

FIGURE 22-9. Taxes Reduce Disposable Income and Shift CC Schedule to the Right and Down

Each dollar of taxes paid shifts the CC schedule to the right by the amount of the tax. A rightward CC shift also means a downward CC shift, but the downward CC shift is less than the rightward shift. Why? Because the downward shift is equal to the rightward shift times the MPC . Thus, if the MPC is $\frac{2}{3}$, the downward shift is $\frac{2}{3}$ times \$300 billion = \$200 billion. Verify that $WV = \frac{2}{3} UV$.

from Chapter 20 that GDP equals disposable income plus taxes. But with tax revenues held constant, GDP and DI will always differ by the same amount; thus, after taking account of such taxes, we can still plot the CC consumption schedule against GDP rather than against DI .

Figure 22-9 shows how the consumption function changes when taxes are present. This figure draws the original no-tax consumption function as the blue CC line. In this case, GDP equals disposable income. We use the same consumption function as in Table 22-2 on page 440. Therefore, consumption is 3000 when GDP (and DI) is 3000, and so forth.

Now introduce taxes of 300. At a DI of 3000, GDP must equal $3300 = 300 + 3000$. Consumption is still 3000 when GDP is 3300 because DI is 3000. We can therefore plot consumption as a function of GDP by shifting the consumption function rightward to the green $C'C'$ curve. The amount of the rightward shift is UV , which is exactly equal to the amount of taxes, 300.

Alternatively, we can plot the new consumption function as a parallel downward shift by 200. As

Figure 22-9 shows, 200 is the result of multiplying a decrease in income of 300 times the MPC of $\frac{2}{3}$.

Turning next to the different components of aggregate demand, recall from Chapter 20 that GDP consists of four elements:

$$\begin{aligned} \text{GDP} &= \text{consumption expenditure} \\ &\quad + \text{gross private domestic investment} \\ &\quad + \text{government purchases of goods and services} \\ &\quad + \text{net exports} \\ &= C + I + G + X \end{aligned}$$

For now, we consider a closed economy with no foreign trade, so our GDP consists of the first three components, $C + I + G$. (We add the final component, net exports, when we consider open-economy macroeconomics.)

Figure 22-10 shows the effect of including government purchases. This diagram is very similar to the one used earlier in this chapter (see Figure 22-7). Here, we have added a new expenditure stream, G , to the consumption and investment amounts. Diagrammatically, we place the new variable, G (government

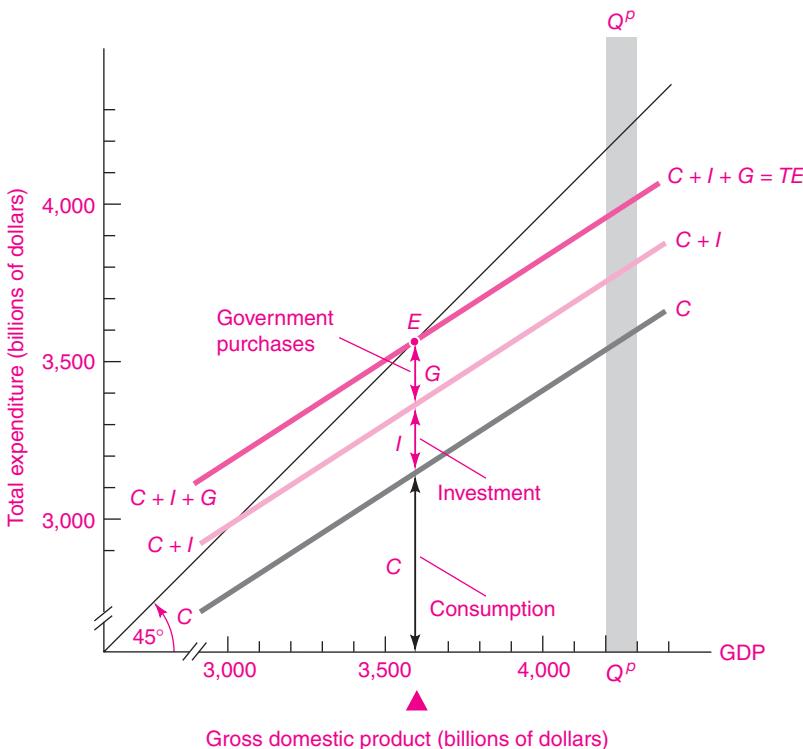


FIGURE 22-10. Government Purchases Add On Just like Investment to Determine Equilibrium GDP

We now add government purchases on top of consumption and investment spending. This gives us the new total planned expenditure schedule, $TE = C + I + G$. At E , where the TE schedule intersects the 45° line, we find the equilibrium level of GDP.

purchases of goods and services), on top of the consumption function and the fixed amount of investment. The vertical distance between the $C + I$ line and the new $TE = C + I + G$ line is just the quantity of G .

Why do we simply add G on the top? Because spending on government buildings (G) has the same macroeconomic impact as spending on private buildings (I); the collective expenditure involved in buying a government vehicle (G) has the same effect on jobs as private consumption expenditures on automobiles (C).

We end up with the three-layer cake of $TE = C + I + G$, calculating the amount of total spending forthcoming at each level of GDP. We now must locate the point of intersection of the TE line with the 45° line to find the equilibrium level of GDP. At this equilibrium GDP level, denoted by point E in Figure 22-10, total planned spending exactly equals total planned output. Point E thus indicates the equilibrium level of output when we add government purchases to the multiplier model.

Impact of Taxation on Aggregate Demand

How does government taxation tend to reduce aggregate demand and the level of GDP? Extra taxes lower our disposable incomes, and lower disposable incomes tend to reduce our consumption spending. Clearly, if investment and government purchases remain unchanged a reduction in consumption spending will then reduce GDP and employment. Thus, in the multiplier model, higher taxes without increases in government purchases will tend to reduce real GDP.²

A look back at Figure 22-9 confirms this reasoning. In this figure, the upper CC curve represents the level of the consumption function with no taxes. But the upper curve cannot be the consumption function because consumers definitely pay taxes on their incomes. Suppose that consumers pay \$300 billion in taxes at every level of income; thus, DI is exactly \$300 billion less than GDP at every level of output.

² Strictly speaking, by "taxes" in this chapter we mean net taxes, or taxes minus transfer payments.

As shown in Figure 22-9, this level of taxes can be represented by a rightward shift in the consumption function of \$300 billion. This rightward shift will also appear as a downward shift; if the MPC is $\frac{2}{3}$, the rightward shift of \$300 billion will be seen as a downward shift of \$200 billion.

Without a doubt, taxes lower output in our multiplier model, and Figure 22-10 shows why. When taxes rise, $I + G$ does not change, but the increase in taxes will lower disposable income, thereby shifting the CC consumption schedule downward. Hence, the $C + I + G$ schedule shifts downward. You can pencil in a new, lower $C + I + G$ schedule in Figure 22-10. Confirm that its new intersection with the 45° line must be at a lower equilibrium level of GDP.

Keep in mind that G is government purchases of goods and services. It excludes spending on transfers such as unemployment insurance or social security payments. These transfers are treated as negative taxes, so the taxes (T) considered here can best be thought of as taxes less transfers. Therefore, if direct and indirect taxes total \$400 billion, while all transfer payments are \$100 billion, then net taxes, T , are $\$400 - \$100 = \$300$ billion. (Can you see why an increase in social security benefits lowers T , raises DI ,

shifts the $C + I + G$ curve upward, and raises equilibrium GDP?)

A Numerical Example

The points made up to now are illustrated in Table 22-3. This table is very similar to Table 22-2, which illustrated output determination in the simplest multiplier model. The first column shows a reference level of GDP, while the second shows a fixed level of taxes, \$300 billion. Disposable income in column (3) is GDP less taxes. Planned consumption, taken as a function of DI , is shown in column (4). Column (5) shows the fixed level of planned investment, while column (6) exhibits the level of government purchases. To find total planned expenditures, TE , in column (7), we add together the C , I , and G in columns (4) through (6).

Finally, we compare total desired expenditures TE in column (7) with the initial level of GDP in column (1). If desired spending is above GDP, firms raise production to meet the level of spending, and output consequently rises; if desired spending is below GDP, output falls. This tendency, shown in the last column, assures us that output will tend toward its equilibrium level at \$3600 billion.

Output Determination with Government Spending (billions of dollars)							
(1) Initial level of GDP	(2) Taxes T	(3) Disposable income DI	(4) Planned consumption C	(5) Planned investment I	(6) Government expenditure G	(7) Total planned expenditure, TE $(C + I + G)$	(8) Resulting tendency of economy
4,200	300	3,900	3,600	200	200	4,000	↓ Contraction
3,900	300	3,600	3,400	200	200	3,800	↓ Contraction
3,600	300	3,300	3,200	200	200	3,600	Equilibrium
3,300	300	3,000	3,000	200	200	3,400	↑ Expansion
3,000	300	2,700	2,800	200	200	3,200	↑ Expansion

TABLE 22-3. Government Purchases, Taxes, and Investment Also Determine Equilibrium GDP

This table shows how output is determined when government purchases of goods and services are added to the multiplier model. In this example, taxes are “lump-sum” or independent of the level of income. Disposable income is thus GDP minus \$300 billion. Total spending is $I + G +$ the consumption determined by the consumption function.

At levels of output less than \$3600 billion, planned spending is greater than output, so output expands. Levels of output greater than \$3600 are unsustainable and lead to contraction. Only at output of \$3600 is output in equilibrium—that is, planned spending equals output.

FISCAL-POLICY MULTIPLIERS

The multiplier analysis shows that government fiscal policy is high-powered spending much like investment. The parallel suggests that fiscal policy should also have multiplier effects upon output. And this is exactly right.

The **government expenditure multiplier** is the increase in GDP resulting from an increase of \$1 in government purchases of goods and services. An initial government purchase of a good or service will set in motion a chain of spending: if the government builds a road, the road-builders will spend some of their incomes on consumption goods, which in turn will generate additional incomes, some of which will be spent. In the simple model examined here, the ultimate effect on GDP of an extra dollar of G will be the same as the effect of an extra dollar of I : the multipliers are both equal to $1/(1 - MPC)$. Figure 22-11 shows how a change in G will result in a higher level of GDP, with the increase being a multiple of the increase in government purchases.

To show the effects of an extra \$100 billion of G , the $C + I + G$ curve in Figure 22-11 has been shifted up by \$100 billion. The ultimate increase in GDP is equal to the \$100 billion of primary spending times

the expenditure multiplier. In this case, because the MPC is $\frac{2}{3}$, the multiplier is 3, so the equilibrium level of GDP rises by \$300 billion.

This example, as well as common sense, tells us that the government expenditure multiplier is exactly the same number as the investment multiplier. They are both called **expenditure multipliers**.

Also, note that the multiplier horse can be ridden in both directions. If government purchases were to fall, with taxes and other influences held constant, GDP would decline by the change in G times the multiplier.

The effect of G on output can be seen as well in the numerical example of Table 22-3. You can pencil in a different level of G —say, \$300 billion—and find the equilibrium level of GDP. It should give the same answer as Figure 22-11.

We can sum up:

Government purchases of goods and services (G) are an important force in determining output and employment. In the multiplier model, if G increases, output will rise by the increase in G times the expenditure multiplier. Government purchases therefore have the potential to increase or decrease output over the business cycle.

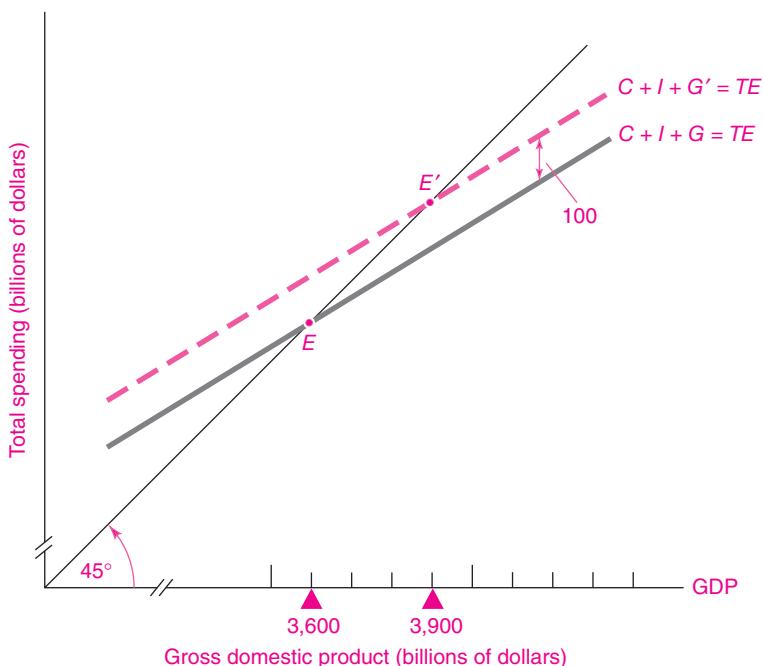


FIGURE 22-11. The Effect of Higher G on Output

Suppose that the government raises defense purchases by \$100 billion in response to a threat to Mideast oil fields. This shifts upward the $C + I + G$ line by \$100 billion to $C + I + G'$.

The new equilibrium level of GDP is thus read off the 45° line at E' rather than at E . Because the MPC is $\frac{2}{3}$, the new level of output is \$300 billion higher. That is, the government expenditure multiplier is

$$3 = \frac{1}{1 - \frac{2}{3}}$$

(What would the government expenditure multiplier be if the MPC were $\frac{3}{4}$? $\frac{1}{2}$? $\frac{1}{3}$? $\frac{1}{4}$? $\frac{1}{5}$? $\frac{1}{6}$? $\frac{1}{7}$? $\frac{1}{8}$? $\frac{1}{9}$? $\frac{1}{10}$? $\frac{1}{11}$? $\frac{1}{12}$? $\frac{1}{13}$? $\frac{1}{14}$? $\frac{1}{15}$? $\frac{1}{16}$? $\frac{1}{17}$? $\frac{1}{18}$? $\frac{1}{19}$? $\frac{1}{20}$? $\frac{1}{21}$? $\frac{1}{22}$? $\frac{1}{23}$? $\frac{1}{24}$? $\frac{1}{25}$? $\frac{1}{26}$? $\frac{1}{27}$? $\frac{1}{28}$? $\frac{1}{29}$? $\frac{1}{30}$? $\frac{1}{31}$? $\frac{1}{32}$? $\frac{1}{33}$? $\frac{1}{34}$? $\frac{1}{35}$? $\frac{1}{36}$? $\frac{1}{37}$? $\frac{1}{38}$? $\frac{1}{39}$? $\frac{1}{40}$? $\frac{1}{41}$? $\frac{1}{42}$? $\frac{1}{43}$? $\frac{1}{44}$? $\frac{1}{45}$? $\frac{1}{46}$? $\frac{1}{47}$? $\frac{1}{48}$? $\frac{1}{49}$? $\frac{1}{50}$? $\frac{1}{51}$? $\frac{1}{52}$? $\frac{1}{53}$? $\frac{1}{54}$? $\frac{1}{55}$? $\frac{1}{56}$? $\frac{1}{57}$? $\frac{1}{58}$? $\frac{1}{59}$? 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Economic Stimulus from Defense Spending			
War	Period of war or buildup	Increase in defense spending as percent of GDP	Real GDP growth over buildup period (%)
World War I	1916–1918	10.2	13.0
World War II			
Before Pearl Harbor	1939–1941	9.7	26.7
All years	1939–1944	41.4	69.1
Korean War	1950:3–1951:3	8.0	10.5
Vietnam War	1965:3–1967:1	1.9	9.7
Persian Gulf War	1990:3–1991:1	0.3	−1.3
Iraq War	2003:1–2003:2	0.1	0.5

TABLE 22-4. Economic Booms Accompany Large Increases in Military Spending

This table shows the period of the war or buildup, the size of the military buildup, and the resulting increase in real GDP. Major wars have produced sustained economic booms, but the last two wars, with relatively little growth in military spending, had only a small impact on the economy.

Source: Department of Commerce, National Income and Product Accounts, available at www.bea.gov, and estimates by authors. The dates are year and quarter. Hence, 1950:3 is the third quarter of 1950.



Are Wars Necessary for Full Employment?

Historically, economic expansions were the constant companions of war. As can be seen in Table 22-4, major wars in the past were often accompanied by large increases in military spending. In World War II, for example, defense outlays rose by almost 10 percent of total GDP before Pearl Harbor was bombed in December 1941. Indeed, many scholars believe that the United States emerged from the Great Depression largely because of the buildup for World War II. Similar but smaller military buildups accompanied economic expansions in the Korean and Vietnam Wars.

By contrast, the Persian Gulf War of the early 1990s triggered a recession. The reason for this anomaly was that there was but a small increase in military spending and psychological factors triggered by the war more than offset the increase in G .

What were these psychological factors? After Iraq invaded Kuwait in August 1990, consumers and investors became frightened and reduced spending. Additionally, oil prices shot up, lowering real incomes. These factors then reversed after the U.S. victory in February 1991.

What was the impact of the war in Iraq in early 2003? This war resembled the Persian Gulf War more than it did major wars. There was little increase in defense

spending, while cautious consumers and businesses, along with high oil prices, produced a strong headwind that slowed the economy.

The role of wartime spending in economic expansions is one of the most direct and persuasive examples of the functioning of the multiplier model. Make sure you understand the underlying mechanism as well as why the sizes of the economic expansions shown in Table 22-4 vary so much.

Impact of Taxes

Taxes also have an impact upon equilibrium GDP, although the size of tax multipliers is smaller than that of expenditure multipliers. Consider the following example: Suppose the economy is at its potential GDP and the nation raises defense spending by \$200 billion. Such sudden increases have occurred at many points in the history of the United States—in the early 1940s for World War II, in 1951 for the Korean war, in the mid-1960s for the Vietnam war, and in the early 1980s during the Reagan administration's military buildup. Furthermore, say that economic planners wish to raise taxes just enough to offset the effect on GDP of the \$200 billion increase in G . How much would taxes have to be raised?

We are in for a surprise. To offset the \$200 billion increase in G , we need to increase tax collections by more than \$200 billion. In our numerical example, we can find the exact size of the tax, or T , increase from Figure 22-9. That figure shows that a \$300 billion increase in T reduces disposable income by just enough to produce a consumption decline of \$200 billion when the MPC is $\frac{2}{3}$. Put differently, a tax increase of \$300 billion will shift the CC curve down by \$200 billion. Hence, while a \$1 billion increase in defense spending shifts up the $C + I + G$ line by \$1 billion, a \$1 billion tax increase shifts down the $C + I + G$ line by only $\frac{2}{3}$ billion (when the MPC is $\frac{2}{3}$). Thus offsetting an increase in government purchases requires an increase in T larger than the increase in G .

Tax changes are a powerful weapon in affecting output. But the tax multiplier is smaller than the expenditure multiplier by a factor equal to the MPC :

$$\text{Tax multiplier} = MPC \times \text{expenditure multiplier}$$

The reason the tax multiplier is smaller than the expenditure multiplier is straightforward. When government spends \$1 on G , that \$1 gets spent directly on GDP. On the other hand, when government cuts taxes by a dollar, only part of that dollar is spent on C , while a fraction of that \$1 tax cut is saved. The difference in the responses to a dollar of G and to a dollar of T is enough to lower the tax multiplier below the expenditure multiplier.³

The Multiplier Model and the Business Cycle

The multiplier model is the simplest model of the business cycle. It can show how changes in

investment due to innovation or pessimism, or fluctuations in government spending due to war, can lead to sharp changes in output. Suppose that war breaks out and the country increases military spending (as illustrated by the many cases in Table 22-4). G increases, and this leads to a multiplied increase in output, as seen in Figure 22-11. If you look back at Figure 22-2 on page 430, you can see how large wars were accompanied by large increases in output relative to potential output. Similarly, suppose that a burst of innovation leads to rapid growth in investment, as occurred with the new-economy boom of the 1990s. This would lead to an upward shift in the $C + I + G$ curve and to higher output. Again, you can see the results in Figure 22-2. Make sure you can graph each of these examples using the $C + I + G$ apparatus. Also, make sure you can explain why a revolution in a country that led to sharp decline in investment might lead to a recession.

Economists often combine the multiplier model with the accelerator principle of investment as an internal theory of the business cycle. In this approach, every expansion breeds recession and contraction, and every contraction breeds revival and expansion—in a quasi-regular, repeating chain. According to the accelerator principle, rapid output growth stimulates investment, which is amplified by the multiplier on investment. High investment, in turn, stimulates more output growth, and the process continues until the capacity of the economy is reached, at which point the economic growth rate slows. The slower growth, in turn, reduces investment spending, and this, working through the multiplier, tends to send the economy into a recession. The process then works in reverse until the trough is reached, and the economy then stabilizes and turns up again. This internal theory of the business cycle shows a mechanism, like the rise and fall of the tides in which an exogenous shock tends to propagate itself through the economy in a cyclical fashion. (See question 11 at the end of the chapter for a numerical example.)

³ For simplicity, we take the absolute value of the tax multiplier (since the multiplier is actually negative). The different multipliers can be seen using the device of the “expenditure rounds” shown on page 441. Let the MPC be r . Then if G goes up by 1 unit, the total increase in spending is the sum of secondary responding rounds:

$$1 + r + r^2 + r^3 + \dots = \frac{1}{1 - r}$$

Now, if taxes are reduced by \$1, consumers save $(1 - r)$ of the increased disposable income and spend r dollars on the first round. With the further rounds, the total spending is thus

$$r + r^2 + r^3 + \dots = \frac{r}{1 - r}$$

Thus the tax multiplier is r times the expenditure multiplier, where r is the MPC .

The multiplier model, working together with the dynamics of investment, shows how alternating bouts of investment optimism and pessimism, along with changes in other exogenous expenditures, can lead to the fluctuations that we call business cycles.

The Multiplier Model in Perspective

We have completed our introductory survey of the Keynesian multiplier model. It will be useful to put all this in perspective and see how the multiplier model fits into a broader view of the macroeconomy. Our goal is to understand what determines the level of national output in a country. In the long run, a country's production and living standards are largely determined by its potential output. But in the short run, business conditions will push the economy above or below its long-term trend. It is this deviation of output and employment from the long-term trend that we analyze with the multiplier model.

The multiplier model has been enormously influential in business-cycle theory over the last half-century. However, it gives an oversimplified picture of the economy. One of the most significant omissions is the impact of financial markets and monetary policy on the economy. Changes in output tend to affect interest rates, which in turn affect the economy. Additionally, the simplest multiplier model omits the interactions between the domestic economy and the

rest of the world. Finally, the model omits the supply side of the economy as represented by the interaction of spending with aggregate supply and prices. All of these shortcomings will be remedied in later chapters, and it is useful to keep in mind that this first model is simply a stepping stone on the path to understanding the economy in all its complexity.

The multiplier analysis focuses primarily on spending changes as the factors behind short-run output movements. In this approach, fiscal policy is often used as a tool to stabilize the economy. But the government has another equally powerful weapon in monetary policy. Although monetary policy works quite differently, it has many advantages as a means of combating unemployment and inflation.

The next two chapters survey one of the most fascinating parts of all economics: money and financial markets. Once we understand how the central bank helps determine interest rates and credit conditions, we will have a fuller appreciation of how governments can tame the business cycles that have run wild through much of the history of capitalism.



SUMMARY

A. What are Business Cycles?

- Business cycles or fluctuations are swings in total national output, income, and employment, marked by widespread expansion or contraction in many sectors of the economy. They occur in all advanced market economies. We distinguish the phases of expansion, peak, recession, and trough.
- Most business cycles occur when shifts in aggregate demand cause changes in output, employment, and prices. Aggregate demand shifts when changes in spending by consumers, businesses, or governments change total spending relative to the economy's productive capacity. A decline in aggregate demand leads to recessions or even depressions. An upturn in economic activity can lead to inflation.
- Business-cycle theories differ in their emphasis on exogenous and internal factors. Importance is often attached to fluctuations in such exogenous factors as technology, elections, wars, exchange-rate movements, and oil-price shocks. Most theories emphasize that these exogenous shocks interact with internal mechanisms, such as financial market bubbles and busts.

B. Aggregate Demand and Business Cycles

- Ancient societies suffered when harvest failures produced famines. The modern market economy can suffer from poverty amidst plenty when insufficient aggregate demand leads to deteriorating business conditions and high unemployment. At other times, excessive government spending and reliance on the monetary printing press can lead to runaway inflation. Understanding the forces that affect aggregate demand, including government fiscal and monetary policies, can help economists and policymakers smooth out the cycle of boom and bust.
- Aggregate demand represents the total quantity of output willingly bought at a given price level, other things held constant. Components of spending include (a) consumption, which depends primarily upon disposable income; (b) investment, which depends upon present and expected future output and upon interest rates and taxes; (c) government purchases of goods and services; and (d) net exports, which depend upon foreign and domestic outputs and prices and upon foreign exchange rates.

6. Aggregate demand curves differ from demand curves used in microeconomic analysis. The *AD* curves relate overall spending on all components of output to the overall price level, with policy and exogenous variables held constant. The aggregate demand curve is downward-sloping because a higher price level reduces real income and real wealth.
7. Factors that change aggregate demand include (a) macroeconomic policies, such as fiscal and monetary policies, and (b) exogenous variables, such as foreign economic activity, technological advances, and shifts in asset markets. When these variables change, they shift the *AD* curve.

C. The Multiplier Model

8. The multiplier model provides a simple way to understand the impact of aggregate demand on the level of output. In the simplest approach, household consumption is a function of disposable income, while investment is fixed. People's desire to consume and the willingness of businesses to invest are brought into balance by adjustments in output. The equilibrium level of national output occurs when planned spending equals planned output. Using the expenditure-output approach, equilibrium output comes at the intersection of the total expenditure (*TE*) consumption-plus-investment schedule and the 45° line.
9. If output is temporarily above its equilibrium level, businesses find output higher than sales, with inventories piling up involuntarily and profits plummeting. Firms therefore cut production and employment back toward the equilibrium level. The only sustainable level of output comes when buyers desire to purchase exactly as much as businesses desire to produce. Thus, for the simplified Keynesian multiplier model, investment calls the tune and consumption dances to the music.

10. Investment has a *multiplied effect* on output. When investment changes, output will initially rise by an equal amount. But that output increase is also an income increase for consumers. As consumers spend a part of their additional income, this sets in motion a whole chain of additional consumption spending and employment.

11. If people always spend r of each extra dollar of income on consumption, the total of the multiplier chain will be

$$1 + r + r^2 + \dots = \frac{1}{1 - r} = \frac{1}{1 - MPC} = \frac{1}{MPS}$$

The simplest multiplier is numerically equal to $1/(1 - MPC)$.

12. Key points to remember are (a) the basic multiplier model emphasizes the importance of shifts in aggregate demand in affecting output and income and (b) it is primarily applicable for situations with unemployed resources.

D. Fiscal Policy in the Multiplier Model

13. The analysis of fiscal policy elaborates the Keynesian multiplier model. It shows that an increase in government purchases—taken by itself, with taxes and investment unchanged—has an expansionary effect on national output much like that of investment. The total expenditure $TE = C + I + G$ schedule shifts upward to a higher equilibrium intersection with the 45° line.
14. A decrease in taxes—taken by itself, with investment and government purchases unchanged—raises the equilibrium level of national output. The *CC* schedule of consumption plotted against GDP is shifted upward and leftward by a tax cut. But since the extra dollars of disposable income go partly into saving, the dollar increase in consumption will not be quite as great as the increase in new disposable income. Therefore, the tax multiplier is smaller than the government-expenditure multiplier.

CONCEPTS FOR REVIEW

Business Fluctuations or Cycles

business cycle or business fluctuation
business-cycle phases: peak, trough,
expansion, contraction
recession
exogenous and internal cycle theories

Aggregate Demand

aggregate demand shifts and business fluctuations
aggregate demand, *AD* curve
major components of aggregate demand: *C, I, G, X*
downward-sloping *AD* curve

factors underlying and shifting the *AD* curve

The Basic Multiplier Model

$TE = C + I + G$ schedule
output and spending: planned vs.
actual levels
multiplier effect of investment

multiplier

$$= 1 + MPC + (MPC)^2 + \dots \\ = \frac{1}{1 - MPC} = \frac{1}{MPS}$$

Government Purchases and Taxation

fiscal policy:

- G* effect on equilibrium GDP
- T* effect on *CC* and on GDP

multiplier effects of government purchases (*G*) and taxes (*T*)

C + *I* + *G* curve

FURTHER READING AND INTERNET WEBSITES

Further Reading

The quotation from Okun is Arthur M. Okun, *The Political Economy of Prosperity* (Norton, New York, 1970), pp. 33 ff. This is a fascinating book on the economic history of the 1960s written by one of America's great macroeconomists.

The classic study of business cycles by leading scholars at the National Bureau of Economic Research (NBER) is Arthur F. Burns and Wesley Clair Mitchell, *Measuring Business Cycles* (Columbia University Press, New York, 1946). This is available from the NBER at www.nber.org/books/burn46-1. The multiplier model was developed by John Maynard Keynes in *The General Theory of Employment, Interest and Money* (Harcourt, New York, first published in 1935). Advanced treatments can be found in the intermediate textbooks listed in the Further Reading section in Chapter 19. One of Keynes's most influential books, *The Economic Consequences*

of the Peace (1919), predicted with uncanny accuracy that the Treaty of Versailles would lead to disastrous consequences for Europe.

Websites

A consortium of macroeconomists participates in the NBER program on economic fluctuations and growth. You can sample the writings and data at www.nber.org/programs/efg/efg.html. The NBER also dates business cycles for the United States. You can see the recessions and expansions along with a discussion at www.nber.org/cycles.html.

Business-cycle data and discussion can be found at the site of the Bureau of Economic Analysis, www.bea.gov. The first few pages of the *Survey of Current Business*, available at www.bea.gov/bea/pubs.htm, contain a discussion of recent business-cycle developments.

QUESTIONS FOR DISCUSSION

1. Define carefully the difference between movements along the *AD* curve and shifts of the *AD* curve. Explain why an increase in potential output would shift out the *AS* curve and lead to a movement along the *AD* curve. Explain why a tax cut would shift the *AD* curve outward (increase aggregate demand).
2. Construct a table parallel to Table 22-1, listing events that would lead to a *decrease* in aggregate demand. (Your table should provide different examples rather than simply changing the direction of the factors mentioned in Table 22-1.)
3. In recent years, a new theory of real business cycles (or RBCs) has been proposed (this approach is further analyzed in Chapter 31). RBC theory suggests that business fluctuations are caused by shocks to productivity, which then propagate through the economy.
 - a. Show the RBC theory in the *AS-AD* framework.
 - b. Discuss whether the RBC theory can explain the customary characteristics of business fluctuations described on pages 430–431.
4. In the simple multiplier model, assume that investment is always zero. Show that equilibrium output in this special case would come at the break-even point of the consumption function. Why would equilibrium output come *above* the break-even point when investment is positive?
5. Define carefully what is meant by equilibrium in the multiplier model. For each of the following, state why the situation is *not* an equilibrium. Also describe how the economy would react to each of the situations to restore equilibrium.
 - a. In Table 22-2, GDP is \$3300 billion.
 - b. In Figure 22-7, actual investment is zero and output is at *M*.
 - c. Car dealers find that their inventories of new cars are rising unexpectedly.
6. Reconstruct Table 22-2 assuming that planned investment is equal to (a) \$300 billion and (b) \$400 billion. What is the resulting difference in GDP? Is this difference greater or smaller than the change in *I*? Why?

When I drops from \$200 billion to \$100 billion, how much must GDP drop?

7. Give (a) the common sense, (b) the arithmetic, and (c) the geometry of the multiplier. What are the multipliers for $MPC = 0.9$? 0.8 ? 0.5 ?
8. Explain in words and using the notion of expenditure rounds why the tax multiplier is smaller than the expenditure multiplier.
9. “Even if the government spends billions on wasteful military armaments, this action can create jobs in a recession.” Discuss.
10. **Advanced problem:** The growth of nations depends crucially on saving and investment. And from youth we are taught that thrift is important and that “a penny saved is a penny earned.” But will higher saving necessarily benefit the economy? In a striking argument called *the paradox of thrift*, Keynes pointed out that when people attempt to save more, this will not necessarily result in more saving for the nation as a whole.

To see this point, assume that people decide to save more. Higher desired saving means lower desired consumption, or a downward shift in the consumption function. Illustrate how an increase in desired saving shifts down the TE curve in the multiplier model of Figure 22-7. Explain why this will *decrease output with no increase in saving!* Provide the intuition here that if people try to increase their saving and lower their consumption for a given level of business investment, sales will fall and businesses will cut back on production. Explain how far output will fall.

Here then is the paradox of thrift: When the community desires to save more, the effect may actually be a lowering of income and output with no increase of saving.

11. **Advanced problem illustrating the multiplier-accelerator mechanism:** Find two dice and use the following technique to see if you can generate something that

looks like a business cycle: Record the numbers from 20 or more rolls of the dice. Take five-period moving averages of the successive numbers. Then plot these averages. They will look very much like movements in GDP, unemployment, or inflation.

One sequence thus obtained was 7, 4, 10, 3, 7, 11, 7, 2, 9, 10, . . . The averages were $(7 + 4 + 10 + 3 + 7)/5 = 6.2$; $(11 + 7 + 2 + 9 + 10)/5 = 7$, and so forth. Why does this look like a business cycle?

[Hint: The random numbers generated by the dice are like exogenous shocks of investment or wars. The moving average is like the economic system’s (or a rocking chair’s) internal multiplier or smoothing mechanism. Taken together, they produce what looks like a cycle.]

12. **Data problem:** Some economists prefer an objective, quantitative definition of a recession to the more subjective approach used by the NBER. These economists define a recession as any period during which real GDP declined for at least two quarters in a row. Note from the text that this is *not* the way the NBER defines a recession.

- a. Get quarterly data on real GDP for the United States for the period since 1948. This can be obtained from the website of the Bureau of Economic Analysis, www.bea.gov. Put the data in a column of a spreadsheet, along with the corresponding date in another column.
- b. Calculate in a spreadsheet the percent growth rate of real GDP for each quarter at an annual rate. This is calculated as follows:

$$g_t = 400 \times \frac{x_t - x_{t-1}}{x_{t-1}}$$

- c. Under this alternative definition, which periods would you identify as recessions? For which years does this alternative objective procedure reach a conclusion different from that of the NBER?

Money and the Financial System

23



Over all history, money has oppressed people in one of two ways: either it has been abundant and very unreliable, or reliable and very scarce.

John Kenneth Galbraith
The Age of Uncertainty (1977)

The financial system is one of the most important and innovative sectors of a modern economy. It forms the vital circulatory system that channels resources from savers to investors. Whereas finance in an earlier era consisted of banks and the country store, finance today involves a vast, worldwide banking system, securities markets, pension funds, and a wide array of financial instruments. When the financial system functions smoothly, as was the case for most of the period since World War II, it contributes greatly to healthy economic growth. However, when banks fail and people lose confidence in the financial system, as happened in the world financial crisis of 2007–2009, credit becomes scarce, investment is curbed, and economic growth slows.

Overview of the Monetary Transmission Mechanism

One of the most important topics in macroeconomics is the *monetary transmission mechanism*. This refers to the process by which monetary policy undertaken by the central bank (in the case of the U.S., the Federal Reserve), interacts with banks and the rest of the economy to determine interest rates, financial conditions, aggregate demand, output, and inflation.

We can provide an overview of the monetary transmission mechanism as a series of five logical steps:

1. The central bank announces a target short-term interest rate that depends upon its objectives and the state of the economy.
2. The central bank undertakes daily open-market operations to meet its interest-rate target.
3. The central bank's new interest-rate target and market expectations about future financial conditions help determine the entire spectrum of short- and long-term interest rates, asset prices, and exchange rates.
4. The changes in interest rates, credit conditions, asset prices, and exchange rates affect investment, consumption, and net exports.
5. Changes in investment, consumption, and net exports affect the path of output and inflation through the AS-AD mechanism.

We survey the different elements of this mechanism in the three chapters on money, finance, and central banking. Chapter 15 examined the major elements of interest rates and capital. The present chapter focuses on the private financial sector, including the structure of the financial system (Section A), the

demand for money (Section B), banks (Section C), and the stock market (Section D). The next chapter surveys central banking as well as the way in which financial markets interact with the real economy to determine output and inflation. When you have completed these chapters, you will understand the different steps in the monetary transmission mechanism. It is one of the most important parts of all of macroeconomics.

A. THE MODERN FINANCIAL SYSTEM

The Role of the Financial System

The financial sector of an economy is the circulatory system that links together goods, services, and finance in domestic and international markets. It is through money and finance that households and firms borrow from and lend to each other in order to consume and invest. People may borrow or lend because their cash incomes do not match their desired spending. For example, students generally have spending needs for tuition and living expenses that exceed their current incomes. They often finance their excess spending with student loans. Similarly, working couples will generally save some of their current incomes for retirement, perhaps by buying stocks or bonds. They are thereby financing their retirement.

The activities involved in finance take place in the **financial system**. This encompasses the markets, firms, and other institutions which carry out the financial decisions of households, businesses, and governments. Important parts of the financial system include the money market (discussed later in this chapter), markets for fixed-interest assets like bonds or mortgages, stock markets for the ownership of firms, and foreign exchange markets which trade the monies of different countries. Most of the financial system in the United States is composed of for-profit entities, but government institutions such as the Federal Reserve System and other regulatory bodies are particularly important for ensuring an efficient and stable financial system.

Borrowing and lending take place in financial markets and through financial intermediaries. **Financial markets** are like other markets except that

their products and services consist of financial instruments like stocks and bonds. Important financial markets are stock markets, bond markets, and foreign exchange markets.

Institutions which provide financial services and products are called **financial intermediaries**. Financial institutions differ from other businesses because their assets are largely financial, rather than real assets like plant and equipment. Many retail financial transactions (such as banking or purchase of insurance) take place through financial intermediaries rather than directly in financial markets.

The most important financial intermediaries are commercial banks, which take deposits of funds from households and other groups and lend these funds to businesses and others who need funds; banks also “create” the special product known as money. Other important financial intermediaries are insurance companies and pension funds; these firms provide specialized services such as insurance policies and investments held until people retire.

Yet another group of intermediaries pools and subdivides securities. These intermediaries include mutual funds (which hold bonds and corporate stocks on behalf of small investors), government-sponsored mortgage buyers (which buy mortgages from banks and sell them to other financial institutions), and “derivative” firms (which buy assets and then subdivide them into various parts).

Table 23-1 shows the growth and composition of the assets of financial institutions in the United States. There has been substantial growth and innovation in this area, such that the ratio of all assets to GDP grew from 1.5 in 1965 to 4.5 in 2007. This growth took place because of increased *financial intermediation*, which is a process in which assets are bought, repackaged, and resold several times. The purpose of financial intermediation is to transform illiquid assets into liquid assets that small investors can buy. By the end of 2007, financial intermediaries had total assets of \$61 trillion, or around \$530,000 per American household. Clearly, given the investments people have in this sector, a careful study is important not only for good policy but also for wise household financial decision making.

The Functions of the Financial System

Because the financial system is such a critical part of a modern economy, let's consider its major functions:

	1965		2007	
	Total assets (\$, billion)	Percent of total	Total assets (\$, billion)	Percent of total
Federal Reserve	112	11	2,863	5
Commercial banks	342	33	11,195	18
Other credit institutions	198	19	2,575	4
Insurance and pension funds	325	31	16,557	27
Money market and mutual funds	43	4	11,509	19
Government-sponsored mortgage firms	20	2	9,322	15
Asset-backed securities	0	0	4,221	7
Security brokers, dealers, and miscellaneous	10	1	3,095	5
Total	1050	100	61,337	100
Percent of GDP	146%		450%	

TABLE 23-1. Assets of Major Financial Institutions in the United States

The financial sector has evolved rapidly over the last four decades. The table shows the total assets of all financial institutions, the grand total of which increased from 146 to 450 percent of GDP. Banks and other credit institutions declined in importance as secondary institutions like mutual funds and government-sponsored mortgage guarantors expanded sharply. Some important new areas, such as asset-backed securities, did not even exist in the 1960s.

Source: Federal Reserve Board, Flow of Funds, available at www.federalreserve.gov/releases/z1/, level tables.

- The financial system *transfers resources* across time, sectors, and regions. This function allows investments to be devoted to their most productive uses rather than being bottled up where they are least needed. We provided the examples above of student loans and retirement saving. Another example is found in international finance. Japan, which has a high saving rate, transfers resources to China, which has robust investment opportunities; this transfer occurs through both loans and direct foreign investments in China.
- The financial system *manages risks* for the economy. In one sense, risk management is like resource transfer: it moves risks from those people or sectors that most need to reduce their risks and transfers or spreads the risks to others who are better able to weather them. For example, fire insurance on your house takes a risk that you may lose a \$200,000 investment and spreads that risk among hundreds or thousands of stockholders of the insurance company.
- The financial system *pools and subdivides funds* depending upon the need of the individual saver or investor. As an investor, you might want to invest \$10,000 in a diversified portfolio of common stocks. To buy efficiently a portfolio of 100 companies might require \$10 million of funds. Here is where a stock mutual fund comes in: by having 1000 investors, it can buy the portfolio, subdivide it, and manage it for you. In return, a well-run mutual fund might charge \$30 per year on your \$10,000 portfolio. Additionally, a modern economy requires large-scale firms which have billions of dollars of invested plant and equipment. No single person is likely to be able to afford that—and if someone could, that person would not want all his or her eggs in one basket. The modern corporation can and does undertake this task because of its ability to sell shares of stock to many people and pool these funds to make large and risky investments.
- The financial system performs an important *clearinghouse function*, which facilitates transactions between payers (purchasers) and payees (sellers). For example, when you write a check to buy a new computer, a clearinghouse will debit your bank and credit the bank of the company selling the computer. This function allows rapid transfers of funds around the world.

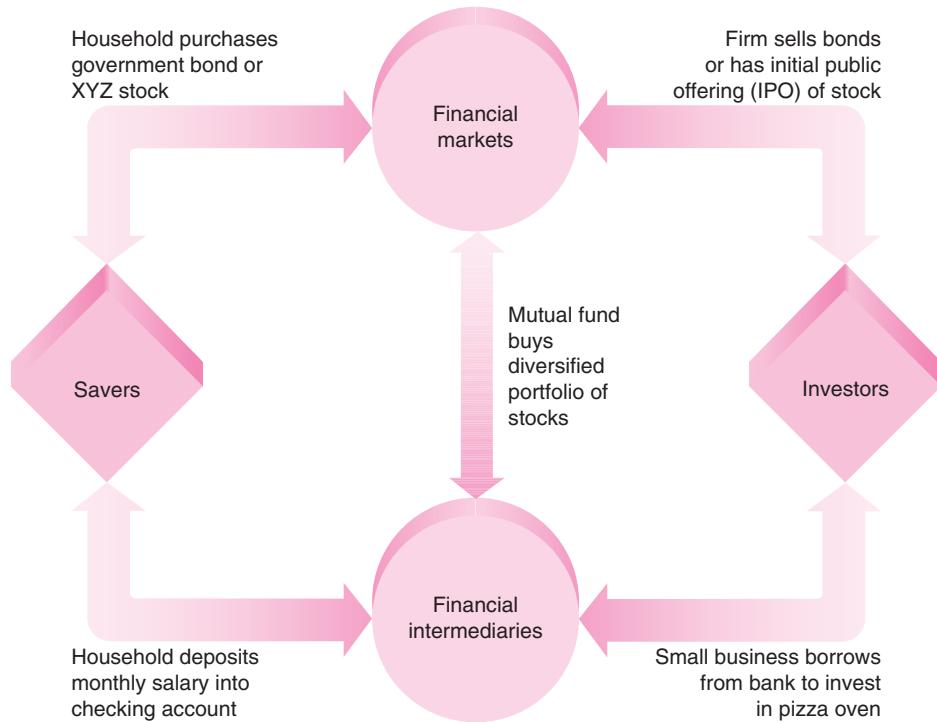


FIGURE 23-1. The Flow of Funds Tracks Financial Flows in the Economy

Savers and investors transfer funds across time, space, and sectors through financial markets and financial intermediaries. Some flows (such as buying 100 shares of XYZ) go directly through financial markets, while others (such as purchasing shares of mutual funds or depositing money in your checking account) go through financial intermediaries.

The Flow of Funds

We can illustrate a simplified account of financial markets through a picture of the **flow of funds**, shown in Figure 23-1. This shows two sets of economic agents—savers and investors—and representative examples of saving and investing through financial markets and financial intermediaries.

This picture is simplified, for there are many different kinds of financial assets or instruments, as we will see in the next section.

A MENU OF FINANCIAL ASSETS

Financial assets are claims by one party against another party. In the United States, they consist primarily of *dollar-denominated assets* (whose payments are fixed in dollar terms) and *equities* (which are claims

on residual flows such as profits or on real assets). Table 23-2 shows the major financial instruments for the United States at the end of 2007. The total value of financial assets was \$142 trillion, which totals an enormous \$1.2 million per American household. Of course, many of these assets are offsetting items, but these huge numbers show how vast the financial system has become.

Here are the major financial instruments or assets:

- *Money* and its two components are very special assets, and they will be defined carefully later in this chapter.
- *Savings accounts* are deposits with banks or credit institutions, usually guaranteed by governments, that have a fixed-dollar principal value and interest rates determined by short-term market interest rates.

Financial instrument	Total (\$, billion)	Percent of total
Money (M_1)		
Currency	774	0.5
Checking deposits	745	0.5
Savings deposits	7,605	5.4
Money market and mutual funds	10,852	7.6
Credit market instruments		
Government and government-sponsored	12,475	8.8
Private	38,660	27.2
Corporate and noncorporate equity	29,355	20.7
Insurance and pension reserves	13,984	9.9
Miscellaneous credit and other	27,470	19.4
Total, all financial instruments	141,921	100.0

TABLE 23-2. Major Financial Instruments in the United States, 2007

This table shows the wide range of financial assets owned by households, firms, and businesses in the United States. The total value is larger than the amount issued by financial institutions alone because many assets are issued by other entities, such as governments.

Source: Federal Reserve Board, Flow of Funds, available at www.federalreserve.gov/releases/z1/, level tables.

- *Credit market instruments* are dollar-denominated obligations of governments or private entities. Federal securities are generally thought to be risk-free assets. Other credit market instruments, which have varying degrees of risk, are mortgages, corporate securities, and junk bonds.
- *Common stocks* (which are a kind of equity) are ownership rights to companies. They yield dividends, which are payments drawn from company profits. Publicly traded stocks, which are priced on stock markets, are discussed later in this chapter. Noncorporate equities are the values of partnerships, farms, and small businesses.
- *Money market funds* and *mutual funds* are funds that hold millions or billions of dollars in either short-term assets or stocks and can be subdivided into fractional shares to be bought by small investors.
- *Pension funds* represent ownership in the assets that are held by companies or pension plans. Workers and companies contribute to these funds during working years. These funds are then drawn down to support people during their retirement years.
- *Financial derivatives* are included in the credit market instruments. These are new forms of financial instruments whose values are based on

or derived from the values of other assets. One important example is a stock option, whose value depends upon the value of the stock to which it is benchmarked.

Note that this list of financial assets excludes the single most important asset owned by most people—their houses, which are tangible as opposed to financial assets.

Review of Interest Rates

Chapter 15 presented a full survey of rates of return, present value, and interest rates. You should review these concepts carefully. Below are the main points.

The interest rate is the price paid for borrowing money. We usually calculate interest as percent per year on the amount of borrowed funds. There are many interest rates, depending upon the maturity, risk, tax status, and other attributes of the loan.

Some examples will illustrate how interest works:

- When you graduate from college, you have only \$500. You decide to keep it in the form of currency in a jar. If you don't spend any, you will still have \$500 at the end of 1 year because currency has a zero interest rate.

- A little later, you deposit \$2000 in a savings account at your local bank, where the interest rate on savings accounts is 4 percent per year. At the end of 1 year, the bank will have paid \$80 in interest into your account, so the account will now be worth \$2080.
- You start your first job and decide to buy a small house that costs \$100,000. You go to your local bank and find that a 30-year, fixed-rate mortgage has an interest rate of 5 percent per year. Each month you must make a mortgage payment of \$536.83. Note that this payment is a little bit more than the pro-rated monthly interest charge of $0.417 (= \frac{5}{12})$ percent per month. Why? Because the monthly payment includes not only interest but also *amortization* (the repayment of principal, the amount borrowed). By the time you have made your 360 monthly payments, you will have completely paid off the loan.

B. THE SPECIAL CASE OF MONEY

Let's now turn to the special case of money. If you think about it for a moment, you will realize that money is a strange thing. We study for years so that we can earn a good living, yet each dollar bill is just paper, with minimal intrinsic value. Money is useless until we get rid of it.

However, money is anything but useless from a macroeconomic point of view. Monetary policy is today one of the two important tools (along with fiscal policy) the government has to stabilize the business cycle. The central bank uses its control over money, credit, and interest rates to encourage growth when the economy slows and to slow growth when inflationary pressures rise.

When the financial system is well managed, output grows smoothly and prices are stable. But an unstable financial system, as seen in many countries torn apart by war or revolution, can lead to inflation or depression. Many of the world's major macroeconomic traumas of the twentieth century can be traced to mismanaged monetary systems.

We now turn to a careful analysis of the definition of demand for money.

THE EVOLUTION OF MONEY

The History of Money

What is money? **Money** is anything that serves as a commonly accepted medium of exchange. Because money has a long and fascinating history, we will begin with a description of money's evolution.

Barter. In an early textbook on money, when Stanley Jevons wanted to illustrate the tremendous leap forward that occurred as societies introduced money, he used the following experience:

Some years since, Mademoiselle Zélie, a singer of the Théâtre Lyrique at Paris, . . . gave a concert in the Society Islands. In exchange for an air from Norma and a few other songs, she was to receive a third part of the receipts.

When counted, her share was found to consist of three pigs, twenty-three turkeys, forty-four chickens, five thousand cocoa-nuts, besides considerable quantities of bananas, lemons, and oranges. . . [I]n Paris . . . this amount of live stock and vegetables might have brought four thousand francs, which would have been good remuneration for five songs. In the Society Islands, however, pieces of money were scarce; and as Mademoiselle could not consume any considerable portion of the receipts herself, it became necessary in the mean time to feed the pigs and poultry with the fruit.

This example describes **barter**, which consists of the exchange of goods for other goods. Exchange through barter contrasts with exchange through money because pigs, turkeys, and lemons are not generally acceptable monies that we or Mademoiselle Zélie can use for buying things. Although barter is better than no trade at all, it operates under grave disadvantages because an elaborate division of labor would be unthinkable without the introduction of the great social invention of money.

As economies develop, people no longer barter one good for another. Instead, they sell goods for money and then use money to buy other goods they wish to have. At first glance this seems to complicate rather than simplify matters, as it replaces one transaction with two. If you have apples and want nuts, would it not be simpler to trade one for the other rather than to sell the apples for money and then use the money to buy nuts?

Actually, the reverse is true: two monetary transactions are simpler than one barter transaction. For example, some people may want to buy apples, and some may want to sell nuts. But it would be a most unusual circumstance to find a person whose desires exactly complement your own—eager to sell nuts and buy apples. To use a classic economics phrase, instead of there being a “double coincidence of wants,” there is likely to be a “want of coincidence.” So, unless a hungry tailor happens to find an unclothed farmer who has both food and a desire for a pair of pants, under barter neither can make a direct trade.

Societies that want to trade extensively simply cannot overcome the overwhelming handicaps of barter. The use of a commonly accepted medium of exchange, money, permits the farmer to buy pants from the tailor, who buys shoes from the cobbler, who buys leather from the farmer.

Commodity Money. Money as a medium of exchange first came into human history in the form of commodities. A great variety of items have served as money at one time or another: cattle, olive oil, beer or wine, copper, iron, gold, silver, rings, diamonds, and cigarettes.

Each of the above has advantages and disadvantages. Cattle are not divisible into small change. Beer does not improve with keeping, although wine may. Olive oil provides a nice liquid currency that is as minutely divisible as one wishes, but it is rather messy to handle. And so forth.

By the eighteenth century, commodity money was almost exclusively limited to metals like silver and gold. These forms of money had *intrinsic value*, meaning that they had use value in themselves. Because money had intrinsic value, there was no need for the government to guarantee its value, and the quantity of money was regulated by the market through the supply and demand for gold or silver. But metallic money has shortcomings because scarce resources are required to dig it out of the ground; moreover, it might become abundant simply because of accidental discoveries of ore deposits.

The advent of monetary control by central banks has led to a much more stable currency system. The intrinsic value of money is now its least important feature.

Modern Money. The age of commodity money gave way to the age of *paper money*. The essence of money is now laid bare. Money is wanted not for its own sake but for the things it will buy. We do not wish to consume money directly; rather, we use it by getting rid of it. Even when we choose to keep money, it is valuable only because we can spend it later on.

The use of paper currency has become widespread because it is a convenient medium of exchange. Paper currency is easily carried and stored. The value of money can be protected from counterfeiting by careful engraving. The fact that private individuals cannot legally create money keeps it scarce. Given this limitation on supply, currency has value. It can buy things. As long as people can pay their bills with currency, as long as it is accepted as a means of payment, it serves the function of money.

Paper money issued by governments was gradually overtaken by *bank money*—the checking accounts that we will discuss shortly.

A few years ago, many people predicted that we would soon move to a cashless society. They foresaw that cash and checking accounts would be replaced by electronic money, such as the stored-value cards found in many stores today. But, in fact, consumers have been reluctant to adopt electronic money in substantial amounts. They trust and prefer government money and checks. To some extent electronic transfers, debit cards, and e-banking have replaced paper checks, but these should be seen as different ways of *using* a checking account rather than as different *kinds* of money.

Components of the Money Supply

Let us now look more carefully at the different kinds of money, focusing on the United States. The main *monetary aggregate* studied in macroeconomics is known as M_1 . This is also called *transactions money*. In earlier times, economists examined other concepts of money, such as M_2 . These concepts included further assets and were often useful for looking at broad trends, but they are little used in monetary policy today. The following are the components of M_1 :

- **Currency.** Currency is defined as coins and paper money held outside the banking system. Most of us know little more about a \$1 or \$5 bill than that each is inscribed with the picture of an American

statesman, bears some official signatures, and has a number showing its face value. Examine a \$10 bill or some other paper bill. You will find that it says "Federal Reserve Note." But what "backs" our paper currency? Many years ago, paper money was backed by gold or silver. There is no such pretense today. Today, all U.S. coins and paper currency are *fiat money*. This term signifies something declared to be money by the government even if it has no intrinsic value. Paper currency and coins are *legal tender*, which must be accepted for all debts, public and private. Currency is approximately one-half of total M_1 .

- *Checking deposits.* The other component of M_1 is bank money. This consists of funds, deposited in banks and other financial institutions, on which you can write checks and withdraw your money on demand. The technical name for this component of the money supply is "demand deposits and other checkable deposits." If I have \$1000 in my checking account at

the Albuquerque National Bank, that deposit can be regarded as money. Why? For the simple reason that I can pay for purchases with checks drawn on it. The funds in my account are a medium of exchange, and it is therefore counted as money.

Students often wonder if credit cards are money. Actually, they are not. The reason is that a credit card is actually an easy (but not cheap!) way to *borrow* money. When paying with a credit card, you are promising to pay the credit card company—with money—at a later date.

Figure 23-2 shows the trend in the ratio of M_1 to GDP. This ratio has declined by a factor of 3 over the last half-century. At the same time, all other financial assets have grown sharply.

Money is anything that serves as a commonly accepted medium of exchange. Today, we define transactions money as M_1 , which is the sum of currency held by the public and checking deposits.

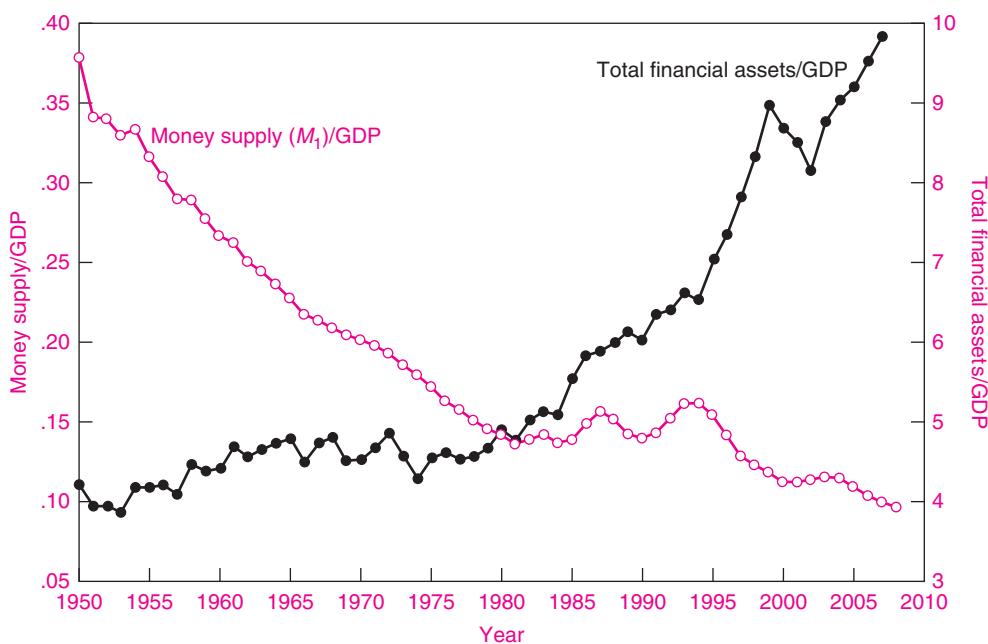


FIGURE 23-2. Money Holdings and Total Financial Assets per Unit of GDP

Total financial assets have risen sharply relative to GDP, while the ratio of the money supply to GDP has gradually declined. Note the vast difference in scale. Total financial assets are defined similarly here as in Table 23-1.

Source: Financial data from the Federal Reserve Board; GDP from the Bureau of Economic Analysis.

THE DEMAND FOR MONEY

The demand for money is different from the demand for ice cream or movies. Money is not desired for its own sake; you cannot eat nickels, and we seldom hang \$100 bills on the wall for the artistic quality of their engraving. Rather, we demand money because it serves us indirectly as a lubricant to trade and exchange.

Money's Functions

Before we analyze the demand for money, let's note money's functions:

- The central function emphasized here is that money serves as a *medium of exchange*. Without money, we would be constantly roving around looking for someone to barter with. Money's value is often shown when the monetary system malfunctions. After Russia abandoned its central-planning system in the early 1990s, for example, people spent hours waiting in line for goods and tried to get dollars or other foreign currencies because the ruble had ceased to function as an acceptable means of exchange.
- Money is also used as the *unit of account*, the unit by which we measure the value of things. Just as we measure weight in kilograms, we measure value in money. The use of a common unit of account simplifies economic life enormously.
- Money is sometimes used as a *store of value*. In comparison with risky assets like stocks or real estate or gold, money is relatively riskless. In earlier days, people held currency as a safe form of wealth. Today, when people seek a safe haven for their wealth, the vast preponderance of their wealth is held in nonmonetary assets, such as savings accounts, stocks, bonds, and real estate.

The Costs of Holding Money

What is the *cost* of holding money? Money is costly because it has a lower yield than do other safe assets. Currency has a nominal interest rate of exactly zero percent per year. Checking deposits sometimes have a small interest rate, but that rate is usually well below the rate on savings accounts or money market mutual funds. For example, over the period 2000–2007, currency had a yield of 0 percent per year, checking

accounts had an average yield of around 0.2 percent per year, and short-term money funds had a yield of around 4.6 percent per year. If the weighted yield on money (currency and checking accounts) was 0.1 percent per year, then the *cost of holding money* was $4.5 = 4.6 - 0.1$ percent per year. Figure 23-3 on page 462 shows the interest rate on money as compared to that on safe short-term assets.

The cost of holding money is the interest forgone from not holding other assets. That cost is usually very close to the short-term interest rate.

Two Sources of Money Demand

Transactions Demand for Money. People need money primarily because their incomes and expenditures do not come at the same time. For example, I might be paid on the last day of the month, but I buy food, newspapers, gasoline, and clothing throughout the month. The need to have money to pay for purchases, or transactions, of goods, services, and other items constitutes the *transactions demand for money*.

For example, suppose that a family earns \$3000 per month, keeps it in money, and spends it evenly throughout the month. A calculation will show that the family holds \$1500 on average in money balances.

This example can help us see how the demand for money responds to different economic influences. If all prices and incomes double, the nominal demand for M doubles. Thus the transactions demand for money doubles if nominal GDP doubles with no change in real GDP or other real variables.

How does the demand for money vary with interest rates? As interest rates rise, the family might say, "Let's put only half of our money in the checking account at the beginning of the month and put the other half in a savings account earning 8 percent per year. Then on day 15, we'll take that \$1500 out of the savings account and put it into our checking account to pay the next 2 weeks' bills."

This means that as interest rates rose and the family decided to put half its earnings in a savings account, the average money balance of our family fell from \$1500 to \$750. This shows how money holdings (or the demand for money) may be sensitive to interest rates: other things equal, as interest rates rise, the quantity of money demanded declines.

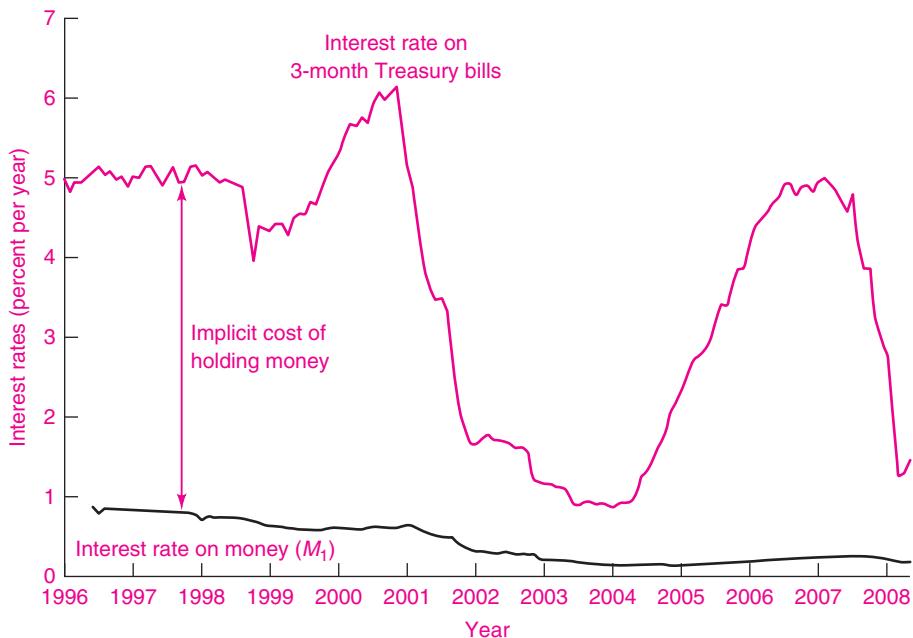


FIGURE 23-3. Interest Rates on Money and Safe Short-Term Assets

This figure shows the interest rate on money (which is the average of zero on currency and the rate on checking accounts) as compared to the interest rate on short-term Treasury securities. The difference between these two interest rates is the implicit cost of holding money.

Source: Treasury interest rate from Federal Reserve; interest rate on checking accounts from Informa Research Services, Inc.

Asset Demand. In addition to its use for transaction needs, you might wonder if money itself would ever be used as a store of value. The answer today is, not often. In a modern economy in normal times, people prefer to keep their nontransaction assets in safe, interest-bearing assets such as savings accounts or money funds. Suppose you need \$2000 a month in your checking account for your transactions, and you have another \$50,000 in savings. Surely, you would be better off putting the \$50,000 in a money market fund earning 4.6 percent per year than in a checking account earning 0.2 percent per year. After a decade, the latter would be worth only \$51,009 while the former would be worth \$78,394. (Make sure you can reproduce these numbers.)

There are some important exceptions, however, where money itself might be used as a store of value. Money might be an attractive asset in primitive financial systems where there are no other reliable assets.

U.S. currency is widely held abroad as a safe asset in countries where hyperinflation occurs, or where a currency might be devalued, or where the financial system is unreliable. Additionally, in advanced countries, people might hold money as an asset when interest rates are near zero. This situation, known as a liquidity trap, terrifies central bankers because they lose the ability to affect interest rates. We will review this syndrome in the next chapter.

The main reason people hold money (M_1) is to meet their transactions demand. This means that money is an acceptable medium of exchange that we can use to buy our goods and pay our bills. As our incomes rise, the dollar value of the goods we buy tends to go up as well, and we therefore need more money for transactions, raising our demand for money. In a modern financial system, there is generally little or no asset demand for M_1 .

C. BANKS AND THE SUPPLY OF MONEY

Now that we have described the basic structure of the financial system, we turn to commercial banks and the supply of money. If you look back at the description of the monetary transmission mechanism at the beginning of this chapter, you will see that the activities of banks are the critical third step. While money constitutes a relatively small fraction of all financial assets, the interaction between the central bank and commercial banks turns out to play a central role in the setting of interest rates, and ultimately in influencing macroeconomic behavior.

Banks are fundamentally businesses organized to earn profits for their owners. A commercial bank provides certain services for its customers and in return receives payments from them.

Table 23-3 shows the consolidated balance sheet of all U.S. commercial banks. A *balance sheet* is a statement of a firm's financial position at a point in time. It lists *assets* (items that the firm owns) and *liabilities* (items that the firm owes). Each entry in a balance sheet is valued at its actual market value or its historical cost.¹ The difference between the

¹ Balance sheets, assets, and liabilities are extensively discussed in Chapter 7 of the full textbook.

total value of assets and total liabilities is called *net worth*.

Except for the details, a bank balance sheet looks much like a balance sheet for any other business. The unique feature of a bank balance sheet is an asset called **reserves**. This is a technical term used in banking to refer to a special category of bank assets that are regulated by the central bank. Reserves equal currency held by the bank ("vault cash") plus deposits with Federal Reserve Banks. In earlier days, reserves were held to pay depositors, but today they serve primarily to meet legal reserve requirements. We will discuss reserves in detail in the next chapter.

How Banks Developed from Goldsmith Establishments

Commercial banking began in England with the goldsmiths, who developed the practice of storing people's gold and valuables for safekeeping. At first, such establishments simply functioned as secure warehouses. Depositors left their gold for safekeeping and were given a receipt. Later they presented their receipt, paid a fee, and got back their gold.

What would the balance sheet of a typical goldsmith establishment look like? Perhaps like Table 23-4. A total of \$1 million has been deposited in its vaults, and this whole sum is held as a cash asset (this is the item "Reserves" in the balance sheet). To balance this

Balance Sheet of All Commercial Banking Institutions, 2008 (billions of dollars)

Assets	Liabilities and Net Worth		
Reserves	43	Checking deposits	629
Loans	6,250	Savings and time deposits	5,634
Investments and securities	2,265	Other liabilities	2,643
Other assets	<u>1,404</u>	Net worth (capital)	<u>1,056</u>
Total	9,961	Total	9,961

TABLE 23-3. Balance Sheet of All U.S. Commercial Banks

Commercial banks are diversified financial institutions and are the major providers of checking deposits, which is an important component of M_1 . Checking accounts are payable on demand and thus can be used as a medium of exchange. Reserves are held primarily to meet legal requirements, rather than to provide against possible unexpected withdrawals. (Note that banks have a small amount of net worth or capital relative to their total assets and liabilities. The ratio of liabilities to net worth is called the "leverage ratio." Highly leveraged financial institutions produce systemic risk if the values of their assets all deteriorate at the same time, as occurred in 2007–2009.)

Source: Federal Reserve Board, available at www.federalreserve.gov/releases/.

Goldsmith Balance Sheet with 100% Reserves			
Assets		Liabilities	
Reserves	1,000,000	Demand deposits	1,000,000
Total	1,000,000	Total	1,000,000

TABLE 23-4. First Goldsmith Bank Held 100 Percent Cash Reserves against Demand Deposits

In a primitive banking system, with 100 percent backing of deposits, no creation of money out of reserves is possible.

Goldsmith Balance Sheet with Fractional Reserves			
Assets		Liabilities	
Reserves	100,000	Demand deposits	
Investments	900,000	and gold notes	1,000,000
Total	1,000,000	Total	1,000,000

TABLE 23-5. Goldsmith Bank Keeps 10 Percent Reserves against Deposits and Gold Notes

Later, Goldsmith Bank learns that it does not need to keep 100 percent reserves. Here, it has decided to invest 90 percent and keep only 10 percent in reserves against deposits and notes.

asset, there is a demand deposit of the same amount. Reserves are therefore 100 percent of deposits.

In today's language, the goldsmiths' demand deposits would be part of the money supply; they would be "bank money." However, the bank money just offsets the amount of ordinary money (gold or currency) placed in the bank's vaults and withdrawn from active circulation. No money creation has taken place. The process is of no more interest than if the public decided to convert nickels into dimes. A *100 percent-reserve banking system has a neutral effect on money and the macroeconomy because it has no effect on the money supply*.

We can go a step further and ask what would happen if there were paper money issued under a gold standard with 100 percent backing by gold. In this case, you can create a new Table 23-4 by writing "gold notes" instead of "demand deposits." The gold notes would be currency and part of M_1 . Again, the money supply would be unchanged because the currency has 100 percent backing.

Fractional-Reserve Banking

Let's take another step toward today's banking system by introducing *fractional-reserve banking*. Banks soon learned that they did not need to keep 100 percent of their gold or silver as reserves against their notes and deposits. People did not all come to redeem their notes at the same time. A bank might be safe if it kept only fractional reserves to back its notes and deposits. This was a tiny first step on the road to today's vast financial system.

We explore the implications of fractional-reserve banking starting with a situation where a system of banks operates with a customary or legal requirement that it keep reserves equal to at least 10 percent

of deposits. Suppose that the president of Goldsmith Bank wakes up and says, "We do not need to keep all this sterile gold as reserves. In fact, we can lend out 90 percent of it and still have sufficient gold to meet the demands of depositors."

So Goldsmith Bank lends out \$900,000 and keeps the remaining \$100,000 as gold reserves. The initial result is shown in Table 23-5. The bank has invested \$900,000—perhaps lending money to Duck.com, which is building a toy factory.

But that is not the end of the process. Duck.com will take the \$900,000 loan and deposit it in its own checking account to pay the bills for the factory. Suppose, for simplicity, that the firm has a checking account in Goldsmith Bank. The interesting result here, shown in Table 23-6, is that Goldsmith Bank

Goldsmith Balance Sheet after Deposit of Loan by Duck.com			
Assets		Liabilities	
Reserves	1,000,000	Demand deposits	
Investments	900,000	and gold notes	1,900,000
Total	1,900,000	Total	1,900,000

TABLE 23-6. After the Firm Deposits Its Loan, the Banking System Has Excess Reserves to Lend Out Again

The Duck firm deposits its \$900,000 loan into its account. This increases Goldsmith Bank's reserves of gold back to \$1,000,000. Soon the excess will be lent out again.

has recovered the \$900,000 of reserves. In essence, Duck.com took the loan of gold and then lent it back to the bank. (The process would be exactly the same if Duck.com went to another bank: that bank would have excess reserves of \$900,000.)

But now the bank needs to keep only 10 percent \times \$1.9 million = \$190,000 for reserves, so it can lend out the excess \$810,000. Soon the \$810,000 will show up in a bank deposit. This process of deposit, relending, and redeposit continues in a chain of dwindling expansions.

Final System Equilibrium

Now let's sum up the total of all deposits. We started with \$1,000,000 in deposits, then added \$900,000, then \$810,000 and so on. The total is given by the sum:

$$\begin{aligned}\text{Total deposits} &= 1,000,000 + 1,000,000 \times 0.9 + 1,000,000 \times 0.9^2 + \dots \\ &= 1,000,000[1 + 0.9 + 0.9^2 + \dots + (0.9)^n + \dots] \\ &= 1,000,000 \left(\frac{1}{1 - 0.9} \right) = 1,000,000 \left(\frac{1}{0.1} \right) = 10,000,000\end{aligned}$$

At the end of the process, the total amount of deposits and money is \$10 million, which is 10 times the total amount of reserves. Assuming that Goldsmith is the only bank, or that we are looking at the consolidated banking system, we can show the final balance sheet in Table 23-7. The point here is that once banks require only fractional reserves, the total money supply is a multiple of the reserves.

This can be seen intuitively. The cumulative process just described must come to an end when every bank in the system has reserves equal to 10 percent of deposits. In other words, the final equilibrium

Consolidated Balance Sheet of All Banks in Equilibrium			
Assets		Liabilities	
Reserves	1,000,000	Demand deposits	
Investments	9,000,000	and gold notes	10,000,000
Total	10,000,000	Total	10,000,000

TABLE 23-7. Final Equilibrium Balance Sheet When Banking System Has No Excess Reserves

We aggregate the banking system together assuming that there are \$1,000,000 of total reserves. When banks have lent out all excess reserves, so reserves are just 10 percent of deposits and notes, total money is $1/0.1 = 10$ times reserves.

of the banking system will be the point at which 10 percent of deposits (D) equals total reserves. What level of D satisfies this condition? The answer is $D = \$10$ million.

When banks hold fractional reserves against their deposits, they actually create money. The total bank money is generally equal to total reserves multiplied by the inverse of the reserve ratio:

$$\text{Bank money} = \text{total reserves} \times \left(\frac{1}{\text{reserve ratio}} \right)$$

A Modern Banking System

It is time to put our fable of goldsmiths behind us. How does all this relate to the actual banking system today? The surprising answer is that with some additional details, the process we just described fits today's banking system exactly. Here are the key elements of the modern banking system:

- Banks are required to hold at least 10 percent of their checking deposits as reserves, in the form of either currency or deposits with the Federal Reserve (more on this in the next chapter).
- The Federal Reserve buys and sells reserves at a target interest rate set by the Fed (again, more on this in the next chapter).
- The checking-deposit component of M_1 is therefore determined by the amount of reserves along with the required reserve ratio.

A few qualifications need to be mentioned before closing this section. First, commercial banks do much more than simply provide checking accounts, as we saw in Table 23-3. This fact may complicate the task of the regulatory authorities, but it does not change the basic operation of monetary policy.

A second complication arises if nominal interest rates approach zero. This is referred to as the liquidity trap. We will discuss this syndrome in the next chapter.

D. THE STOCK MARKET

We close this chapter with a tour through one of the most exciting parts of a capitalist system: the stock market. A **stock market** is a place where shares

in publicly owned companies—the titles to business firms—are bought and sold. In 2008, the value of corporate equities in the United States was estimated at \$21 trillion. The stock market is the hub of our corporate economy.

The New York Stock Exchange is America's main stock market, listing more than a thousand securities. Another important market is the NASDAQ, which had a meteoric rise and subsequent collapse in stock prices after 2000. Every large financial center has a stock exchange. Major ones are located in Tokyo, London, Frankfurt, Shanghai, and, of course, New York.

Risk and Return on Different Assets

Before discussing major issues in stock market analysis, we need to introduce some basic concepts in financial economics. We noted earlier in this chapter that different assets have different characteristics. Two important characteristics are the rate of return and the risk.

The *rate of return* is the total dollar gain from a security (measured as a percent of the price at the beginning of the period). For savings accounts and short-term bonds, the return would simply be the interest rate. For most other assets, the return combines an income item (such as dividends) with a *capital gain or loss*, which represents the increase or decrease in the value of the asset between two periods.

We can illustrate the rate of return using data on stocks. (For this example, we ignore taxes and commissions.) Say that you bought a representative portfolio of \$10,000 worth of stocks in U.S. companies at the end of 1996. Over the next 3 years, your fund would have had a total real return (including dividends plus capital gains and correcting for inflation) of 32 percent per year.

However, before you get too excited about these fantastic gains, be forewarned that the stock market also goes down. In the 3 years after 1999, real stock prices declined by 19 percent per year. An even worse experience came in 2008, when stock prices declined 38 percent during the year.

The fact that some assets have predictable rates of return while others are quite risky leads to the next important characteristic of investments. **Risk** refers to the variability of the returns on an investment. If

I buy a 1-year Treasury bond with a 6 percent return, the bond is a riskless investment because I am sure to get my expected dollar return. On the other hand, if I buy \$10,000 worth of stocks, I am uncertain about their year-end value.

Economists often measure risk as the standard deviation of returns; this is a measure of dispersion whose range encompasses about two-thirds of the variation.² For example, from 1908 to 2008, common stocks had an average annual real return of 6 percent per year with an annual standard deviation of return of 16 percent. This implies that the real return was between $22(= 6 + 16)$ percent and $-10(= 6 - 16)$ percent about two-thirds of the time.

Individuals generally prefer higher return, but they also prefer lower risk because they are *risk-averse*. This means that they must be rewarded by higher returns to induce them to hold investments with higher risks. We would not be surprised, therefore, to learn that over the long run safe investments like bonds have lower average returns than risky investments like stocks.

Table 15-1 on page 289 showed the historical returns or interest rates on a number of important investments. We show the most important assets in the *risk-return diagram* in Figure 23-4. This diagram shows the average real (or inflation-corrected) return on the vertical axis and the historical risk (measured as a standard deviation) on the horizontal axis. Note the positive relationship between risk and return.

Bubbles and Crashes

The history of finance is one of the most exciting parts of economics. Sometimes, sound judgments get put aside as markets engage in frenzies of speculation, often followed by moods of pessimism and falling prices.

Investors are sometimes divided into those who invest on firm foundations and those who try to

² The standard deviation is a measure of variability that can be found in any elementary statistics textbook. It is roughly equal to the average deviation of a series from its mean. The precise definition of standard deviation is the square root of the squared deviations of a variable from its mean. As an example, if a variable takes the values of 1, 3, 1, 3, the mean or expected value is 2 while the standard deviation is 1.

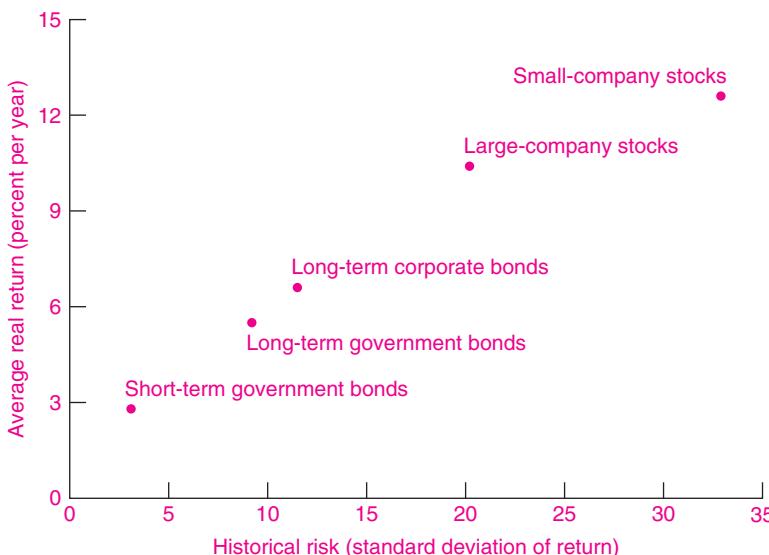


FIGURE 23-4. Risk and Return on Major Investments, 1926–2005

Investments vary in their average returns and riskiness. Bonds tend to be safe with low returns, while stocks have much higher returns but face higher risks. This diagram shows the *historical* risk and return on different financial assets. Depending upon market sentiments, the *expected* risk and return may differ markedly from the historical experience.

Source: Ibbotson Associates, 2006.

outguess the market psychology. The firm-foundation approach holds that assets should be valued on the basis of their intrinsic value. For common stocks, the intrinsic value is the expected present value of the dividends. If a stock has a constant dividend of \$2 per year and the appropriate interest rate with which to discount dividends is 5 percent per year, the intrinsic value would be $\$2 / .05 = \40 per share. The firm-foundation approach is the slow but safe way of getting rich.

Impatient souls might share the view of Keynes, who argued that investors are more likely to worry about market psychology and to speculate on the future value of assets rather than wait patiently for stocks to prove their intrinsic value. He argued, “It is not sensible to pay 25 for an investment which is worth 30, if you also believe that the market will value it at 20 three months hence.” The market psychologist tries to guess what the average investor thinks, which requires considering what the average investor thinks about the average investor, and so on, ad infinitum.

When a psychological frenzy seizes the market, it can result in speculative bubbles and crashes. A *speculative bubble* occurs when prices rise because people think they are going to rise even further in the future—it is the reverse of Keynes’s just-cited

dictum. A piece of land may be worth only \$1000, but if you see a land-price boom driving prices up 50 percent each year, you might buy it for \$2000 hoping you can sell it to someone else next year for \$3000.

A speculative bubble fulfills its own promises for a while. If people buy because they think stocks will rise, their act of buying sends up the price of stocks. This causes other people to buy even more and sends the dizzy dance off on another round. But, unlike people who play cards or dice, no one apparently loses what the winners gain. Of course, the prizes are all on paper and would disappear if everyone tried to cash them in. But why should anyone want to sell such lucrative securities? Prices rise because of hopes and dreams, not because the profits and dividends of companies are soaring.

History is marked by bubbles in which speculative prices were driven up far beyond the intrinsic value of the asset. In seventeenth-century Holland, a tulip mania drove tulip prices to levels higher than the price of a house. In the eighteenth century, the stock of the South Sea Company rose to fantastic levels on empty promises that the firm would enrich its stockholders. In more recent times, similar bubbles have been found in biotechnology, Japanese land, “emerging markets,” and a vacuum-cleaning company called

ZZZZ Best, whose business was laundering money for the Mafia.

The most famous bubble of them all occurred in the American stock market in the 1920s. The “roaring twenties” saw a fabulous stock market boom, when everyone bought and sold stocks. Most purchases in this wild bull market were on margin. This means that a buyer of \$10,000 worth of stocks put up only part of the price in cash and borrowed the difference, pledging the newly bought stocks as collateral for the loan. What did it matter that you had to pay the broker 6, 10, or 15 percent per year on the loan when Auburn Motors or Bethlehem Steel might jump 10 percent in value overnight?

Speculative bubbles always produce crashes and sometimes lead to economic panics. The speculation of the 1920s was soon followed by the 1929 panic and crash. This event ushered in the long

and painful Great Depression of the 1930s. By the trough of the Depression in 1933, the market had declined 85 percent.

Trends in the stock market are tracked using *stock-price indexes*, which are weighted averages of the prices of a basket of company stocks. Commonly followed averages include the Dow-Jones Industrial Average (DJIA) of 30 large companies; Standard and Poor’s index of 500 companies (the S&P 500), which is a weighted average of the stock prices of 500 large American corporations; and the NASDAQ Composite Index, which includes more than 3000 stocks listed on that market.

Figure 23-5 shows the history of the Standard and Poor’s 500 price index over the last century. The lower curve shows the nominal stock-price average, which records the actual average during a particular month. The upper line shows the real price of stocks;

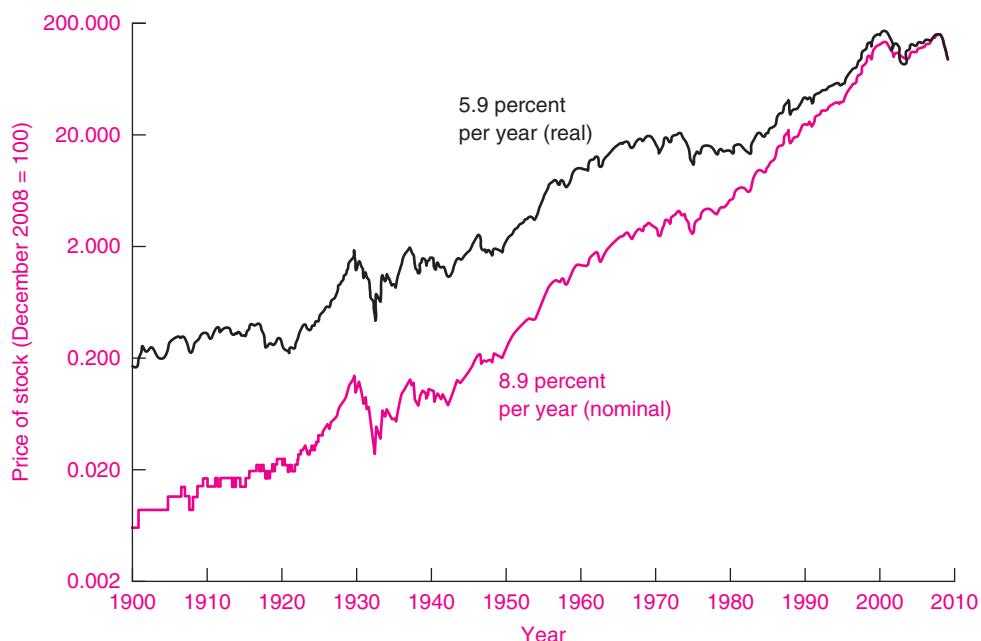


FIGURE 23-5. The Only Guarantee about Stock Prices Is That They Will Fluctuate

The Standard and Poor’s index (the S&P 500) tracks the value-weighted average of the stock prices of 500 large companies traded in the U.S. It is shown here including reinvested dividends. Stock prices in nominal terms are shown by the bottom line; these averaged a growth of 8.9 percent per year from 1900 to 2008. The top line shows the “real” S&P 500, which is the S&P 500 corrected for movements in the consumer price index. It rose 5.9 percent per year on average.

Source: Standard and Poor, Bureau of Labor Statistics.

this equals the nominal price divided by an index of consumer prices. Both curves are indexed to equal 100 in December 2008. The average growth rate of stocks over the period was 8.9 percent per year in dollar terms but only 5.9 percent per year after correcting for inflation.

Stocks have proven to be a good investment over the long term. But they are also extremely risky in the short run, as people learned when stock prices declined 52 percent from the peak in October 2007 to the trough in November 2008. Is there a crystal ball that can foretell the movement of stock prices? This is the subject of modern finance theory.

Efficient Markets and the Random Walk

Economists and finance professors have long studied prices in speculative markets such as the stock market and the foreign exchange market. One important hypothesis is that speculative markets tend to be “efficient.” This finding has stirred great controversy in the economics profession and with financial analysts.

What is the essence of the **efficient-market theory**? A summary statement is the following:

Securities markets are extremely efficient in absorbing information about individual stocks and about the stock market as a whole. When new information arrives, the news is quickly incorporated into stock prices. Systems which attempt to forecast prices on the basis of the past or of fundamentals cannot produce returns greater than those that could be obtained by holding a randomly selected portfolio of individual stocks of comparable risk.³

A colorful story illustrates the basic message. A finance professor and a student are walking across the campus when they see what looks like a \$100 bill lying on the ground. The professor tells the student, “Don’t bother to pick it up. If it were really a \$100 bill, it wouldn’t be there.” In other words, you can’t get rich simply by bending down on a public thoroughfare!

This paradoxical view has been generally confirmed in hundreds of studies over the last

half-century. Their lesson is not that you will never become rich by following a rule or formula but that, on average, such rules do not outperform a diversified portfolio of stocks.

Rationale for the Efficient-Market View. Finance theorists have spent many years analyzing stock and bond markets in order to understand why well-functioning financial markets rule out persistent excess profits. The theory of efficient markets explains this.

An **efficient financial market** is one where all new information is quickly understood by market participants and becomes immediately incorporated into market prices. For example, say that Lazy-T Oil Company has just struck oil in the Gulf of Alaska. This event is announced at 11:30 A.M. on Tuesday. When will the price of Lazy-T’s shares rise? The efficient-market theory holds that market participants will react at once, bidding the price of Lazy-T up by the correct amount. In short, at every point in time, markets have already digested and included all available information in asset prices.

The theory of efficient markets holds that market prices contain all available information. It is not possible to make profits by acting on old information or at patterns of past price changes. Returns on stocks will be primarily determined by their riskiness relative to the market.

A Random Walk. The efficient-market view provides an important way of analyzing price movements in organized markets. Under this approach, the price movements of stocks should look highly erratic, like a random walk, when charted over a period of time.

A price follows a **random walk** when its movements over time are completely unpredictable. For example, toss a coin for heads or tails. Call a head “plus 1” and a tail “minus 1.” Then keep track of the running score of 100 coin tosses. Draw it on graph paper. This curve is a random walk. Now, for comparison, also graph 100 days’ movement of Microsoft stock and of Standard and Poor’s 500 index. Note how similar all three figures appear.

Why do speculative prices resemble a random walk? Economists, on reflection, have arrived at the following truths: In an efficient market all predictable things have already been built into the prices. It

³ This definition is adopted from Malkiel’s 2003 article; see Further Readings. Note that “efficiency” is used differently in finance theory than in other parts of economics. Here, “efficiency” means that information is quickly absorbed, not that resources produce the maximal outputs.

is the arrival of *new* information that affects stock or commodity prices. Moreover, the news must be random and unpredictable (or else it would be predictable and therefore not truly news).

To summarize:

The efficient-market theory explains why movements in stock prices look so erratic. Prices respond to news, to surprises. But surprises are unpredictable events—like the flip of a coin or next month's rainstorm—that may move in any direction. Because stock prices move in response to erratic events, stock prices themselves move erratically, like a random walk.

Qualifications to the Efficient-Market View. Although the efficient-market view has been the canon of finance in economics and business, many believe that it is oversimplified and misleading. Here are some of the reservations:

1. Researchers have uncovered many “anomalies” in stock-price movements that lead to some predictability. For example, stocks with high dividends or earnings relative to prices appear to perform better in subsequent periods. Similarly, sharp upward or downward movements tend to be followed by “reversals” in movements. To some, these anomalies are persuasive indicators of market inefficiencies; to others, they simply reflect the tendency of analysts to mine the data looking for patterns that are in fact spurious correlations.
2. Economists who look at the historical record ask whether it is plausible that sharp movements in stock prices could actually reflect new information. Consider the 30 percent drop in stock prices that occurred from October 15 to October 19, 1987. Efficient-market theories imply that this drop was caused by economic events that depressed the expected present value of future corporate earnings. Critics of the efficient-market view argue that there was no news that could make a 30 percent difference in the value of stock prices over those 4 days. Efficient-market theorists fall silent before this criticism.
3. Finally, the efficient-market view applies to individual stocks but not necessarily to the market as a whole. There is persuasive evidence of long, self-reversing swings in stock market prices. These

swings tend to reflect changes in the general mood of the financial community. Periods like the 1920s and 1990s saw investor optimism and rising stock prices, while the 1930s and 2007–2008 were periods of investor pessimism when stock prices declined sharply. However, say that we believed that the market reflected an “irrational exuberance” and was overvalued. What could we do? We could not individually buy or sell enough stocks to overcome the entire national mood. In addition, we might get wiped out if we bet against the market a year or two before the peak. So, from a macroeconomic perspective, speculative markets can exhibit waves of pessimism and optimism without powerful economic forces moving in to correct these mood swings.

PERSONAL FINANCIAL STRATEGIES

While taking a course in economics is no guarantee of great wealth, the principles of modern finance can definitely help you invest your nest egg wisely and avoid the worst financial blunders. What lessons does economics teach about personal investment decisions? We have culled the following five rules from the wisdom of the best brains on the street:

Lesson 1: Know thy investments. The absolute bedrock of a sound investment strategy is to be realistic and prudent in your investment decisions. For important investments, study the materials and get expert advice. Be skeptical of approaches that claim to have found the quick route to success. You can't get rich by listening to your barber or consulting the stars (although, unbelievably, some financial advisers push astrology to their clients). Hunches work out to nothing in the long run. Moreover, the best brains on Wall Street do not, on average, beat the averages (Dow-Jones, Standard and Poor's, etc.).

Lesson 2: Diversify, diversify—that is the law of the prophets of finance. One of the major lessons of finance is the advantage of diversifying your investments. “Don't put all your eggs in one basket” is one way of expressing this rule. By putting funds in a number of different investments, you can continue to average a high yield while reducing the risk. Calculations show that by diversifying their wealth among a broad array of investments—different

common stocks, conventional and inflation-indexed bonds, real estate, domestic and foreign securities—people can attain a good return while minimizing the downside risk on their investments.

Lesson 3: Consider common-stock index funds. Investors who want to invest in the stock market can achieve a good return with the least possible risk by holding a broadly diversified portfolio of common stocks. A good vehicle for diversifying is an *index fund*. This is a portfolio of the stocks of many companies, weighting each company in proportion to its market value and often tracking a major stock index like the S&P 500. One major advantage of index funds is that they have low expenses and low turnover-induced taxes.

Lesson 4: Minimize unnecessary expenses and taxes. People often find that a substantial amount of their investment earnings is nibbled away by taxes and expenses. For example, some mutual funds charge a high initial fee when you purchase the fund. Others might charge a management fee of 1 or even 2 percent of assets each year. Additionally, heavily “managed” funds have high turnover and may lead to large taxes on capital gains. Day traders may find great enjoyment in lightning movements in and out, and they may strike it rich, but they *definitely* will pay heavy brokerage and investment charges. By choosing your investments carefully, you can avoid these unnecessary drains on your investment income.

Lesson 5: Match your investments with your risk preference.

You can increase your expected return by picking riskier investments (see Figure 23-4). But always consider how much risk you can afford—financially *and psychologically*. As one sage put it, investments are a tradeoff between eating well and sleeping well. If you get insomnia worrying about the ups and downs of the market, you can maximize your sleep by keeping your assets in inflation-indexed U.S. Treasury bonds. But in the long run, you might be snoozing soundly on a cot! If you want to eat well and can tolerate disappointments, you might invest more heavily in stocks, including ones in foreign countries and emerging markets, and incorporate more volatile small companies into your portfolio—rather than concentrating on short-term bonds and bank deposits.

Such are the lessons of history and economics. If, after reading all this, you still want to try your hand in the stock market, do not be daunted. But take to heart the caution of one of America’s great financiers, Bernard Baruch:

If you are ready to give up everything else—to study the whole history and background of the market and all the principal companies whose stocks are on the board as carefully as a medical student studies anatomy—if you can do all that, and, in addition, you have the cool nerves of a great gambler, the sixth sense of a kind of clairvoyant, and the courage of a lion, you have a ghost of a chance.



A. The Modern Financial System

1. Financial systems in a modern economy transfer resources over space, time, and sectors. The flow of funds in financial systems occurs through financial markets and financial intermediaries. The major functions of a financial system are to transfer resources, to manage risk, to subdivide and pool funds, and to clear transactions.
2. Interest rates are the prices paid for borrowing funds; they are measured in dollars paid back per year per dollar borrowed. The standard way we quote interest

rates is in percent per year. People willingly pay interest because borrowed funds allow them to buy goods and services to satisfy current consumption needs or make profitable investments.

3. Recall the menu of financial assets, especially money, bonds, and equities.
4. Study the *monetary transmission mechanism*. This refers to the process by which monetary policy undertaken by the central bank, our Federal Reserve, interacts with banks and the rest of the economy to determine interest rates, other financial conditions, aggregate

demand, output, and inflation. Make sure you understand each of the five steps (page 453).

B. The Special Case of Money

5. Money is anything that serves as a commonly accepted medium of exchange, or a means of payment. Money also functions as a unit of account. Unlike other economic goods, money is valued because of social convention. We value money indirectly for what it buys, rather than for its direct utility. Money today is composed of currency and checking deposits and is denoted M_1 .
6. People hold money primarily because they need it to pay their bills or buy goods; this is known as the transactions demand. But people keep only a small fraction of their assets in money because money has an opportunity cost: we sacrifice interest earnings when we hold money. Therefore, the asset demand for money is limited.

C. Banks and the Supply of Money

7. Banks are commercial enterprises that seek to earn profits for their owners. One major function of banks is to provide checking accounts to their customers. Banks are legally required to keep reserves on their checking deposits. These can be in the form of either vault cash or deposits at the Federal Reserve.
8. Under 100 percent reserves, banks cannot create money, as seen in the simplest goldsmith bank example. For illustrative purposes, we then examined a required reserve ratio of 10 percent. In this case, the banking system as a whole creates bank money in a ratio of 10 to 1 for each dollar of reserves. With fractional-reserve banking, the total value of checking deposits is a multiple of reserves. Remember the formula

$$\text{Bank money} = \text{total reserves} \times \left(\frac{1}{\text{reserve ratio}} \right)$$

D. The Stock Market

9. The most important factors about assets are the rate of return and the risk. The rate of return is the total dollar gain from a security over a specified period of time. Risk refers to the variability of the returns on an investment, often measured by the statistical standard deviation. Because people are risk-averse, they require higher returns to induce them to buy riskier assets.
10. Stock markets, of which the New York Stock Exchange is the most important, are places where titles of ownership to the largest companies are bought and sold. The history of stock prices is filled with violent gyrations, such as the Great Crash of 1929 or the sharp bear market of 2008. Trends are tracked using stock-price indexes, such as the Standard and Poor's 500 and the familiar Dow-Jones Industrial Average.
11. Modern economic theories of stock prices generally focus on the efficient-market theory. An "efficient" financial market is one in which all information is immediately absorbed by speculators and built into market prices. In efficient markets, there are no easy profits; looking at yesterday's news or at past patterns of prices or business cycles will not help predict future price movements. Thus, in efficient markets, prices respond to surprises. Because surprises are inherently random, stock prices and other speculative prices move erratically, as in a random walk.
12. Plant the five rules of personal finance firmly in your long-term memory: (a) Know thy investments. (b) Diversify, diversify—that is the law of the prophets of finance. (c) Consider common-stock index funds. (d) Minimize unnecessary expenses and taxes. And (e) Match your investments with your risk preference.

CONCEPTS FOR REVIEW

The Modern Financial System

financial system, financial markets, financial intermediaries
functions of the financial system
major financial assets or instruments
interest forgone as the cost of holding money

The Special Case of Money

Money (M_1) = currency outside the banks plus checking deposits

commodity M , paper M , bank M
motives for money demand:

transactions demand (today)
asset demand (in a fragile financial system)

Banking and the Money Supply

bank reserves = vault cash plus
deposits with the Fed
fractional-reserve banking

bank money = reserves/required
reserve ratio

The Stock Market

common stocks (corporate equities)
efficient market, random walk of
stock prices
index fund
five rules for personal investing

FURTHER READING AND INTERNET WEBSITES

Further Reading

There are many fine histories of money. A good one is John Kenneth Galbraith, *Money, Whence It Came, Where It Went* (Houghton, Boston, 1975). There are many good textbooks on monetary economics. The standard reference on U.S. monetary history is Milton Friedman and Anna Jacobson Schwartz, *Monetary History of the United States 1867–1960* (Princeton University Press, Princeton, N.J., 1963).

Modern capital and finance theory are very popular subjects often covered in the macroeconomics part of an introductory course or in special courses. Good books on the subject are Burton Malkiel, *A Random Walk down Wall Street*, 9th ed. (Norton, New York, 2007). A recent book surveying financial history and theory and arguing that the stock market was extraordinarily overvalued in the bull market of 1981–2000 is Robert Shiller, *Irrational Exuberance*, 2d ed. (Princeton University Press, Princeton,

N.J., 2005). A recent summary of evidence on the efficient-market theory by Burton Malkiel and Robert Shiller is found in the *Journal of Economic Perspectives*, Winter 2003.

Websites

Review our list of good blogs in Chapter 19.

Basic data on money, interest rates, and monetary policy can be found at the website of the Federal Reserve, www.federalreserve.gov. Interesting articles on monetary policy can be found in the *Federal Reserve Bulletin* at www.federalreserve.gov/publications.htm. The best comprehensive data on finance are from the Federal Reserve flow of funds at www.federalreserve.gov/releases/z1/.

A good source for data on financial markets is finance.yahoo.com. If you are interested in the latest buzz on stocks, you might visit the Motley Fool at www.fool.com.

QUESTIONS FOR DISCUSSION

1. Suppose that banks hold 20 percent of deposits as reserves rather than 10 percent. Assuming that reserves are unchanged, redo the balance sheet in Table 23-7. What is the new ratio of bank deposits to reserves?
2. What would be the effect of each of the following on the money demand, M_1 (with other things held equal)?
 - a. An increase in real GDP
 - b. An increase in the price level
 - c. A rise in the interest rate on savings accounts and Treasury securities
 - d. A doubling of all prices, wages, and incomes (Calculate the exact effect on the money demand.)
 - e. An increase in the interest rate banks pay on checking accounts
3. The implicit cost of checking accounts is equal to the difference between the yield on safe short-term assets (such as Treasury bills) and the interest rate on checking accounts. What are the impacts of the following on the opportunity cost of holding money in checking deposits?
 - a. Before 1980 (when checking deposits had a zero interest rate under law), market interest rates increased from 8 to 9 percent.
 - b. In 2007 (when interest rates on money were one-quarter of market interest rates), interest rates declined from 4 to 2 percent.
4. How would you expect the demand for checking deposits to respond to the change in market interest rates under a and b if the elasticity of demand for money with respect to the implicit cost of money is -1 ?
5. Explain whether you think that each of the following should be counted as part of the money supply (M_1) of the United States: savings accounts, subway tokens, postage stamps, credit cards, debit cards, Starbucks cash cards, and \$20 bills used by Russians in Moscow.
6. Explain why the best portfolio should not contain any money (use information from Section D of this chapter). How does the notion of the cost of holding money fit into your answer? Would your answer change if your checking account earned a return equal to that of risk-free investments?
6. According to the efficient-market theory, what effect would the following events have on the price of GM's stock?
 - a. A surprise announcement that the government is going to lower business taxes next July 1
 - b. A decrease in business taxes on July 1, 6 months after Congress passed the legislation

- c. An announcement, unexpected by experts, that the United States will impose quotas on imports of Chinese cars during the coming year
- d. Implementation of c by issuing regulations on December 31
7. The Federal Reserve is scheduled to pay interest on bank reserves.
- Suppose that the interest rate on reserves is 1 percentage point below market rates. Would banks still desire to minimize excess reserves? Would this affect the bank money equation in Summary point 8 above?
 - Suppose that the interest rate on reserves is equal to the market rate. How would your answer to a change?
 - Using your answer to b, can you see why the relationship between reserves and bank money becomes very loose when market interest rates are zero (the “liquidity trap”)?
8. Suppose that one giant bank, the Humongous Bank of America, held all the checking deposits of all the people, subject to a 10 percent legal reserve requirement. If reserves increased by \$1 billion, could the Humongous Bank expect to lend out more than 90 percent of the reserve increase, knowing that the new deposit must come back to it? Would this change the ultimate money-supply multiplier? Explain both answers.
9. **Advanced problem:** An *option* is the right to buy or sell an asset (stocks, bonds, foreign exchange, land, etc.) for a specified price on or before a specific date. A *call option* is the right to buy the stock, while a *put* option is the right to sell the stock. Suppose you have a call option to buy 100 shares in a highly volatile stock, Fantasia.com, at any time in the next 3 months at \$10 per share. Fantasia currently sells at \$9 per share.
- Explain why the value of the option is more than \$1 per share.
 - Suppose the option were to expire tomorrow and the price of Fantasia.com had an even chance of rising \$5 or falling \$5 before then. What would be the value of the option today?
 - Replace the figure “\$5” with “\$10” in b. What would happen to the value of the option? Explain why an increase in volatility *increases* the value of an option (other things unchanged).
10. This problem will illustrate the point that the prices of many speculative financial assets look like a random walk.
- Flip a coin 100 times. Count a head as “plus 1” and a tail as “minus 1.” Keep a running score of the total. Plot your results. This is a random walk. (This is easily accomplished on a computer with a program such as Excel, which contains a random-number generator and a graphics function.)
 - Next, keep track of the closing price of the stock of your favorite company for a few weeks, or get it online. Plot the price against time for each day. Compare the random numbers in a with your stock prices, or show them to a friend and ask the friend to spot the difference. If they look the same, this illustrates that stocks behave like a random walk.

Monetary Policy and the Economy

24



There have been three great inventions since the beginning of time: fire, the wheel, and central banking.

Will Rogers

Where would you look to find the most important macroeconomic policymakers today? In the White House? In Congress? Perhaps in the United Nations or the World Bank? Surprisingly, the answer is that you would look in an obscure marble building in Washington that houses the Federal Reserve System. It is here that you will find the Federal Reserve (or “the Fed,” as it is often called). The Fed determines the level of short-term interest rates and lends money to financial institutions, thereby profoundly affecting financial markets, wealth, output, employment, and prices. Indeed, the Fed’s influence spreads not only throughout the 50 states but to virtually every corner of the world through financial and trade linkages.

The Federal Reserve’s central goals are to ensure low inflation, steady growth in national output, low unemployment, and orderly financial markets. If output is growing rapidly and inflation is rising, the Federal Reserve Board is likely to raise interest rates, putting a brake on the economy and reducing price pressures.

The period 2007–2009 was a particularly challenging time for the Federal Reserve and other central banks. During this period, unsound investments and excessive leverage led to the deteriorating financial health of banks and other financial institutions. This in turn produced huge declines in stock and bond

prices, “bank runs,” and the failures of several large banks. The Federal Reserve, the European Central Bank, and U.S. and foreign governments provided *trillions* of dollars of loans, loan guarantees, nationalizations, and bailouts. All of these were designed to prevent the seizing up of financial markets and to reduce the severity of the ensuing recession.

Every country has a central bank that is responsible for managing the country’s monetary affairs. This chapter begins by explaining the objectives and organization of central banks, focusing on the U.S. Federal Reserve System. It explains how the Fed operates and describes the monetary transmission mechanism. The second section of the chapter then surveys some of the major issues in monetary policy.

A. CENTRAL BANKING AND THE FEDERAL RESERVE SYSTEM

We begin this section by providing an overview of central banking. The next section provides the details about the different tools employed by the central bank and explains how they can be used to affect short-term interest rates.

THE ESSENTIAL ELEMENTS OF CENTRAL BANKING

A central bank is a government organization that is primarily responsible for the monetary affairs of a country. In this section, we focus on the U.S. Federal Reserve System. We describe its history, objectives, and functions.

History

During the nineteenth century, the United States was plagued by banking panics. These occurred when large numbers of people attempted to convert their bank deposits into currency all at the same time. When people arrived at the banks, they found that there was insufficient currency to cover everybody's deposits because of the system of fractional reserves. Bank failures and economic downturns often ensued. After the severe panic of 1907, agitation and discussion led to the Federal Reserve Act of 1913, whose purpose was "to provide for the establishment of Federal reserve banks, to furnish an elastic currency, to afford means of rediscounting commercial paper, to establish a more effective supervision of banking in the United States, and for other purposes." That was the beginning of the Fed.

Structure

As currently constituted, the **Federal Reserve System** consists of the Board of Governors in Washington, D.C., and the regional Reserve Banks. The core of the Federal Reserve is the *Board of Governors*, which consists of seven members nominated by the president and confirmed by the Senate to serve overlapping terms of 14 years. Members of the board are generally economists or bankers who work full time at the job.

Additionally, there are 12 regional Federal Reserve Banks, located in New York, Chicago, Richmond, Dallas, San Francisco, and other major cities. The regional structure was originally designed in the populist age to ensure that different areas of the country would have an equal voice in banking matters and to avoid a great concentration of central-banking powers in Washington or in the hands of the Eastern bankers. Today, the Federal Reserve Banks supervise banks in their districts, operate the national payments system, and participate in the making of national monetary policy.

The key decision-making body in the Federal Reserve System is the *Federal Open Market Committee* (FOMC). The 12 voting members of the FOMC include the seven governors plus five of the presidents of the regional Federal Reserve Banks who serve as voting members on a rotating basis. This key group controls the most important tool used in monetary policy: the setting of the short-term interest rate.

At the pinnacle of the entire system is the *chair of the Board of Governors*. The chair is nominated by the president and confirmed by the Senate for renewable four-year terms. The chair presides over the Board of Governors and the FOMC, acts as the public spokesperson for the Fed, and exercises enormous power over monetary policy. The current chair is Ben Bernanke, who was a distinguished academic economist, a professor of economics at Princeton University, as well as a former Fed governor before he was appointed chair in 2006. Bernanke succeeded Alan Greenspan, a conservative business economist who became an iconic figure in American economic affairs during his long term as Fed chair (1987–2006).

In spite of the geographically dispersed structure of the Fed, the Fed's power is actually quite centralized. The Federal Reserve Board, joined at meetings by the presidents of the 12 regional Federal Reserve Banks, operates under the Fed chair to formulate and carry out monetary policy. The structure of the Federal Reserve System is shown in Figure 24-1.

Goals of Central Banks

Before focusing primarily on the U.S. system, we discuss briefly the goals of central banks around the world. We can distinguish three different general approaches of central banks:

- *Multiple objectives.* Many central banks have general goals, such as to maintain economic stability. Among the specific objectives pursued might be low and stable inflation, low unemployment, rapid economic growth, coordination with fiscal policy, and a stable exchange rate.
- *Inflation targeting.* In recent years, many countries have adopted explicit inflation targets. Under such a mandate, the central bank is directed to undertake its policies so as to ensure that inflation stays within a range that is generally low but positive. For example, the Bank of England has

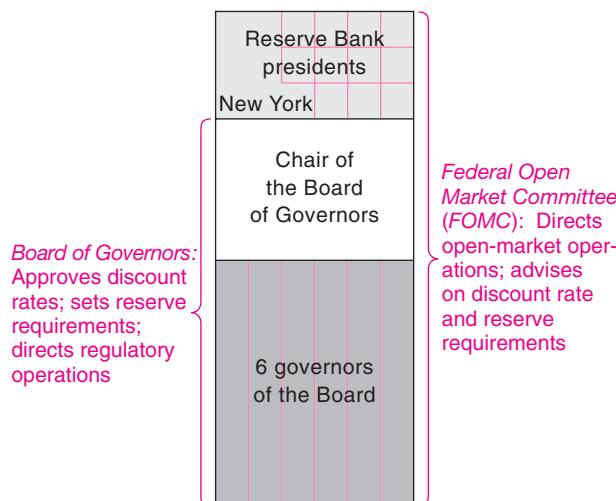


FIGURE 24-1. The Major Players in Monetary Policy

Two important committees are at the center of monetary policy. The seven-member Board of Governors approves changes in discount rates and sets reserve requirements. The FOMC directs the setting of bank reserves. The chair of the Board of Governors heads both committees. The size of each box indicates that person's or group's relative power; note the size of the chair's box.

been directed to set monetary policy to maintain a 2 percent annual inflation rate.

- *Exchange-rate targeting.* In a situation where a country has a fixed exchange rate and open financial markets, it can no longer conduct an independent monetary policy, as we will see in our chapters on open-economy macroeconomics. In such a case, the central bank can be described as setting its monetary policy to attain an exchange-rate target.

The Federal Reserve falls into the first category, that of “multiple objectives.” Under the Federal Reserve Act, the Fed is directed “to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates.” Today this is interpreted as a dual mandate to maintain low and stable inflation along with a healthy real economy. This is how the Fed sees its role today:

[The Federal Reserve’s] objectives include economic growth in line with the economy’s potential to expand;

a high level of employment; stable prices (that is, stability in the purchasing power of the dollar); and moderate long-term interest rates.¹

Functions of the Federal Reserve

The Federal Reserve has four major functions:

- Conducting monetary policy by setting short-term interest rates
- Maintaining the stability of the financial system and containing systemic risk as the lender of last resort
- Supervising and regulating banking institutions
- Providing financial services to banks and the government

We will primarily examine the first two of these functions because they have the most important impact on macroeconomic activity.

Central-Bank Independence

On examining the structure of the Fed, you might naturally ask, “In which of the three branches of government does the Fed lie?” The answer is interesting. Although nominally a corporation owned by the commercial banks that are members of the Federal Reserve System, the Federal Reserve is in practice a public agency. It is directly responsible to Congress; it attends to the advice of the president; and whenever any conflict arises between making a profit and promoting the public interest, it acts unswervingly in the public interest.

Above all, the Federal Reserve is an *independent* agency. While it consults with Congress and the president, in the end the Fed decides monetary policy according to its own views about the nation’s economic interests. As a result, the Fed sometimes comes into conflict with the executive branch. Almost every president has words of advice for the Fed. When Fed policies clash with the administration’s goals, presidents occasionally use harsh words. The Fed listens politely but generally chooses the path it deems best for the country, for its decisions do not have to be approved by anybody.

From time to time, critics argue that the Fed is too independent—that it is undemocratic for a small group of unelected people to govern the nation’s

¹ See *The Federal Reserve System: Purposes and Functions*, p. 2, under “Websites” in this chapter’s Further Reading section.

financial markets. This is a sobering thought, for unelected bodies sometimes lose touch with social and economic realities.

Defenders of the Fed's independence respond that an independent central bank is the guardian of a nation's currency and the best protector against rampant inflation. Moreover, independence ensures that monetary policy is not subverted for partisan political objectives, as sometimes happens in countries where the executive branch controls the central bank. Historical studies show that countries with independent central banks have generally been more successful in keeping inflation down than have those whose central banks are under the control of elected officials.

To summarize:

Every modern country has a central bank. The U.S. central bank is composed of the Federal Reserve Board in Washington, together with the 12 regional Federal Reserve Banks. The Fed's primary mission is to conduct the nation's monetary policy by influencing monetary and credit conditions in pursuit of low inflation, high employment, and stable financial markets.

HOW THE CENTRAL BANK DETERMINES SHORT-TERM INTEREST RATES

Central banks are at the center stage of macroeconomics because they largely determine short-term interest rates. We now turn to an explanation of this function.

Overview of the Fed's Operations

The Federal Reserve conducts its policy through changes in an important short-term interest rate called the **federal funds rate**. This is the interest rate that banks charge each other to trade reserve balances at the Fed. It is a short-term (overnight) risk-free interest rate in U.S. dollars. The Fed controls the federal funds rate by exercising control over the following important instruments of monetary policy:

- **Open-market operations**—buying or selling U.S. government securities in the open market to influence the level of bank reserves

- **Discount-window lending**—setting the interest rate, called the *discount rate*, and the collateral requirements with which commercial banks, other depository institutions, and, more recently, primary dealers can borrow from the Fed
- **Reserve-requirements policy**—setting and changing the legal reserve-ratio requirements on deposits with banks and other financial institutions

The basic description of monetary policy is this: When economic conditions change, the Fed determines whether the economy is departing from the desired path of inflation, output, and other goals. If so, the Fed announces a change in its target interest rate, the federal funds rate. To implement this change, the Fed undertakes open-market operations and changes the discount rate. These changes then cascade through the entire spectrum of interest rates and asset prices, and eventually change the overall direction of the economy.

Balance Sheet of the Federal Reserve Banks

To understand how the Fed conducts monetary policy, we first need to describe the consolidated balance sheet of the Federal Reserve System, shown in Table 24-1. U.S. government securities (e.g., bonds) have historically been the bulk of the Fed's assets. Starting in 2007, the Fed extended its operations to include term auctions, dealer credit, and loan guarantees, which by 2008 constituted a substantial fraction of its assets. The exact composition of the balance sheet is not essential for our understanding of how the Fed normally determines interest rates.

There are two unique items among the Fed's liabilities: currency and reserves. *Currency* is the Fed's principal liability. This item comprises the coins and the paper bills we use every day. The other major liability is reserve balances of banks, which are balances kept on deposit by commercial banks. These deposits, along with the banks' vault cash, are designated as **bank reserves**.

The following is our plan for the remainder of this section: First, we explain in more detail the three instruments that the Fed uses to conduct monetary policy. We will show how the supply of reserves is determined through a combination of announcements, open-market operations, and

Combined Balance Sheet of 12 Federal Reserve Banks, September 2008 (billions of dollars)			
Assets		Liabilities and Net Worth	
U.S. government securities	\$479.8	Federal Reserve currency	\$832.4
Loans, auction credits, and repurchase agreements	322.5	Deposits:	
Miscellaneous other assets	181.0	Reserve balances of banks	47.0
Total	<u>\$983.3</u>	Other deposits	14.4
		Miscellaneous liabilities	89.5
		Total	<u>\$983.3</u>

TABLE 24-1. By Changing Its Balance Sheet, the Fed Determines Short-Term Interest Rates and Credit Conditions

By buying and selling its assets (government securities and repurchase agreements), the Fed controls its liabilities (bank deposits and Federal Reserve notes). The Fed determines the federal funds interest rate by changing the volume of reserves and thereby affects GDP, unemployment, and inflation.

Source: Federal Reserve Board, at www.federalreserve.gov/releases/h41.

discount-window policy. Then, we show how short-term interest rates are determined, with the most important factor being the Fed's control over the supply of reserves.

Operating Procedures

The FOMC meets eight times a year to decide upon monetary policy and give operating instructions to the Federal Reserve Bank of New York, which conducts open-market operations on a day-to-day basis.

Today, the Fed operates primarily by setting a short-term target for the *federal funds rate*, which is the interest rate that banks pay each other for the overnight use of bank reserves. Figure 24-2 shows the federal funds rate for recent years along with shaded areas for recessions. You can see how the Fed tends to lower interest rates before recessions and raise them as the economy enters expansions. If you look back to Figure 15-2 on p. 289, you can see how other interest rates tend to move along with the federal funds rate. The linkage is not a tight one, however. While the Fed sets the general level and trend in interest rates, there are many other factors at work in determining interest rates and financial conditions, as evidenced by the fact that interest rates sometime move in different directions.

HOW THE FEDERAL RESERVE AFFECTS BANK RESERVES

The most important element of monetary policy is the determination of bank reserves through Fed policy. This is an intricate process and requires careful study. Through the combination of reserve requirements, open-market operations, and discount-window policy, the Fed can normally determine the quantity of bank reserves within very narrow limits. We start with a review of the nuts and bolts of these major policy instruments.

Open-Market Operations

Open-market operations are a central bank's primary tool for implementing monetary policy. These are activities whereby the Fed affects bank reserves by buying or selling government securities on the open market.

How does the Fed decide how much to buy or sell? The Fed looks at the factors underlying reserve demand and supply and determines whether those trends are consistent with its target for the federal funds rate. On the basis of this forecast, the Fed will buy or sell a quantity of government securities that will help keep the funds rate near the target.

Suppose that, on the basis of its forecasts, the Fed desires to sell \$1 billion worth of securities. The Fed

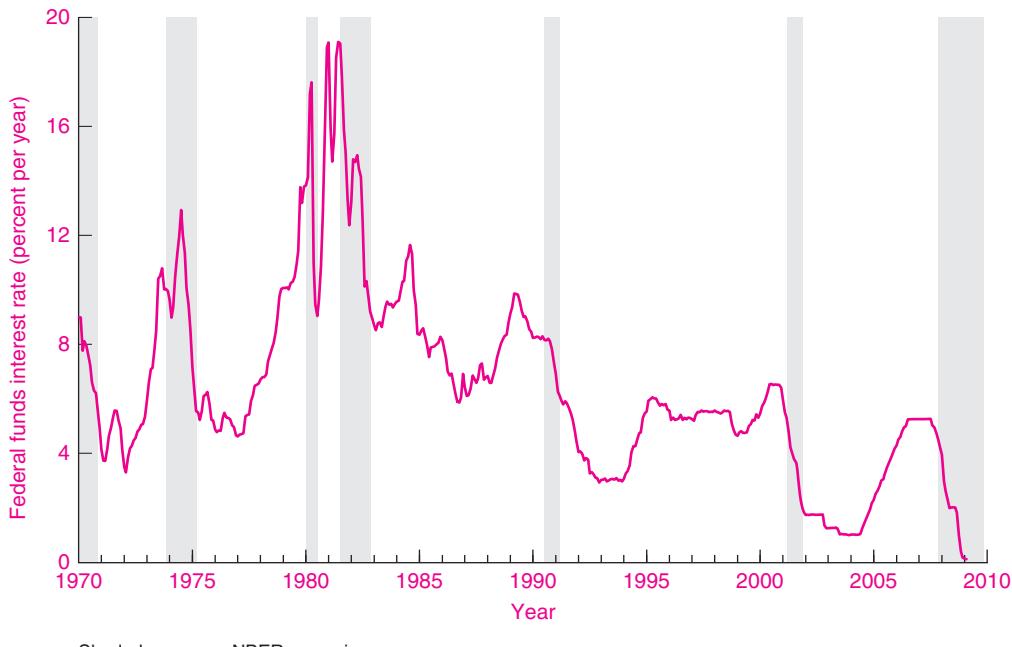


FIGURE 24-2. Federal Reserve Determines the Federal Funds Rate

The Fed sets a target for the federal funds rate, which is the interest rate charged by banks for lending reserves to each other. This rate then affects all other interest rates, although the linkage is variable and is affected by expectations of future interest rates as well as by overall financial conditions. (Look at Figure 15-2 for a graph of other major interest rates.) Note how the federal funds rate approached zero at the end of 2008 as the economy entered a liquidity trap.

Source: Federal Reserve Board.

conducts open-market operations with primary dealers, which include about 20 large banks and securities broker-dealers such as Goldman-Sachs and J.P. Morgan. The dealers would buy the securities, drawing upon accounts at the Federal Reserve. After the sale, the total deposits at the Fed would decline by \$1 billion. *The net effect would be that the banking system loses \$1 billion in reserves.*

Table 24-2(a) shows the effect of a \$1 billion open-market sale on a hypothetical Federal Reserve balance sheet. The blue entries show the Fed balance sheet before the open-market operation. The green entries show the effect of the open-market sale. The net effect is a \$1 billion reduction in both assets and liabilities. The Fed's assets decreased with the \$1 billion sale of government bonds, and

its liabilities decreased by exactly the same amount, with the corresponding \$1 billion decrease in bank reserves.

Now focus on the impact this has on commercial banks, whose consolidated balance sheet is shown in Table 24-2(b). We assume that commercial banks hold 10 percent of their deposits as reserves with the central bank. After the open-market operation, banks see that they are short of reserves because they have lost \$1 billion of reserves but only lost \$1 billion of deposits. The banks must then sell some of their investments and call in some short-term loans to meet the legal reserve requirement. This sets off a multiple contraction of deposits. When the entire chain of impacts has unfolded, deposits are down by \$10 billion, with corresponding changes on the asset

Federal Reserve Balance Sheet (billions of dollars)			
Assets		Liabilities	
Securities	500 -1	Currency held by public	410
Loans	<u>10</u>	Bank reserves	<u>100 -1</u>
Total assets	510 -1	Total liabilities	510 -1

TABLE 24-2(a). Open-Market Sale by Fed Cuts Bank Reserves

The central bank sells securities to reduce reserves in order to raise interest rates toward its target.

In (a), the Fed sells \$1 billion worth of securities on the open market. When dealers pay for the securities, this reduces reserves by \$1 billion.

Then, in (b), we see the effect of the open-market operation on the balance sheet of the commercial banks. With a reserve-requirement ratio of 10 percent of deposits, banks must reduce loans and investments. The net effect will be to tighten money and raise interest rates.

Balance Sheet of Commercial Banks (billions of dollars)			
Assets		Liabilities	
Reserves	100 -1	Demand deposits	1000 -10
Loans and investments	<u>900 -9</u>		
Total assets	1000 -10	Total liabilities	1000 -10

TABLE 24-2(b). Decline in Reserves Leads Banks to Reduce Loans and Investments until Money Supply Is Cut by 10-to-1 Ratio

side of the banks' balance sheet [look carefully at the green entries in Table 24-2(b)].

This contraction of loans and investments will tend to raise interest rates. If the Fed has forecast correctly, the interest rate will move to the Fed's new target.

But if it has forecast incorrectly, what should the Fed do? Simply make another adjustment by buying or selling reserves the next day!

Discount-Window Policy: A Backstop for Open-Market Operations

The Fed has a second set of instruments that it can use to meet its targets. The discount window is a facility from which banks, and more recently primary dealers, can borrow when they need additional funds. The Fed charges a "discount rate" on borrowed funds, although the discount rate will vary slightly among different uses and institutions. Generally, the primary discount rate is $\frac{1}{4}$ to $\frac{1}{2}$ of a percentage point above the target federal funds rate.

The discount window serves two purposes. It complements open-market operations by making reserves available when they are needed on short notice. It also serves as a backstop source of liquidity

for institutions when credit conditions may suddenly become tight.

Until very recently, the discount window was seldom used. In the credit crisis of 2007–2009, the Federal Reserve opened the discount window so that banks could borrow when their customers became nervous and demanded immediate withdrawals. During this period, in order to provide more liquidity to a nervous financial market, the Fed enlarged the scope of its lending capacities in several ways. The Fed broadened its definition of allowable collateral, added primary dealers to the list of institutions eligible to borrow at the discount window, put guarantees on shaky securities to help prop up failing banks, and purchased private commercial paper from nonbank entities. All these steps were intended to reduce fears that financial institutions would be unable to pay off their obligations and that the financial system would freeze up and credit would become unavailable to businesses and households.

Lender of Last Resort. Financial intermediaries like banks are inherently unstable because, as we have seen, their liabilities are short-term and subject to

rapid withdrawal while their assets are often long-term and even illiquid. From time to time, banks and other financial institutions cannot meet their obligations to their customers. Perhaps there are seasonal needs for cash, or perhaps, even more ominously, depositors may lose faith in their banks and withdraw their deposits all at once. In this situation, when the bank has run out of liquid assets and lines of credit, a central bank may step in to be the *lender of last resort*. This function was well described by former Fed chair Alan Greenspan:

[If] we choose to enjoy the advantages of a system of leveraged financial intermediaries, the burden of managing risk in the financial system will not lie with the private sector alone. Leveraging always carries with it the remote possibility of a chain reaction, a cascading sequence of defaults that will culminate in financial implosion if it proceeds unchecked. Only a central bank, with its unlimited power to create money, can with a high probability thwart such a process before it becomes destructive. Hence, central banks have, of necessity, been drawn into becoming lenders of last resort.

Today the discount window is used primarily to ensure that money markets are operating smoothly. It provides additional liquidity, and it is also the place to which banks can turn when they need a lender of last resort.

The Role of Reserve Requirements

The Nature of Reserves. The previous chapter showed the relationship between bank reserves and bank money. In a free-market banking system, prudent bankers would always need to hold some reserves on hand. They would need to keep a small fraction of their deposits in cash to pay out to depositors who desired to convert their deposits to currency or who wrote checks drawn on their accounts.

Many years ago, bankers recognized that, although deposits are payable on demand, they are seldom all withdrawn together. It would be necessary to hold reserves equal to total deposits if all depositors suddenly wanted to be paid off in full at the same time, but this almost never occurred. On any given day, some people made withdrawals while others made deposits. These two kinds of transactions generally canceled each other out.

Early bankers did not need to keep 100 percent of deposits as sterile reserves; reserves earned no interest when they were sitting in a vault. Banks quickly hit upon the idea of finding profitable investments for their excess deposits. By putting most of the money deposited with them into interest-bearing assets and keeping only fractional cash reserves, banks could maximize their profits.

The transformation into fractional-reserve banks—holding fractional rather than 100 percent reserves against deposits—was in fact revolutionary. It led to the leveraged financial institutions that dominate our financial system today.

Legal Reserve Requirements. In the nineteenth century, banks sometimes had insufficient reserves to meet depositors' demands, and these occasionally spiraled into bank crises. Therefore, beginning at that time, and currently formalized under Federal Reserve regulations, banks were required to keep a certain fraction of their checking deposits (the Fed uses the technical term “checkable deposits”) as reserves. In an earlier period, reserve requirements were an important part of controlling the quantity of money (as discussed later in this chapter). In today's environment, where the Fed primarily targets interest rates, reserve requirements are a relatively unimportant instrument of monetary policy.

Reserve requirements apply to all types of checking deposits. Under Federal Reserve regulations, banks are required to hold a fixed fraction of their checking deposits as reserves. This fraction is called the **required reserve ratio**. Bank reserves take the form of vault cash (bank holdings of currency) and deposits by banks with the Federal Reserve System.

Table 24-3 shows current reserve requirements along with the Fed's discretionary power to change these requirements. The key concept is the level of required reserve ratios. They currently range from 10 percent against checking deposits down to zero for personal savings accounts. For convenience in our numerical examples, we use 10 percent reserve ratios, with the understanding that the actual ratio may differ from time to time.

In normal times, the level of required reserves is generally higher than what banks would voluntarily hold. These high requirements serve primarily to ensure that the demand for reserves is relatively

Type of deposit	Reserve ratio (%)	Range in which Fed can vary (%)
Checking (transactions) accounts:		
\$0–\$44 million	3	No change allowed
Above \$44 million	10	8–14
Time and savings deposits:		
Personal	0	
Nonpersonal:		
Up to 1½ years' maturity	0	0–9
More than 1½ years' maturity	0	0–9

TABLE 24-3. Required Reserves for Financial Institutions

Reserve requirements are governed by law and regulation. The reserve-ratio column shows the percent of deposits in each category that must be held in non-interest-bearing deposits at the Fed or as cash on hand. Checking accounts in large banks face a required reserve ratio of 10 percent, while other major deposits have no reserve requirements. The Fed has power to alter the reserve ratio within a given range but does so only on the rare occasion when economic conditions warrant a sharp change in monetary policy.

Source: *Federal Reserve Bulletin*, March 2008.

predictable so that the Fed can have more precise control over the federal funds rate.

The Fed began to pay interest on bank reserves in 2008. The idea was that the interest rate on reserves would serve as a floor under the federal funds rate, thereby allowing better control over the federal funds rate. For example, if the target federal funds rate is 3½ percent, while the interest rate on reserves is 3 percent and the discount rate is 4 percent, then the federal funds rate will effectively be constrained between 3 and 4 percent, and the Fed can more easily attain its target. The financial environment took an unusual turn during the financial crisis of 2007–2009 as the economy entered a “liquidity trap.” We return to this point briefly later in this chapter.

Determination of the Federal Funds Rate

Now that we have surveyed the basic instruments, we can analyze how the Fed determines short-term interest rates. The basic operation is shown in Figure 24-3. This shows the demand for and supply of bank reserves.

First, consider the demand for bank reserves. As we saw in the last chapter, banks are required to hold reserves as determined by the total value of their checking deposits and the required reserve

ratio. Because the demand for checking deposits is an inverse function of the interest rate, this implies that the demand for bank reserves will also decline as interest rates rise. This is what lies behind the downward-sloping $D_R D_R$ curve in Figure 24-3.

Next, we need to consider the supply of reserves. This is determined by open-market operations. By purchasing and selling securities, the Fed controls the level of reserves in the system. A purchase of securities by the Fed increases the supply of bank reserves, while a sale does the opposite.

The equilibrium federal funds interest rate is determined where desired supply and demand are equal. The important insight here is that the Fed can achieve its target through the judicious purchase and sale of securities—that is, through open-market operations.

But Figure 24-3 shows only the very short run supply and demand. Because the Fed intervenes in the market daily, and because market participants know the Fed's interest-rate target, the Fed can keep the federal funds rate close to its target. Figure 24-4 shows supply and demand over the period of a month or more. The central bank in essence provides a perfectly elastic supply of reserves at the target federal funds rate. This shows how the Fed achieves its funds target on a week-to-week and month-to-month basis.

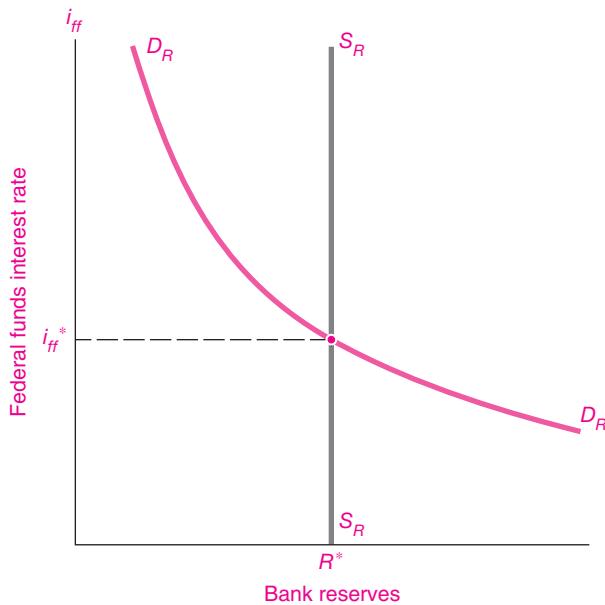


FIGURE 24-3. Supply of and Demand for Bank Reserves Determine the Federal Funds Rate

The demand for bank reserves declines as interest rates rise, reflecting that checking deposits decline as lower interest rates increase money demand. The Fed has a target interest rate at i_{ff}^* . By supplying the appropriate quantity of reserves at R^* through open-market operations, the Fed achieves its target.

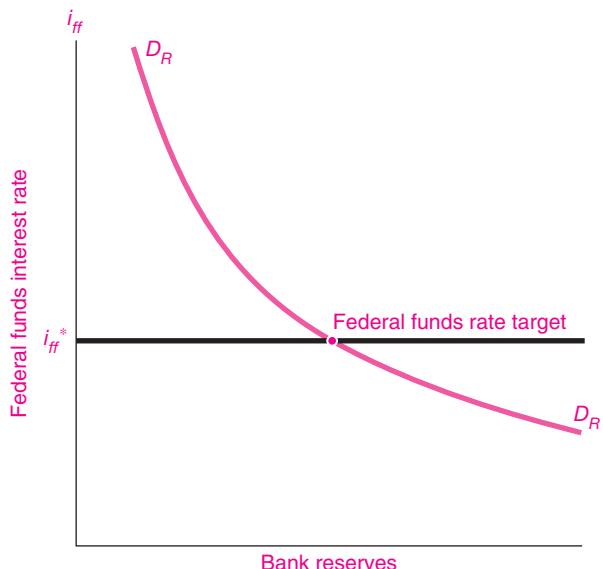


FIGURE 24-4. By Constant Intervention the Fed Can Achieve Its Interest-Rate Target

Because the Fed intervenes daily, undertaking open-market operations as illustrated in Figure 24-3, it can achieve its target with a narrow margin.

affects output, employment, prices, and inflation. We sketched the mechanism at the beginning of the previous chapter, and now we describe the mechanism in greater detail.

1. *The central bank raises the interest-rate target.* The central bank announces a target short-term interest rate chosen in light of its objectives and the state of the economy. The Fed may also change the discount rate and the terms of its lending facilities. These decisions are based on current economic conditions, particularly inflation, output growth, employment, and financial conditions.
2. *The central bank undertakes open-market operations.* The central bank undertakes daily open-market operations to meet its federal funds target. If the Fed wished to slow the economy, it would sell securities, thereby reducing reserves and raising short-term interest rates; if a recession threatened, the Fed would buy securities, increasing the supply of reserves and lowering short-term interest rates. Through open-market operations,

B. THE MONETARY TRANSMISSION MECHANISM

A Summary Statement

Having examined the building blocks of monetary theory, we now describe the **monetary transmission mechanism**, the route by which monetary policy

the Fed keeps the short-term interest rate close to its target on average.

3. *Asset markets react to the policy changes.* As the short-term interest rate changes, given expectations about future financial conditions, banks adjust their loans and investments, as well as their interest rates and credit terms. Changes in current and expected future short-term interest rates, along with other financial and macroeconomic influences, determine the entire spectrum of longer-term interest rates. Higher interest rates tend to reduce asset prices (such as those of stocks, bonds, and houses). Higher interest rates also tend to raise foreign-exchange rates in a flexible-exchange-rate system.
4. *Investment and other spending react to interest-rate changes.* Suppose the Fed has raised interest rates to reduce inflation. The combination of higher interest rates, tighter credit, lower wealth, and a higher exchange rate tends to reduce investment, consumption, and net exports. Businesses scale down their investment plans. Similarly, when mortgage interest rates rise, people may postpone buying a house, lowering housing investment. In addition, in an open economy, the higher foreign-exchange rate of the dollar will depress net exports. Hence, tight money will reduce spending on interest-sensitive components of aggregate demand.
5. *Monetary policy will ultimately affect output and price inflation.* The aggregate supply-and-demand analysis (or, equivalently, the multiplier analysis) showed how changes in investment and other autonomous spending affect output and employment. If the Fed tightens money and credit, the decline in AD will lower output and cause prices to rise less rapidly, thereby curbing inflationary forces.

We can summarize the steps as follows:

Change in monetary policy

- change in interest rates, asset prices, exchange rates
- impact on I , C , X
- effect on AD
- effect on Q , P

Make sure you understand this important sequence from the central bank's change in its interest-rate

target to the ultimate effect on output and prices. We have discussed the first steps of the sequence in depth, and we now follow through by exploring the effect on the overall economy.

The Effect of Changes in Monetary Policy on Output

We close with a graphical analysis of the monetary transmission mechanism.

Interest Rates and the Demand for Investment. We can track the first part of the mechanism in Figure 24-5. This diagram puts together two diagrams we have met before: the supply of and demand for reserves in (a) and the demand for investment in (b). We have simplified our analysis by assuming that there is no inflation, no taxes, and no risk, with the result that the federal funds interest rate in (a) is the same as the cost of capital paid by business and residential investors in (b). In this simplified situation, the real interest rate (r) equals the central bank's interest rate (i_f). Monetary policy leads to interest rate r^* , which then leads to the corresponding level of investment I^* .

Next, consider what happens when economic conditions change. Suppose that economic conditions deteriorate. This could be the result of a decline in military spending after a war, or the result of a decline in investment due to the burst of a bubble, or the result of a collapse in consumer confidence after a terrorist attack. The Fed would examine economic conditions and determine that it should lower short-term interest rates through open-market purchases. This would lead to the downward shift in interest rates from r^* to r^{**} shown in Figure 24-6(a).

The next step in the sequence would be the reaction of investment, shown in Figure 24-6(b). As interest rates decline *and holding other things constant*, the demand for investment would increase from I^* to I^{**} . (We emphasize the point about holding other things constant because this diagram shows the shift relative to what would otherwise occur. Taking into account that other things *are* changing, we might see a fall in *actual* investment. However, the monetary shift indicates that investment would fall less with the policy than without it.)

Changes in Investment and Output. The final link in the mechanism is the impact on aggregate demand,

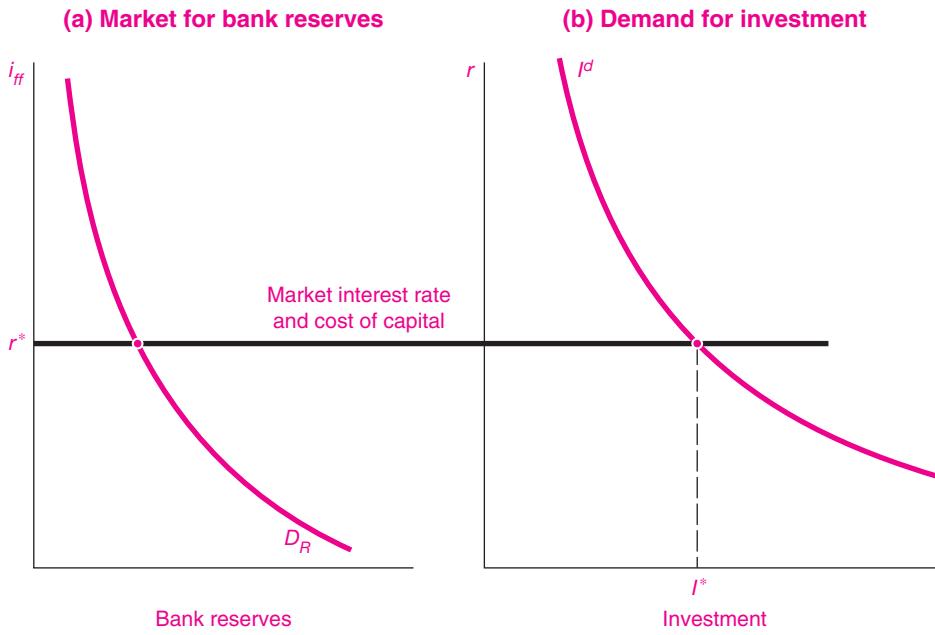


FIGURE 24-5. Interest Rate Determines Business and Residential Investment

This figure shows the linkage between monetary policy and the real economy. (a) The Fed uses open-market operations to determine short-term interest rates. (b) Assuming no inflation or risk, the interest rate determines the cost of business and residential investment; that is, $r = i_{ff}$. Total investment, which is the most interest-sensitive component of AD , can be found at I^* .

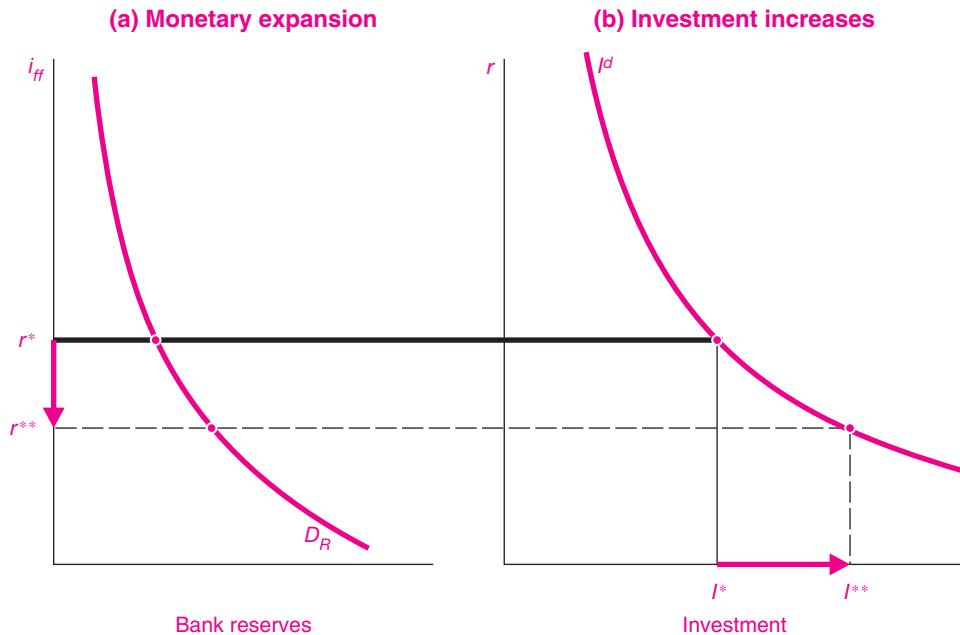


FIGURE 24-6. Monetary Expansion Leads to Lower Interest Rates and Increased Investment

Suppose that the economy weakens, as happened in 2007–2008. (a) The Fed buys securities and increases reserves, lowering the interest rate. (b) The effect (other things held constant) is that the lower interest rate raises asset prices and stimulates business and residential investment. See how investment rises from I^* to I^{**} .

as shown in Figure 24-7. This is the same diagram we used to illustrate the multiplier mechanism in Chapter 22. We have shown the $C + I + G$ curve of total expenditure as a function of total output on the horizontal axis. With the original interest rate r^* , output is at the depressed level Q^* before the central bank undertakes its expansionary policy.

Next, assume that the Fed takes steps to lower market interest rates, as shown in Figure 24-6. The lower interest rates increase investment from I^* to I^{**} . This is illustrated in Figure 24-7 as an upward shift in the total expenditure line to $C + I(r^{**}) + G$. The result is a higher total output at Q^{**} . This diagram shows how the sequence of monetary steps has led to higher output, just as the Fed desired in the face of deteriorating economic conditions.

This graphical device is oversimplified. It omits many other contributions to changes in aggregate demand, such as the impact of monetary policy on

wealth and consequently on consumption, the effect of exchange rates on foreign trade, and the direct effect of credit conditions on spending. Additionally, we have not yet fully described how monetary policy affects inflation. Nevertheless, this simple graph illustrates the essence of the monetary transmission mechanism.

Monetary policy uses open-market operations and other instruments to affect short-term interest rates. These short-term interest rates then interact with other economic influences to affect other interest rates and asset prices. By affecting interest-sensitive spending, such as business and residential investment, monetary policy helps control output, employment, and price inflation.

The Challenge of a Liquidity Trap

One of the greatest challenges for a central bank arises as nominal interest rates approach zero. This is referred to as the **liquidity trap**. Such a situation occurred in the Great Depression of the 1930s and then again in 2008–2009 in the United States.

When short-term safe interest rates are zero, short-term safe securities are equivalent to money. The demand for money becomes infinitely elastic with respect to the interest rate. In this situation, banks have no reason to economize on their reserve holdings; they get essentially the same interest rates on reserves as on riskless short-term investments. For example, in early 2009, banks could earn 0.10 percent annually on reserves and 0.12 percent on Treasury bills.

Central bank open-market operations therefore have little or no impact upon interest rates and financial markets. Instead, when the Fed purchases securities, the banks just increase their excess reserves. This syndrome appeared with a vengeance in 2008–2009 as excess reserves rose from a normal level of \$1 billion to over \$900 billion. In essence, banks were using the Fed as a safe deposit box for their funds! (Make sure you understand why open-market operations are ineffective in a liquidity trap.) Because the Fed cannot lower short-term interest rates, it is unable to use the normal monetary transmission mechanism to stimulate the economy in a liquidity trap.

If the central bank cannot lower short-term interest rates below zero, what other steps can it take to stimulate a depressed economy? This was

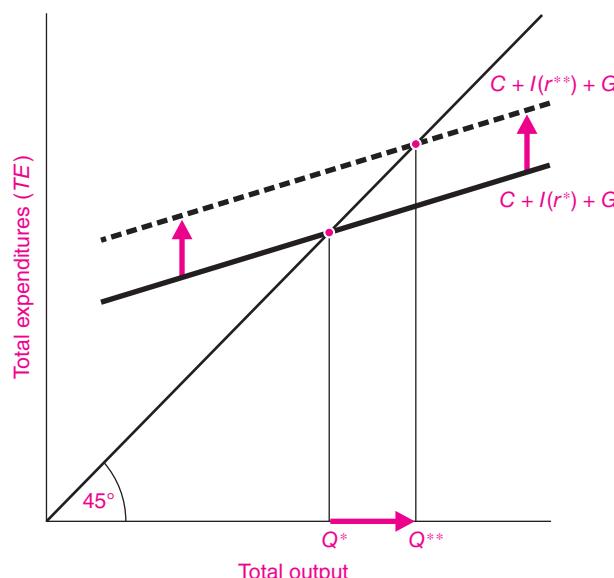


FIGURE 24-7. Monetary Expansion Lowers Interest Rate and Increases Output

As interest rates decline from r^* to r^{**} , then (other things held constant) investment increases from $I(r^*)$ to $I(r^{**})$. This increase shifts up the aggregate demand $C + I + G$ curve of total expenditure, and output increases from Q^* to Q^{**} . This completes the monetary transmission mechanism.

the dilemma that the Fed faced in early 2009. One step would be to attempt to lower *long-term interest rates*. This would require that the central bank purchase long-term bonds instead of focusing on short-term securities, which is its usual practice. A second step would be to *reduce the risk premium on risky securities*. Acting with the U.S. Treasury, the Fed has been taking forceful steps in this direction since the early stages of the 2007–2009 credit crisis. The steps included buying distressed assets, opening the discount window to non-bank financial institutions, buying commercial paper, and lending against a wide range of private financial assets. The purpose of these steps was to improve liquidity and increase the availability of credit in financial markets. An excellent review of the Fed's activities during this period is contained in a 2009 speech by Fed chair Bernanke cited in the Further Readings section at the end of this chapter.

Monetary Policy in the AS-AD Framework

Figures 24-5, 24-6, and 24-7 illustrate how a change in monetary policy could lead to an increase in aggregate demand. We can now show the effect of such an increase on the overall macroeconomic equilibrium by using aggregate supply and aggregate demand curves.

The increase in aggregate demand produced by a monetary expansion is shown as a rightward shift of the *AD* curve, as drawn in Figure 24-8. This shift illustrates a monetary expansion in the presence of unemployed resources, with a relatively flat *AS* curve. The monetary expansion shifts aggregate demand from *AD* to *AD'*, moving the equilibrium from *E* to *E'*. This example demonstrates how monetary expansion can increase aggregate demand and have a powerful impact on real output.

The complete sequence of impacts from expansionary monetary policy is therefore as follows: Open-market operations lower market interest rates. Lower interest rates stimulate interest-sensitive spending on business investment, housing, net exports, and the like. Aggregate demand increases via the multiplier mechanism, raising output and prices above the levels they would otherwise attain. Therefore, the basic sequence is

$$r \text{ down} \rightarrow I, C, X \text{ up} \rightarrow AD \text{ up} \rightarrow Q \text{ and } P \text{ up}$$

Expansionary Monetary Policy

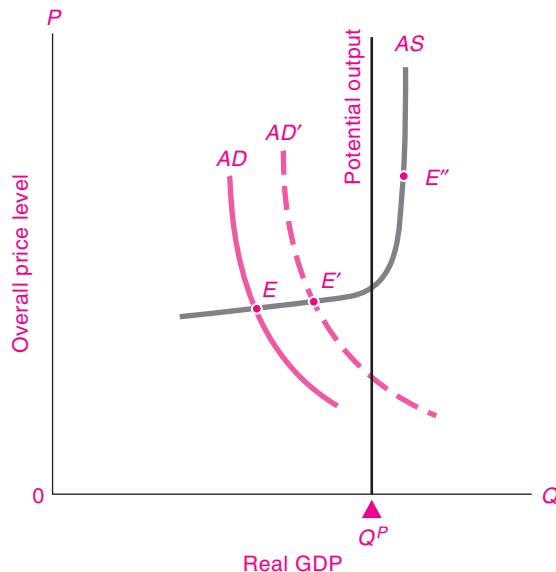


FIGURE 24-8. Expansionary Monetary Policy Shifts Out the *AD* Curve, Increasing Output and Prices

Figures 24-5 to 24-7 showed how a monetary expansion would lead to an increase in investment and thereby to a multiplied increase in output. This results in a rightward shift of the *AD* curve.

In the Keynesian region where the *AS* curve is relatively flat, a monetary expansion has its primary effect on real output, with only a small effect on prices. In a fully employed economy, the *AS* curve is near-vertical (shown at point *E''*), and a monetary expansion will primarily raise prices and nominal GDP, with little effect on real GDP. Can you see why in the long run monetary policy would have no impact on real output if the *AS* curve is vertical?

To clinch your understanding of this vital sequence, work through the opposite case of a monetary contraction. Say that the Federal Reserve decides to raise interest rates, slow the economy, and reduce inflation. You can trace this sequence in Figures 24-5 through 24-7 by reversing the direction of the initial change in monetary policy, thereby seeing how money, interest rates, investment, and aggregate demand react when monetary policy is tightened. Then see how a corresponding leftward shift of the *AD* curve in Figure 24-8 would reduce both output and prices.

Monetary Policy in the Long Run

The analysis in this chapter focuses primarily on monetary policy and business cycles. That is, it considers how monetary policy and interest rates affect output in the short run.

Be aware, however, that a different set of forces will operate in the long run. Monetary policies to stimulate the economy cannot keep increasing output beyond its potential for long. If the central bank holds interest rates too low for long periods of time, the economy will overheat and inflationary forces will take hold. With low real interest rates, speculation may arise, and animal spirits may overtake rational calculations. Some analysts believe that interest rates were too low for too long in the 1990s, causing the stock market bubble; some people think that the same mechanism was behind the housing market bubble of the 2000s.

In the long run, therefore, monetary expansion mainly affects the price level with little or no impact upon real output. As shown in Figure 24-8, monetary changes will affect aggregate demand and real GDP in the short run when there are unemployed resources in the economy and the *AS* curve is relatively flat. However, in our analysis of aggregate supply in the following chapters, we will see that the *AS* curve tends to be vertical or near-vertical in the long run as wages and prices adjust. Because of such price-wage adjustments and a near-vertical *AS* curve, the effects of *AD* shifts on output will diminish in the long run, and the effects on prices will tend to dominate. *This means that, as prices and wages become more flexible in the long run, monetary-policy changes tend to have a relatively small impact on output and a relatively large impact on prices.*

What is the intuition behind this difference between the short run and the long run? Suppose that monetary policy lowers interest rates. In the beginning, real output rises smartly and prices rise modestly. As time passes, however, wages and prices adjust more completely to the higher price and output levels. Higher demand in both labor and product markets raises wages and prices; wages are adjusted to reflect the higher cost of living. In the end, the expansionary monetary policy would produce an economy with unchanged real output and higher prices. All dollar variables (including the money supply, reserves, government debt, wages, prices, exchange rates, etc.) would be higher, while

all real variables would be unchanged. In such a case, we say that *money is neutral*, meaning that changes in monetary policy have no effect on real variables.

This discussion of monetary policy has taken place without reference to fiscal policy. In reality, whatever the philosophical predilections of the government, every advanced economy simultaneously conducts both fiscal and monetary policies. Each type of policy has both strengths and weaknesses. In the chapters that follow, we return to an integrated consideration of the roles of monetary and fiscal policies in combating the business cycle and promoting economic growth.

C. APPLICATIONS OF MONETARY ECONOMICS

Having examined the basic elements of monetary economics and central banking, we now turn to two important applications of money to macroeconomics. We begin with a review of the influential monetarist approach, and then we examine the implications of globalization for monetary policy.

MONETARISM AND THE QUANTITY THEORY OF MONEY AND PRICES

Financial and monetary systems cannot manage themselves. The government, including the central bank, must make fundamental decisions about the monetary standard, the money supply, and the ease or tightness of money and credit. Today, there are many different philosophies about the best way to manage monetary affairs. Many believe in an active policy that “leans against the wind” by raising interest rates when inflation threatens and lowering them in recessions. Others are skeptical about the ability of policymakers to use monetary policy to “fine-tune” the economy to attain the desired levels of inflation and unemployment; they would rather limit monetary policy to targeting inflation. Then there are the monetarists, who believe that discretionary monetary policy should be replaced by a fixed rule relating to the growth of the money supply.

Having reviewed the basics of mainstream monetary theory, this section analyzes monetarism and traces the history of its development from the older quantity theory of money and prices. We will also see that monetarism is closely related to modern macroeconomic theory.

The Roots of Monetarism

Monetarism holds that the money supply is the primary determinant of both short-run movements in nominal GDP and long-run movements in prices. Of course, Keynesian macroeconomics also recognizes the key role of money in determining aggregate demand. The main difference between monetarists and Keynesians lies in the importance assigned to the role of money in the determination of aggregate demand. While Keynesian theories hold that many other forces besides money also affect aggregate demand, monetarists believe that changes in the money supply are the primary factor that determines movement in output and prices.

In order to understand monetarism, we need to understand the concept of the *velocity of money*.

The Equation of Exchange and the Velocity of Money

Money sometimes turns over very slowly; it may sit under a mattress or in a bank account for long periods of time between transactions. At other times, particularly during periods of rapid inflation, money circulates quickly from hand to hand. The speed of the turnover of money is described by the concept of the velocity of money, introduced by Cambridge University's Alfred Marshall and Yale University's Irving Fisher. The velocity of money measures the number of times per year that the average dollar in the money supply is spent for goods and services. When the quantity of money is large relative to the flow of expenditures, the velocity of circulation is low; when money turns over rapidly, its velocity is high.

The concept of velocity is formally introduced in the **equation of exchange**. This equation states²

$$MV \equiv PQ \equiv (p_1 q_1 + p_2 q_2 + \dots)$$

where M is the money supply, V is the velocity of money, P is the overall price level, and Q is total real output. This can be restated as the definition of the **velocity of money** by dividing both sides by M :

$$V \equiv \frac{PQ}{M}$$

We generally measure PQ as total income or output (nominal GDP); the associated velocity concept is the *income velocity of money*.

Velocity is the rate at which money circulates through the economy. The income velocity of money is measured as the ratio of nominal GDP to the stock of money.

As a simple example, assume that the economy produces only bread. GDP consists of 48 million loaves of bread, each selling at a price of \$1, so $GDP = PQ = \$48$ million per year. If the money supply is \$4 million, then by definition $V = \$48/\$4 = 12$ per year. This means that money turns over 12 times per year or once a month as incomes are used to buy the monthly bread.

The Quantity Theory of Prices

Having defined an interesting variable called velocity, we now describe how early monetary economists used velocity to explain movements in the overall price level. The key assumption here is that *the velocity of money is stable and predictable*. The reason for stability, according to monetarists, is that velocity mainly reflects underlying patterns in the timing of earning and spending. If people are paid once a month and tend to spend their income evenly over the course of the month, income velocity will be 12 per year. Suppose that all prices, wages, and incomes double. With unchanged spending patterns, the income velocity of money would remain unchanged and the demand for money would double. Only if people and businesses modify their spending patterns or the way in which they pay their bills would the income velocity of money change.

On the basis of this insight about the stability of velocity, some early writers used velocity to explain changes in the price level. This approach, called the **quantity theory of money and prices**, rewrites the definition of velocity as follows:

$$P \equiv \frac{MV}{Q} \equiv \left(\frac{V}{Q}\right)M \approx kM$$

² The definitional equations have been written with the three-bar identity symbol rather than with the more common two-bar equality symbol. This usage emphasizes that they are “identities”—statements which hold true by definition.

This equation is obtained from the earlier definition of velocity by substituting the variable k as a shorthand for V/Q and solving for P . We write the equation in this way because many classical economists believed that if transaction patterns were stable, k would be constant or stable. In addition, they generally assumed full employment, which meant that real output would grow smoothly. Putting these two assumptions together, $k \approx (V/Q)$ would be near-constant in the short run and decline smoothly in the long run.

What are the implications of the quantity theory? As we can see from the equation, if k were constant, the price level would then move proportionally with the supply of money. A stable money supply would produce stable prices; if the money supply grew rapidly, so would prices. Similarly, if the money supply were growing a hundredfold or a millionfold each year, the economy would experience galloping inflation or hyperinflation. Indeed, the most vivid demonstrations of the quantity theory can be seen in periods of hyperinflation. Look at Figure 30-4 (on page 613). Note how prices rose a billionfold in Weimar Germany after the central bank unleashed the power of the monetary printing presses. This is the quantity theory of money with a vengeance.

To understand the quantity theory of money, it is essential to recall that money differs fundamentally from ordinary goods such as bread and cars. We want bread to eat and cars to drive. But we want money only because it buys us bread and cars. If prices in Zimbabwe today are 100 million times what they were a few years ago, it is natural that people will need about 100 million times as much money to buy things as they did before. Here lies the core of the quantity theory of money: the demand for money rises proportionally with the price level as long as other things are held constant.

In reality, velocity has tended to increase slowly over time, so the k ratio might also change slowly over time. Moreover, in normal times, the quantity theory is only a rough approximation to the facts. Figure 24-9 shows a scatter plot of money growth and inflation over the last half-century. While periods of faster U.S. money growth are also periods of higher inflation, other factors are clearly at work as well, as evidenced by the imperfect correlation between money supply and prices.

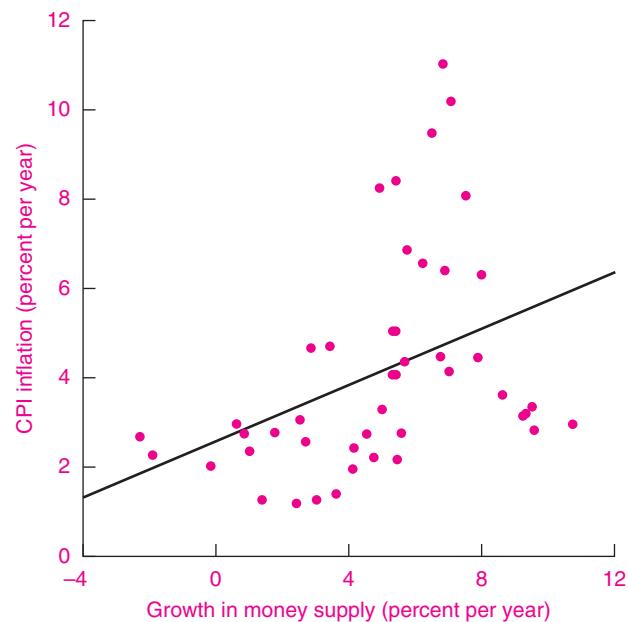


FIGURE 24-9. The Quantity Theory in the United States, 1962–2007

The quantity theory states that prices should change 1 percent for each 1 percent change in the money supply. The scatter plot and the line of best fit show how the simple quantity theory holds for data from the last half-century. Inflation is indeed correlated with money growth, but the relationship is a loose fit. As we will see in our chapters on inflation, other variables such as unemployment and commodity prices influence inflation as well. Query: Assuming velocity is constant and output grows at 3 percent per year, what scatter plot would be produced if money were neutral?

Source: Money supply from the Federal Reserve Board, and the consumer price index from the Bureau of Labor Statistics. Data are 3-year moving averages.

The quantity theory of money and prices holds that prices move proportionally with the supply of money. Although the quantity theory is only a rough approximation, it does help to explain why countries with low money growth have moderate inflation while those with rapid money growth find their prices galloping along.

Modern Monetarism

Modern monetary economics was developed after World War II by Chicago's Milton Friedman and his numerous colleagues and followers. Under

Friedman's leadership, monetarists challenged Keynesian macroeconomics and emphasized the importance of monetary policy in macroeconomic stabilization. In the 1970s, the monetarist approach branched into two separate schools of thought. One continued the monetarist tradition, which we will now describe. The younger offshoot became the influential "new classical school," which is analyzed in Chapter 31.

Strict monetarists hold that "only money matters." This means that prices and output are determined solely by the money supply and that other factors affecting aggregate demand, such as fiscal policy, have no effect on total output or prices. Moreover, while monetary changes may affect real output in the short run, in the long run output is determined by supply factors of labor, capital, and technology. This theory predicts that in the long run, *money is neutral*. This proposition means that in the long run, after expectations have been corrected and business-cycle movements have damped out, (1) nominal output moves proportionally with the money supply and (2) all real variables (output, employment, and unemployment) are independent of the money supply.

The Monetarist Platform: Constant Money Growth

Monetarism played a significant role in shaping macroeconomic policy in the period after World War II. Monetarists hold that money has no effect on real output in the long run, while it does affect output in the short run with long and variable lags. These views lead to the central monetarist tenet of a **fixed-money-growth rule**: The central bank should set the growth of the money supply at a fixed rate and hold firmly to that rate.

Monetarists believe that a fixed growth rate of money would eliminate the major source of instability in a modern economy—the capricious and unreliable shifts of monetary policy. They argue that we should, in effect, replace the Federal Reserve with a computer that produces a fixed-money-growth rate. Such a computerized policy would ensure that there would be no bursts in money growth. With stable velocity, nominal GDP would grow at a stable rate. With suitably low money growth, the economy would soon achieve price stability. So argue the monetarists.

The Monetarist Experiment

When U.S. inflation moved into the double-digit range in the late 1970s, many economists and policymakers believed that monetary policy was the only hope for an effective anti-inflation policy. In October 1979, Federal Reserve chair Paul Volcker launched a fierce attack against inflation in what has been called the *monetarist experiment*. In a dramatic shift from its normal operating procedures, the Fed attempted to stabilize the growth of bank reserves and the money supply rather than targeting interest rates.

The Fed hoped that the quantitative approach to monetary management would lower the growth rate of nominal GDP and thereby lower inflation. In addition, some economists believed that a disciplined monetary policy would quickly reduce inflationary expectations. Once people's expectations were reduced, the economy could experience a relatively painless reduction in the underlying rate of inflation.

The experiment succeeded in slowing the growth of nominal GDP and reducing inflation. With tight money, interest rates rose sharply. Inflation slowed from 13 percent per year in 1980 to 4 percent per year in 1982. Any lingering doubts about the efficacy of monetary policy were killed by the monetarist experiment. Money works. Money matters. Tight money can wring inflation out of the economy. However, the decline in inflation came at the cost of a deep recession and high unemployment during the 1980–1983 period.

The Decline of Monetarism

Paradoxically, just as the monetarist experiment succeeded in rooting inflation out of the American economy, changes in financial markets undermined the monetarist approach. During and after the monetarist experiment, velocity became extremely unstable. Careful economic studies have shown that velocity is positively affected by interest rates and cannot be considered to be a constant that is independent of monetary policy.

Figure 24-10 shows trends in velocity over the 1960–2007 period. M_1 velocity growth was relatively stable in the 1960–1979 period, leading many economists to believe that velocity was predictable. Velocity became much more unstable after 1980 as the high interest rates of the 1979–1982 period spurred financial innovations, including money market

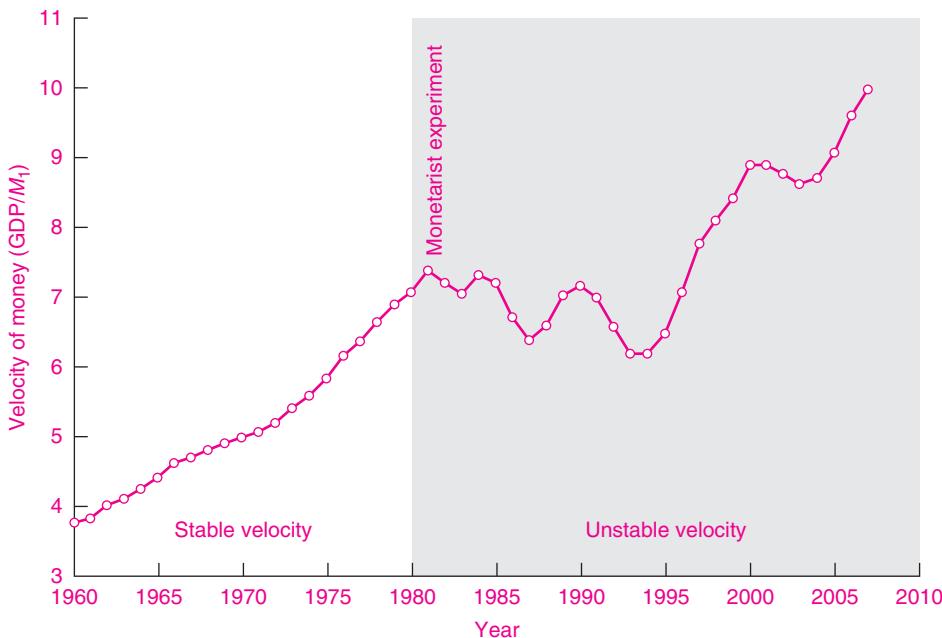


FIGURE 24-10. Income Velocity of M_1

Monetarists assume that the velocity of money is stable and thereby argue for a constant money-supply growth rate. The velocity of money grew at a steady and predictable rate until around 1979. Beginning in 1980 (the shaded area of the graph), an active monetary policy, more-volatile interest rates, and financial innovations led to the extreme instability of velocity.

Source: Velocity defined as the ratio of nominal GDP to M_1 ; money supply from the Federal Reserve Board, and GDP from the Commerce Department.

accounts and interest-bearing checking accounts. Some economists believe that the instability of velocity was actually *produced* by the heavy reliance on targeting monetary aggregates during this period.

As the velocity of money became increasingly unstable, the Federal Reserve gradually stopped using it as a guide for monetary policy. By the early 1990s, the Fed began to rely on macroeconomic indicators such as inflation, output, and employment to diagnose the state of the economy. Interest rates, not the money supply, became the major instrument of policy.

For most central banks today, monetarism is no longer a useful macroeconomic theory. Indeed, during the recession of 2007–2009, the Federal Reserve did not include monetary quantities among its objectives. But this did not diminish the importance of monetary policy, which continues to be a central partner in macroeconomic policy around the world.

Monetarism holds that “only money matters” in the determination of output and prices and that money is neutral in the long run. Although monetarism is no longer a dominant branch of macroeconomics, monetary policy continues to be a central tool of stabilization policy in large market economies today.

MONETARY POLICY IN AN OPEN ECONOMY³

Central banks are particularly important in open economies, where they manage reserve flows and the exchange rate and monitor international financial developments. As economies become increasingly

³ This section is relatively advanced and can usefully be studied after the chapters on open-economy macroeconomics (Chapters 27 and 28) have been covered.

integrated (a process often called *globalization*), central banks must learn to manage external flows as well as internal targets. This section discusses some of the major issues concerning the monetary management of an open economy.

International Linkages

No country is an island, isolated from the world economy. All economies are linked through international trade in goods and services and through flows of capital and financial assets.

An important element in the international financial linkage between two countries is the exchange rate. As we will see again in later chapters, international trade and finance involve the use of different national currencies, all of which are linked by relative prices called foreign exchange rates. Hence, the relative price of Euros to U.S. dollars is the exchange rate between those two currencies.

One important exchange-rate system is floating exchange rates, in which a country's foreign exchange rate is determined by market forces of supply and demand. Today, the United States, Europe, and Japan all operate floating-exchange-rate systems. These three regions can pursue their monetary policies independently from other countries. This chapter's analysis mainly concerns the operation of monetary policy under floating exchange rates.

Some economies—such as Hong Kong and China today, as well as virtually all countries in earlier periods—maintain fixed exchange rates. They “peg” their currencies to one or more external currencies. When a country has a fixed exchange rate, it must align its monetary policy with that of the country to which its currency is pegged. For example, if Hong Kong has open financial markets and an exchange rate pegged to the U.S. dollar, then it must have the same interest rates as the United States.

The Federal Reserve acts as the government's operating arm in the international financial system. Under a floating-exchange-rate system, the main aim of the central bank is to prevent disorderly conditions, such as might occur during a political crisis. The Fed might buy or sell dollars or work with foreign central banks to ensure that exchange rates do not move erratically. However, unlike in the earlier era of fixed exchange rates, the Fed does not “intervene” to maintain a particular exchange rate.

In addition, the Federal Reserve often takes the lead in working with foreign countries and international agencies when international financial crises erupt. The Fed played an important role in the Mexican loan package in 1994–1995, worked with other countries to help calm markets during the East Asian crisis in 1997 and the global liquidity crisis in 1998, and helped calm markets during the Argentine crisis of 2001–2002. When financial institutions in many countries began to incur large losses in 2007–2008, the Federal Reserve joined forces with other central banks to provide liquidity and prevent investor panics in one country from spilling over into other countries.

MONETARY TRANSMISSION IN THE OPEN ECONOMY

The monetary transmission mechanism in the United States has evolved over the last three decades as the economy has become more open and changes have occurred in the exchange-rate system. The relationship between monetary policy and foreign trade has always been a major concern for smaller and more open economies like Canada and Great Britain. However, after the introduction of flexible exchange rates in 1973 and with the rapid growth of cross-border linkages, international trade and finance have come to play a new and central role in U.S. macroeconomic policy.

Let's see how monetary policy affects the economy through international trade with a flexible exchange rate. Suppose the Federal Reserve decides to tighten money. This raises interest rates on assets denominated in U.S. dollars. Attracted by higher-dollar interest rates, investors buy dollar securities, driving up the foreign exchange rate on the dollar. The higher exchange rate on the dollar encourages imports into the United States and reduces U.S. exports. As a result, net exports fall, reducing aggregate demand. This will lower real GDP and reduce the rate of inflation. We will study the international aspects of macroeconomics in more detail in Chapters 27 and 28.

Foreign trade opens up another link in the monetary transmission mechanism. Monetary policy has the same impact on international trade as it has on domestic investment: tight money lowers net exports,

thereby depressing output and prices. The international-trade impact of monetary policy reinforces its domestic-economy impact.

FROM AGGREGATE DEMAND TO AGGREGATE SUPPLY

We have completed our introductory analysis of the determinants of aggregate demand. We examined the foundations and saw that aggregate demand is determined by exogenous factors, such as investment and net exports, along with monetary and fiscal government policies. In the short run, changes in these factors lead to changes in spending and changes in both output and prices.

In today's volatile and globalized world, economies are exposed to shocks from both the inside and the outside of their borders. Wars, revolutions, stock market collapses, housing-price bubbles, financial and currency crises, oil-price shocks, and government miscalculations have led to periods of high inflation or

high unemployment or both. No market mechanism provides an automatic pilot that can eliminate macroeconomic fluctuations. Governments must therefore take responsibility for moderating the swings of the business cycle.

While the United States experienced recessions in 1990, 2001, and 2008, it has up to now been fortunate to avoid deep and prolonged downturns. Other countries over the last quarter-century have not been so lucky. Japan, much of Europe, Latin America, Russia, and the East Asian countries have all occasionally been caught in the turbulent storms of rapid inflation, high unemployment, currency crises, or sharp declines in living standards. These events serve as a reminder that there is no universal cure for unemployment and inflation in the face of all the shocks to a modern economy.

We have now concluded our introductory chapters on short-run macroeconomics. The next part of the book turns to issues of economic growth, the open economy, and economic policy.



SUMMARY

A. Central Banking and the Federal Reserve System

1. Every modern country has a central bank. The U.S. central bank is made up of the Federal Reserve Board in Washington, together with the 12 regional Federal Reserve Banks. Its primary mission is to conduct the nation's monetary policy by influencing financial conditions in pursuit of low inflation, high employment, and stable financial markets.
2. The Federal Reserve System (or "the Fed") was created in 1913 to control the nation's money and credit and to act as the "lender of last resort." It is run by the Board of Governors and the Federal Open Market Committee (FOMC). The Fed acts as an independent government agency and has great discretion in determining monetary policy.
3. The Federal Reserve has four major functions: conducting monetary policy by setting short-term interest rates, maintaining the stability of the financial system and containing systemic risk as the lender of last resort, supervising and regulating banking institutions, and providing financial services to banks and the government.

4. The Fed has three major policy instruments: (a) open-market operations, (b) the discount window for borrowing by banks and, more recently, primary dealers, and (c) legal reserve requirements for depository institutions.

5. The Federal Reserve conducts its policy through changes in an important short-term interest rate called the federal funds rate. This is the short-term interest rate that banks charge each other to trade reserve balances at the Fed. The Fed controls the federal funds rate by exercising control over its instruments, primarily through open-market operations.

B. The Monetary Transmission Mechanism

6. Remember the important monetary transmission mechanism, the route by which monetary policy is translated into changes in output, employment, and inflation:
 - a. The central bank announces a target short-term interest rate chosen in light of its objectives and the state of the economy.

- b. The central bank undertakes daily open-market operations to meet its interest-rate target.
- c. The central bank's interest-rate target and expectations about future financial conditions determine the entire spectrum of short- and long-term interest rates, asset prices, and exchange rates.
- d. The level of interest rates, credit conditions, asset prices, and exchange rates affect investment, consumption, and net exports.
- e. Investment, consumption, and net exports affect the path of output and inflation through the AS-AD mechanism.

We can write the operation of a monetary policy change as follows:

Change in monetary policy

- change in interest rates, asset prices, exchange rates
- impact on I , X , C
- effect on AD
- effect on Q , P

- 7. Although the monetary transmission mechanism is often described simply in terms of "the interest rate" and "investment," this mechanism is in fact an extremely rich and complex process whereby changes in all kinds of financial conditions influence a wide variety of spending. The affected sectors include: housing, affected by mortgage interest rates and housing

prices; business investment, affected by interest rates and stock prices; spending on consumer durables, influenced by interest rates and credit availability; state and local capital spending, affected by interest rates; and net exports, determined by the effects of interest rates upon foreign exchange rates.

C. Applications of Monetary Economics

- 8. Monetarism holds that the money supply is the primary determinant of short-run movements in both real and nominal GDP as well as the primary determinant of long-run movements in nominal GDP. The income velocity of money (V) is defined as the ratio of the dollar-GDP flow (PQ) to the stock of money (M): $V = PQ/M$. With constant velocity, prices move proportionally to the money supply. Monetarists propose that the money supply should grow at a low fixed rate. Statistical studies indicate that velocity tends to be positively correlated with interest rates, a finding that undermines the monetarist policy prescription.
- 9. In an open economy, the international-trade linkage reinforces the domestic impacts of monetary policy. In a regime of flexible exchange rates, changes in monetary policy affect the exchange rate and net exports, adding yet another facet to the monetary mechanism. The trade link tends to reinforce the impact of monetary policy, which operates in the same direction on net exports as it does on domestic investment.

CONCEPTS FOR REVIEW

Central Banking

bank reserves
federal funds interest rate
Federal Reserve balance sheet
open-market purchases and sales
discount rate, borrowing from the Fed

legal reserve requirements
FOMC, Board of Governors

The Monetary Transmission Mechanism and Applications

demand for and supply of reserves
monetary transmission mechanism

interest-sensitive components of spending
monetary policy in the AS-AD framework
"neutrality" of money
second route by which M affects output

FURTHER READING AND INTERNET WEBSITES

Further Reading

Alan Greenspan's memoir, *The Age of Turbulence* (Penguin, New York, 2007) is a valuable history of the last half-decade as well as of his stewardship of the Federal Reserve.

The *Federal Reserve Bulletin* contains monthly reports on Federal Reserve activities and other important financial developments. The *Bulletin* is available on the Internet at www.federalreserve.gov/pubs/bulletin/default.htm.

The quotation on the lender of last resort is from Alan Greenspan, "Remarks," Lancaster House, London, U.K., September 25, 2002, available at www.federalreserve.gov/boarddocs/speeches/2002/200209253/default.htm.

The governors of the Fed often bring informed economic expertise to monetary and other issues. See speeches at www.federalreserve.gov/newsevents/. A particularly influential speech by current Fed chair Ben Bernanke on the "global savings glut" is at www.federalreserve.gov/boarddocs/speeches/2005/200503102/default.htm.

Websites

The Federal Reserve System: Purposes and Functions, 9th ed. (Board of Governors of the Federal Reserve System, Washington, D.C., 2005), available online at www.federalreserve.gov/pf/pf.htm, provides a useful description of the operations of the Fed. Also, see the Further Reading and Websites sections in Chapter 25 for a more detailed list of sites on monetary policy. An excellent review of the Federal Reserve's response to the credit crisis of 2007–2009 is contained in a speech by Fed chair Ben Bernanke, "The Crisis and the Policy Response," January 2009, available at <http://www.federalreserve.gov/newsevents/speech/bernanke20090113a.htm>.

If you want to know which Reserve Bank region you live in, see www.federalreserve.gov/otherfrb.htm. Why are the eastern regions so small?

Biographies of the members of the Board of Governors can be found at www.federalreserve.gov/bios/. Particularly interesting are the transcripts and minutes of Fed meetings, at www.federalreserve.gov/fomc/.

QUESTIONS FOR DISCUSSION

1. Using Figures 24-5 through 24-7, work through each of the following:
 - a. As in 2007–2008, the Federal Reserve is concerned about a decline in housing prices that is reducing investment. What steps might the Fed take to stimulate the economy? What will be the impact on bank reserves? What will be the impact on interest rates? What will be the impact on investment (other things held constant)?
 - b. As in 1979, the Fed is concerned about rising inflation and wishes to reduce output. Answer the same questions as in a.
2. Suppose you are the chair of the Fed's Board of Governors at a time when the economy is heading into a recession and you are called to testify before a congressional committee. Write your explanation to an interrogating senator outlining what monetary steps you would take to prevent the recession.
3. Consider the balance sheet of the Fed in Table 24-1. Construct a corresponding balance sheet for banks (like the one in Table 23-3 in the previous chapter) assuming that reserve requirements are 10 percent on checking accounts and zero on everything else.
 - a. Construct a new set of balance sheets, assuming that the Fed sells \$1 billion worth of government securities through open-market operations.
 - b. Construct another set of balance sheets, assuming that the Fed increases reserve requirements from 10 to 20 percent.
 - c. Assume that banks borrow \$1 billion worth of reserves from the Fed. How will this action change the balance sheets?
4. Assume that commercial banks have \$100 billion of checking deposits and \$4 billion of vault cash. Further assume that reserve requirements are 10 percent of checking deposits. Lastly, assume that the public holds \$200 billion of currency, which is always fixed. Central-bank assets include only government securities.
 - a. Construct the balance sheets for the central bank and the banking system. Make sure you include banks' deposits with the central bank.
 - b. Now assume that the central bank decides to engage in an open-market operation, selling

\$1 billion worth of government securities to the public. Show the new balance sheets. What has happened to M_1 ?

- c. Finally, using the graphical apparatus of the monetary transmission mechanism, show the qualitative impact of the policy on interest rates, investment, and output.
- 5. In his memoirs, Alan Greenspan wrote, “I regret to say that Federal Reserve independence is not set in stone. FOMC discretion is granted by statute and can be withdrawn by statute.” (*The Age of Turbulence*, p. 478 f.) Explain why the independence of a central bank might affect the way in which monetary policy is conducted. If a central bank is not independent, how might its monetary policies change in response to electoral pressures? Would you recommend that a new country have an independent central bank? Explain.
- 6. One of the nightmares of central bankers is the liquidity trap. This occurs when nominal interest rates approach or even equal zero. Once the interest rate has declined to zero, monetary expansion is ineffective because interest rates on securities cannot go below zero.
 - a. Explain why the nominal interest rate on government bonds cannot be negative. (*Hint:* What is the nominal interest rate on currency? Why would you hold a bond whose interest rate is below the interest rate on currency?)
 - b. A liquidity trap is particularly serious when a country simultaneously experiences falling prices, also called deflation. For example, in the early 2000s, consumer prices in Japan were falling at 2 percent per year. What were Japanese real interest rates during this period if the nominal interest rate was 0? What was the *lowest* real interest rate that the Bank of Japan could have produced during this period?
 - c. Explain on the basis of b why the liquidity trap poses such a serious problem for monetary policy during periods of deflation and depression.
- 7. After the reunification of Germany in 1990, payments to rebuild the East led to a major expansion of aggregate demand in Germany. The German central bank responded by slowing money growth and raising German real interest rates. Trace through why this German monetary tightening would be expected to lead to a depreciation of the dollar. Explain why such a depreciation would stimulate economic activity in the United States. Also explain why European countries that had pegged their currencies to the German mark would find themselves plunged into recessions as German interest rates rose and pulled other European rates up with them.
- 8. In December 2007, the Federal Open Market Committee made the following statement: “The Federal Open Market Committee seeks monetary and financial conditions that will foster price stability and promote sustainable growth in output. To further its long-run objectives, the Committee [will reduce] the federal funds rate [from 4½ percent to] 4¼ percent.” Your assignment is to explain the macroeconomic rationale behind this monetary expansion. It will help to review the minutes of the FOMC meeting at www.federalreserve.gov/monetarypolicy/files/fomcminutes20071211.pdf.



PART SIX

Growth, Development, and the Global Economy

Economic Growth

25



The Industrial Revolution was not an episode with a beginning and an end. . . . It is still going on.

E. J. Hobsbawm

The Age of Revolution (1962)

If you look at photographs of an earlier era, you will quickly recognize how dramatically the living standards of the average household have changed over past decades and centuries. Today's homes are stocked with goods that could hardly be imagined a century ago. Just think of entertainment before the era of plasma televisions, high-definition DVDs, and portable media devices. Similarly, the Internet has opened up a vast array of information that could be obtained only by going to the library, and even then only a small fraction of published knowledge was available in most libraries. Or consider the health care available today as compared to periods such as the U.S. Civil War, when soldiers died simply because they got an infection.

These changes in the array, quality, and quantity of goods and services available to the average household are the human face of economic growth. In macroeconomics, economic growth designates the process by which economies accumulate larger quantities of capital equipment, push out the frontiers of technological knowledge, and become steadily more productive. Over the long run of decades and generations, living standards, as measured by output per capita or consumption per household, are primarily determined by aggregate supply and the level of productivity of a country.

This chapter begins with a survey of the theory of economic growth and then reviews the historical trends in economic activity with particular application to wealthy countries like the United States. The next chapter looks at the other end of the income spectrum by examining the plight of the developing countries, struggling to reach the level of affluence enjoyed in the West. The two chapters that follow examine the role of international trade and finance in macroeconomics.

The Long-Term Significance of Growth

A careful analysis of the economic history of the United States reveals that real GDP has grown by a factor of 35 since 1900 and by a factor of over 1000 since 1800. Rapid growth of output is the distinguishing feature of modern times and contrasts sharply with human history going back to its origins millions of years ago. This is perhaps the central economic fact of the century. Continuing rapid economic growth enables advanced industrial countries to provide more of everything to their citizens—better food and bigger homes, more resources for medical care and pollution control, universal education for children, better equipment for the military, and public pensions for retirees.

Because economic growth is so important for living standards, it is a central objective of policy. Countries that run swiftly in the economic-growth race, such as Britain in the nineteenth century and the United States in the twentieth century, serve as role models for other countries seeking the path to affluence. At the other extreme, countries in economic decline often experience political and social turmoil. The revolutions in Eastern Europe and the Soviet Union in 1989–1991 were sparked when those nations' residents compared their economic stagnation under socialism with the rapid growth experienced by their Western, market-oriented neighbors. Economic growth is the single most important factor in the success of nations in the long run.

A. THEORIES OF ECONOMIC GROWTH

Let's begin with a careful definition of exactly what we mean by economic growth: **Economic growth** represents the expansion of a country's potential GDP or national output. Put differently, economic growth occurs when a nation's production-possibility frontier (*PPF*) shifts outward.

A closely related concept is the growth rate of *output per person*. This determines the rate at which the country's living standards are rising. Countries are primarily concerned with the growth in per capita output because this leads to rising average incomes.

What are the long-term patterns of economic growth in high-income countries? Table 25-1 shows the history of economic growth since 1870 for high-income countries including the major countries of North America and Western Europe, Japan, and Australia. We see the steady growth of output over this period. Even more important for living standards is the growth in output per hour worked, which moves closely with the increase in living standards. Over the entire period, output per hour worked grew by an average annual rate of 2.3 percent. If we compound this rate over the 136 years, output per person at the end was 22 times higher than at the beginning (make sure you can reproduce this number).

What were the major forces behind this growth? What can nations do to speed up their economic growth rate? And what are the prospects for the twenty-first century? These are the issues that must be confronted by economic-growth analysis.

Economic growth involves the growth of potential output over the long run. The growth in output per capita is an important objective of government because it is associated with rising average real incomes and rising living standards.

THE FOUR WHEELS OF GROWTH

What is the recipe for economic growth? To begin with, many roads lead to Rome. There are many successful strategies on the road to self-sustained economic growth. Britain, for example, became the

Period	Average Annual Growth Rate (percent per year)			
	GDP	GDP per hour worked	Total hours worked	Labor force
1870–1913	2.5	1.6	0.9	1.2
1913–1950	1.9	1.8	0.1	0.8
1950–1973	4.8	4.5	0.3	1.0
1973–2006	2.6	2.2	0.4	1.0
Total period	2.8	2.3	0.5	1.0

TABLE 25-1. Patterns of Growth in Advanced Countries

Over the last century-plus, major high-income countries like the United States, Germany, France, and Japan have grown rapidly. Output has grown faster than inputs of labor, reflecting increases in capital and technological advance.

Source: Angus Maddison, *Phases of Capitalist Development* (Oxford University Press, Oxford, 1982), updated by authors. The data cover 16 major countries starting in 1870, while more recent data cover 31 advanced economies.

world economic leader in the 1800s by pioneering the Industrial Revolution, inventing steam engines and railroads, and emphasizing free trade. Japan, by contrast, came to the economic-growth race later. It made its mark by first imitating foreign technologies and protecting domestic industries from imports and then developing tremendous expertise in manufacturing and electronics.

Even though their individual paths may differ, all rapidly growing countries share certain common traits. The same fundamental process of economic growth and development that helped shape Britain and Japan is at work today in developing countries like China and India. Indeed, economists who have studied growth have found that the engine of economic progress must ride on the same four wheels, no matter how rich or poor the country. These four wheels, or factors of growth, are:

- Human resources (labor supply, education, skills, discipline, motivation)
- Natural resources (land, minerals, fuels, environmental quality)
- Capital (factories, machinery, roads, intellectual property)
- Technological change and innovation (science, engineering, management, entrepreneurship)

Often, economists write the relationship in terms of an *aggregate production function* (or *APF*), which relates total national output to inputs and technology. Algebraically, the *APF* is

$$Q = AF(K, L, R)$$

where Q = output, K = productive services of capital, L = labor inputs, R = natural-resource inputs, A represents the level of technology in the economy, and F is the production function. As the inputs of capital, labor, or resources rise, we would expect that output would increase, although output will probably show diminishing returns to additional inputs of production factors. We can think of the role of technology as augmenting the productivity of inputs. **Productivity** denotes the ratio of output to a weighted average of inputs. As technology (A) improves through new inventions or the adoption of technologies from abroad, this advance allows a country to produce more output with the same level of inputs.

Let's now see how each of the four factors contributes to growth.

Human Resources

Labor inputs consist of quantities of workers and of the skills of the workforce. Many economists believe that the quality of labor inputs—the skills, knowledge, and discipline of the labor force—is the single most important element in economic growth. A country might buy fast computers, modern telecommunications devices, sophisticated electricity-generating equipment, and hypersonic fighter aircraft. However, these capital goods can be effectively used and maintained only by skilled and trained workers. Improvements in literacy, health, and discipline, and most recently the ability to use computers, add greatly to the productivity of labor.

Natural Resources

The second classic factor of production is natural resources. The important resources here are arable land, oil, gas, forests, water, and mineral deposits. Some high-income countries like Canada and Norway have grown primarily on the basis of their ample resource base, with large output in oil, gas, agriculture, fisheries, and forestry. Similarly, the United States, with its fertile farmlands, is the world's largest producer and exporter of grains.

But the possession of natural resources is not necessary for economic success in the modern world. New York City prospers primarily on its high-density service industries. Many countries, such as Japan, had virtually no natural resources but thrived by concentrating on sectors that depend more on labor and capital than on indigenous resources. Indeed, tiny Hong Kong, with but a tiny fraction of the land and natural resources of Nigeria, actually has a larger GDP than does that giant country.

Capital

Capital includes tangible capital goods like roads, power plants, and equipment like trucks and computers, as well as intangible items such as patents, trademarks, and computer software. The most dramatic stories in economic history often involve the accumulation of capital. In the nineteenth century, the transcontinental railroads of North America brought commerce to the American heartland, which had been living in isolation. In the twentieth century, waves of investment in automobiles, roads, and power plants increased productivity and provided the infrastructure which created entire new industries. Many

believe that computers and information technology will do for the twenty-first century what railroads and highways did in earlier times.

Accumulating capital, as we have seen, requires a sacrifice of current consumption over many years. Countries that grow rapidly tend to invest heavily in new capital goods; in the most rapidly growing countries, 10 to 20 percent of output may go into net capital formation. The United States shows a stark contrast with high-saving countries. The U.S. net national saving rate, after averaging around 7 percent during the first four decades after World War II, began to decline and actually fell to near-zero in 2008. The low saving rate was the result of low personal saving and large government fiscal deficits. The low saving was seen primarily in the large external (trade) deficit. Economists worry that the low saving rate will retard investment and economic growth in the decades to come and that the large foreign indebtedness may require major adverse changes in exchange rates and real wages.

When we think of capital, we must not concentrate only on computers and factories. Many investments that are necessary for the efficient functioning of the private sector will be undertaken only by governments. These investments are called **social overhead capital** and consist of the large-scale projects that precede trade and commerce. Roads, irrigation and water projects, and public-health measures are important examples. All these involve large investments that tend to be “indivisible,” or lumpy, and sometimes have increasing returns to scale. These projects generally involve external economies, or spillovers that private firms cannot capture, so the government must step in to ensure that these social overhead or infrastructure investments are effectively undertaken. Some investments, such as transportation and communication systems, involve “network” externalities in which productivity depends upon the fraction of the population which uses or has access to the network.

Technological Change and Innovation

In addition to the three classic factors discussed above, technological advance has been a vital fourth ingredient in the rapid growth of living standards. Historically, growth has definitely not been a process of simple replication, adding rows of steel mills or power plants next to each other. Rather, a never-ending stream of inventions and technological

advances led to a vast improvement in the production possibilities of Europe, North America, and Japan.

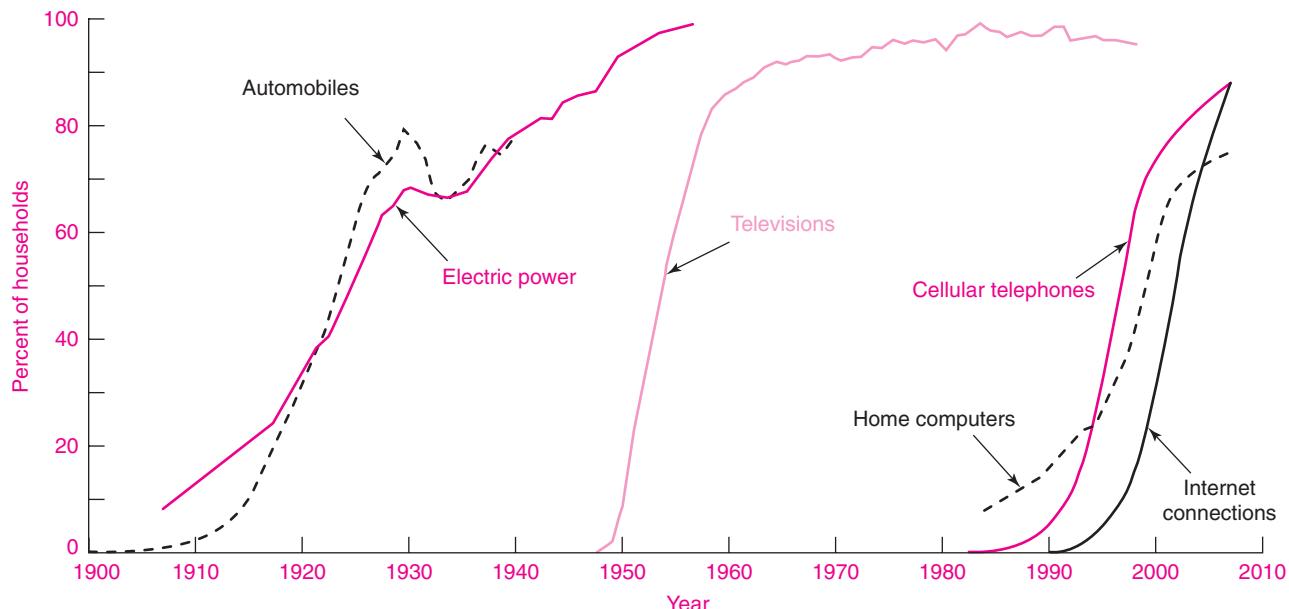
We are today witnessing an explosion of new technologies, particularly in computation, communication (such as the Internet), and the life sciences. But this is not the first time that American society has been shaken by fundamental inventions. Electricity, radio, the automobile, and television also diffused rapidly through the American economy in an earlier age. Figure 25-1 shows the diffusion of major inventions of the twentieth century. This S-shaped pattern is typical of the diffusion of new technologies.

Technological change denotes changes in the processes of production or introduction of new products or services. Process inventions that have greatly increased productivity were the steam engine, the generation of electricity, antibiotics, the internal-combustion engine, the wide-body jet, the microprocessor, and the fax machine. Fundamental product inventions include the telephone, the radio, the airplane, the phonograph, the television, the computer, and the DVR.

The most dramatic developments of the modern era are occurring in information technology. Here, tiny notebook computers can outperform the fastest computer of the 1960s, while fiber-optic lines can carry 200,000 simultaneous conversations that required 200,000 paired copper-wire lines in an earlier period. These inventions provide the most spectacular examples of technological change. Nonetheless, technological advance is in fact a continuous process of small and large improvements, as witnessed by the fact that the United States issues over 100,000 new patents annually and that millions of other small refinements are routine activities in a modern economy.

Economists have long pondered how to encourage technological progress because of its importance in raising living standards. Technological progress is a complex and multifaceted process, and no single formula for success has been found.

Here are some historical examples: Toyota succeeded in instilling a workplace ethic of making continuous quality improvements from the bottom up; this propelled Toyota to the top of the automobile industry. Quite a different pattern arose in Silicon Valley’s computer business. Here, technological change was fostered by an entrepreneurial spirit of free inquiry, light government regulation, free international trade in intellectual property products, and the lure of lucrative stock options. Economists

**FIGURE 25-1.** Diffusion of Major Technologies

Today's information technologies such as cellular telephones, computers, and the Internet are spreading rapidly through American society. Similar diffusion patterns were seen with other fundamental inventions in the past.

Source: *Economic Report of the President*, 2000, updated by authors.

Factor in economic growth	Examples
Human resources	Size of labor force Quality of workers (education, skills, discipline)
Natural resources	Oil and gas Soils and climate
Capital stock	Homes and factories Machinery Intellectual property Social overhead capital
Technology and entrepreneurship	Quality of scientific and engineering knowledge Managerial know-how Rewards for innovation

TABLE 25-2. The Four Wheels of Progress

Economic growth inevitably rides on the four wheels of labor, natural resources, capital, and technology. But the wheels may differ greatly among countries, and some countries combine them more effectively than others.

recognize that some approaches seem to kill the spirit of innovation. Many sectors of the Soviet Union under central planning saw technological stagnation because of the heavy hand of state regulation, lack of

profit motivation, an inefficient pricing mechanism, and widespread corruption.

Table 25-2 summarizes the four wheels of economic growth.



Institutions, Incentives, and Innovation

In the very long run, the growth in the world's output and wealth has come primarily because of improvements in knowledge. Yet institutions to promote the creation and spread of knowledge, along with incentives to devote our human effort to that task, were developed late in human history—slowly in Western Europe over the last 500 years. This point was eloquently argued by William Baumol:

The museum at Alexandria was the center of technological innovation in the Roman Empire. By the first century B.C., that city knew of virtually every form of machine gearing that is used today, including a working steam engine. But these seemed to be used only to make what amounted to elaborate toys. The steam engine was used to open and close the doors of a temple.¹

Baumol and economic historian Joel Mokyr argue that innovation depends crucially on the development of incentives and institutions. They particularly point to the role of private ownership, the patent system, and a rule-based system of adjudicating disputes as devices for fostering innovation.

THEORIES OF ECONOMIC GROWTH

Virtually everyone is in favor of economic growth. But there are strong disagreements about the best way to accomplish this goal. Some economists and policymakers stress the need to increase capital investment. Others advocate measures to stimulate research and development and technological change. Still a third group emphasizes the role of a better-educated workforce.

Economists have long studied the question of the relative importance of different factors in determining growth. In the discussion below, we look at different theories of economic growth, which offer some clues about the driving forces behind growth. Then, in the final part of this section, we see what can be learned about growth from its historical patterns over the last century.

¹ See Baumol in the Further Reading section at the end of this chapter.

The Classical Dynamics of Smith and Malthus

Early economists like Adam Smith and T. R. Malthus stressed the critical role of land in economic growth. In *The Wealth of Nations* (1776), Adam Smith provided a handbook of economic development. He began with a hypothetical idyllic age: “that original state of things, which precedes both the appropriation of land and the accumulation of [capital] stock.” This was a time when land was freely available to all, and before capital accumulation had begun to matter.

What would be the dynamics of economic growth in such a “golden age”? Because land is freely available, people would simply spread out onto more acres as the population increases, just as the settlers did in the American West. Because there is no capital, national output would exactly double as population doubles. What about real wages? The entire national income would go to wages because there is no subtraction for land rent or interest on capital. Output expands in step with population, so the real wage rate per worker would be constant over time.

But this golden age cannot continue forever. Eventually, as population growth continues, all the land will be occupied. Once the frontier disappears, balanced growth of land, labor, and output is no longer possible. New laborers begin to crowd onto already-worked soils. Land becomes scarce, and rents rise to ration it among different uses.

Population still grows, and so does the national product. But output must grow more slowly than does population. Why? With new laborers added to fixed land, each worker now has less land to work with, and the law of diminishing returns comes into operation. The increasing labor-land ratio leads to a declining marginal product of labor and hence to declining real wage rates.²

How bad could things get? The dour Reverend T. R. Malthus thought that population pressures would

² The theory in this chapter relies on an important finding from microeconomics. In analysis of the determination of wages under simplified conditions, including perfect competition, it is shown that the wage rate of labor will be equal to the extra or marginal product of the last worker hired. For example, if the last worker contributes goods worth \$12.50 per hour to the firm's output, then under competitive conditions the firm will be willing to pay up to \$12.50 per hour in wages to that worker. Similarly, the rent on land is the marginal product of the last unit of land, and the real interest rate will be determined by the marginal product of the least productive piece of capital.

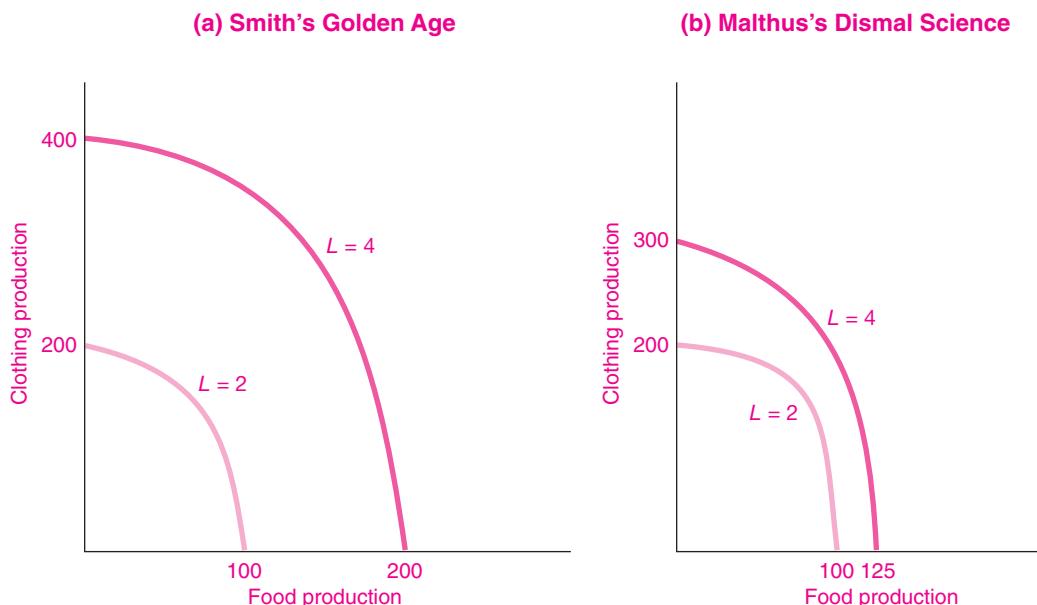


FIGURE 25-2. The Classical Dynamics of Smith and Malthus

In (a), unlimited land on the frontier means that when population doubles, labor can simply spread out and produce twice the quantity of any food and clothing combination. In (b), limited land means that increasing population from 2 million to 4 million triggers diminishing returns. Note that potential food production rises by only 25 percent with a doubling of labor inputs.

drive the economy to a point where workers were at the minimum level of subsistence. Malthus reasoned that whenever wages were above the subsistence level, population would expand; below-subsistence wages would lead to high mortality and population decline. Only at subsistence wages could there be a stable equilibrium of population. He believed the working classes were destined to a life that is brutish, nasty, and short. This gloomy picture led Thomas Carlyle to criticize economics as “the dismal science.”

Figure 25-2(a) shows the process of economic growth in Smith’s golden age. Here, as population doubles, the production-possibility frontier (PPF) shifts out by a factor of 2 in each direction, showing that there are no constraints on growth from land or resources. Figure 25-2(b) shows the pessimistic Malthusian case, where a doubling of population leads to a less-than-doubling of food and clothing, lowering per capita output, as more people crowd onto limited land and diminishing returns drive down output per person.

Economic Growth with Capital Accumulation: The Neoclassical Growth Model

Malthus’s forecast was dramatically wide of the mark because he did not recognize that technological innovation and capital investment could overcome the law of diminishing returns. Land did not become the limiting factor in production. Instead, the first Industrial Revolution brought forth power-driven machinery that increased production, factories that gathered teams of workers into giant firms, railroads and steamships that linked together the far points of the world, and iron and steel that made possible stronger machines and faster locomotives. As market economies entered the twentieth century, a second Industrial Revolution grew up around the telephone, automobile, and electricity industries. Capital accumulation and new technologies became the dominant forces affecting economic development.

What will be the driving forces of economic growth in the twenty-first century? Perhaps advances

in computation, software, and artificial intelligence will spark yet another industrial revolution. Perhaps, as some ecological pessimists warn, a present-day Malthusian specter haunts rich countries as climate change, sea-level rise, and drought-induced migrations lead to social unrest and economic decline.

To understand how capital accumulation and technological change affect the economy, we must introduce the **neoclassical model of economic growth**. This approach was pioneered by Robert Solow of MIT, who was awarded the 1987 Nobel Prize for this and other contributions to economic-growth theory. The neoclassical growth model serves as the basic tool for understanding the growth process in advanced countries and has been applied in empirical studies of the sources of economic growth.



Apostle of Economic Growth

Robert M. Solow was born in Brooklyn and educated at Harvard and then moved to the MIT Economics Department in 1950. Over the next few years he developed the neoclassical growth model and applied it in the growth-accounting framework discussed later in this chapter.

One of Solow's major studies was "A Contribution to the Theory of Economic Growth" in 1956. This was a mathematical version of the neoclassical growth model surveyed in this chapter. The importance of this study was highlighted as follows in Solow's Nobel Prize citation:

Solow's theoretical model had an enormous impact on economic analysis. From simply being a tool for the analysis of the growth process, the model has been generalized in several different directions. It has been extended by the introduction of other types of production factors and it has been reformulated to include stochastic features. The design of dynamic links in certain "numerical" models employed in general equilibrium analysis has also been based on Solow's model. But, above all, Solow's growth model constitutes a framework within which modern macroeconomic theory can be structured.

The increased interest of government to expand education and research and development was inspired by these studies. Every long-term report ... for any country has used a Solow-type analysis.³

Solow has also contributed to empirical studies of economic growth, to natural-resource economics, and to the

development of capital theory. In addition, Solow served as a macroeconomic adviser for the Kennedy administration.

Solow is known for his enthusiasm for economics as well as for his humor. He believed that the hunger for publicity has led some economists to exaggerate their knowledge. He criticized economists for "an apparently irresistible urge to push their science further than it will go, to answer questions more delicate than our limited understanding of a complicated question will allow. Nobody likes to say 'I don't know.'"

A lively writer, Solow worries that economics is terribly difficult to explain to the public. At his news conference after winning the Nobel Prize, Solow quipped, "The attention span of the people you write for is shorter than the length of one true sentence." Nonetheless, Solow continues to labor for his brand of economics, and the world listens carefully to the apostle of economic growth from MIT.

Basic Assumptions. The neoclassical growth model describes an economy in which a single homogeneous output is produced by two types of inputs—capital and labor. In contrast to the Malthusian analysis, labor growth is assumed to be a given. In addition, we assume that the economy is competitive and always operates at full employment, so we can analyze the growth of potential output.

The major new ingredients in the neoclassical growth model are capital and technological change. For the moment, assume that technology remains constant. Capital consists of durable produced goods that are used to make other goods. Capital goods include structures like factories and houses, equipment like computers and machine tools, and inventories of finished goods and goods in process.

For convenience, we will assume that there is a single kind of capital good (call it K). We then measure the aggregate stock of capital as the total quantity of capital goods. In our real-world calculations, we approximate the universal capital good as the total dollar value of capital goods (i.e., the constant-dollar value of equipment, structures, and inventories). If L is the number of workers, then (K/L) is equal to the quantity of capital per worker, or the *capital-labor ratio*. We can write our aggregate production function for the neoclassical growth model without technological change as $Q = F(K, L)$.

Turning now to the economic-growth process, economists stress the need for **capital deepening**, which is the process by which the quantity of capital

³ The citations of the committees for the Nobel Prizes in economics can be found on the Internet at www.nobel.se/laureates.

per worker increases over time. Here are some examples of capital deepening: A farmer uses a mechanical orange picker instead of unskilled manual labor; a road builder uses a backhoe instead of a worker with a pick and shovel; a bank substitutes hundreds of ATM machines for human tellers. These are all examples of how the economy increases the amount of capital per worker. As a result, the output per worker has grown enormously in agriculture, road building, and banking.

What happens to the return on capital in the process of capital deepening? For a given state of technology, a rapid rate of investment in plant and equipment tends to depress the rate of return on capital.⁴ This occurs because the most worthwhile investment projects get undertaken first, after which later investments become less and less valuable. Once a full railroad network or telephone system has been constructed, new investments will branch into more sparsely populated regions or duplicate existing lines. The rates of return on these later investments will be lower than the high returns on the first lines between densely populated regions.

In addition, the wage rate paid to workers will tend to rise as capital deepening takes place. Why? Each worker has more capital to work with and his or her marginal product therefore rises. As a result, the competitive wage rate rises along with the marginal product of labor.

We can summarize the impact of capital deepening in the neoclassical growth model as follows:

Capital deepening occurs when the stock of capital grows more rapidly than the labor force. In the absence of technological change, capital deepening will produce a growth of output per worker, of the marginal product of labor, and of real wages; it also will lead to diminishing returns on capital and therefore to a decline in the rate of return on capital.

Geometrical Analysis of the Neoclassical Model

We can analyze the effects of capital accumulation by using Figure 25-3. This figure shows the aggregate production function graphically by depicting output

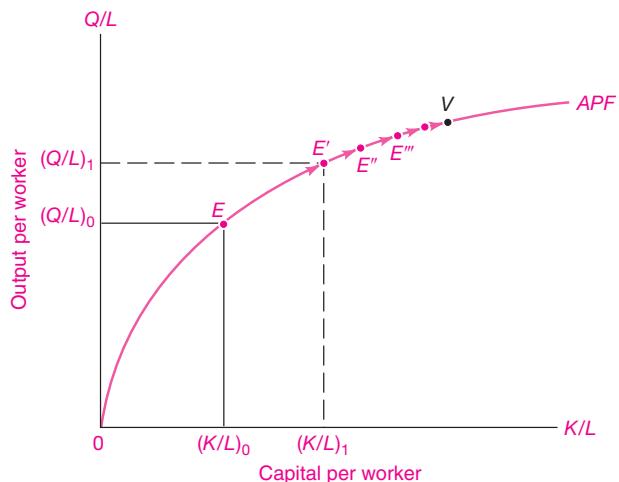


FIGURE 25-3. Economic Growth through Capital Deepening

As the amount of capital per worker increases, output per worker also increases. This graph shows the importance of “capital deepening,” or increasing the amount of capital each worker has on hand. Remember, however, that other factors are held constant, such as technology, quality of the labor force, and natural resources.

per worker on the vertical axis and capital per worker on the horizontal axis. In the background, *and held constant for the moment*, are all the other variables that were discussed at the start of this section—the amount of land, the endowment of natural resources, and, most important of all, the technology used by the economy.

What happens as the society accumulates capital? As each worker has more and more capital to work with, the economy moves up and to the right on the aggregate production function. Say that the capital-labor ratio increases, from $(K/L)_0$ to $(K/L)_1$. Then the amount of output per worker increases, from $(Q/L)_0$ to $(Q/L)_1$.

What happens to the factor prices of labor and capital? As capital deepens, diminishing returns to capital set in, so the rate of return on capital and the real interest rate fall. (The slope of the curve in Figure 25-3 is the marginal product of capital, which is seen to fall as capital deepening occurs.) Also, because each worker can work with more capital, workers’ marginal productivities rise and the real wage rate consequently also rises.

⁴ Under perfect competition and without risk, taxes, or inflation, the rate of return on capital is equal to the real interest rate on bonds and other financial assets.

The reverse would happen if the amount of capital per worker were to fall for some reason. For example, wars tend to reduce much of a nation's capital to rubble and lower the capital-labor ratio; after wars, therefore, we see a scarcity of capital and high returns on capital. Hence, our earlier verbal summary of the impact of capital deepening is verified by the analysis in Figure 25-3.

Long-Run Steady State. What is the long-run equilibrium in the neoclassical growth model without technological change? Eventually, the capital-labor ratio will stop rising. *In the long run, the economy will enter a steady state in which capital deepening ceases, real wages stop growing, and capital returns and real interest rates are constant.*

We can show how the economy moves toward the steady state in Figure 25-3. As capital continues to accumulate, the capital-labor ratio increases as shown by the arrows from E' to E'' to E''' until finally the capital-labor ratio stops growing at V . At that point, output per worker (Q/L) is constant, and real wages stop growing.

Without technological change, output per worker and the wage rate stagnate. This is certainly a far better outcome than the world of subsistence wages predicted by Malthus. But the long-run equilibrium of the neoclassical growth model makes it clear that if economic growth consists only of accumulating capital through replicating factories with existing methods of production, then the standard of living will eventually stop rising.

The Central Role of Technological Change

While the capital-accumulation model is a first step on the road to understanding economic growth, it leaves some major questions unanswered. To begin with, the model predicts that real wages will eventually stagnate if there is no improvement in technology. However, real wages have definitely not stagnated over the last century. Peek ahead at Figure 25-5(c) on page 513. This figure shows that real wages have grown by a factor of more than 8 over the last century. The simple capital-accumulation model cannot explain the tremendous growth in productivity over time, nor does it account for the tremendous differences in per capita income among countries.

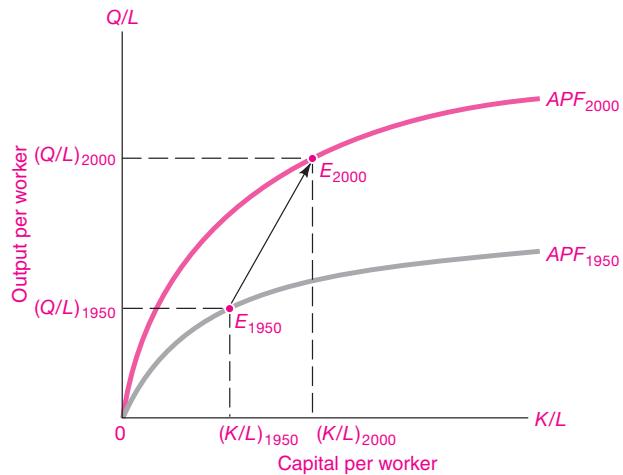


FIGURE 25-4. Technological Advance Shifts Up the Production Function

As a result of improvements in technology, the aggregate production function shifts *upward over time*. Hence improvements in technology combine with capital deepening to raise output per worker and real wages.

What is missing is technological change. We can depict technological change in our growth diagram as an upward shift in the aggregate production function, as illustrated in Figure 25-4. In this diagram, we show the aggregate production function for both 1950 and 2000. Because of technological change, the aggregate production function has shifted upward from APF_{1950} to APF_{2000} . This upward shift shows the advances in productivity that are generated by the vast array of new processes and products like electronics, Internet commerce, advances in metallurgy, improved medical technologies, and so forth.

Therefore, in addition to considering the capital deepening described above, we must also take into account advances in technology. The sum of capital deepening and technological change is the arrow in Figure 25-4, which indicates an increase in output per worker from $(Q/L)_{1950}$ to $(Q/L)_{2000}$. Instead of settling into a steady state, the economy enjoys rising output per worker, rising wages, and increasing living standards.

Of particular interest is the impact of changing technologies on rates of profit and real interest

rates. As a result of technological progress, the real interest rate need not fall. Invention increases the productivity of capital and offsets the tendency for a falling rate of profit.

Technological Change as an Economic Output

Up to now we have treated technological change as something that floats mysteriously down from scientists and inventors like manna from heaven. Recent research on economic growth has begun to focus on the *sources of technological change*. This research, sometimes called *new growth theory* or the “theory of endogenous technological change,” seeks to uncover the processes by which private market forces, public policy decisions, and alternative institutions lead to different patterns of technological change.

One important point is that technological change is an output of the economic system. Edison’s lightbulb was the result of years of research into different lightbulb designs; the transistor resulted from the efforts of scientists in Bell Labs to find a process that would improve telephone switching devices; pharmaceutical companies spend hundreds of millions of dollars developing and testing new drugs. Those who are talented and lucky may earn supernormal profits, or even become billionaires like Bill Gates of Microsoft, but many are the disappointed inventors or companies that end up with empty pockets.

The other unusual feature of technologies is that they are public goods, or “nonrival” goods in technical language. This means that they can be used by many people at the same time without being used up. A new computer language, a new miracle drug, a design for a new steelmaking process—I can use each of these without reducing its productivity for you and the British and the Japanese and everyone else. In addition, inventions are expensive to produce but inexpensive to reproduce. These features of technological change can produce severe market failures, which means that inventors sometimes have great difficulty profiting from their inventions because other people can copy them.

The market failures are largest for the most basic and fundamental forms of research. Public policy has an important role to play here. First, governments generally support basic science through government grants and research facilities. Without government and not-for-profit support, basic

research in mathematics, the natural sciences, and the social sciences would wither away. Additionally, governments must be careful to ensure that profit-oriented inventors have adequate incentives to engage in research and development. Governments increasingly pay attention to *intellectual property rights*, such as patents and copyrights, to provide adequate market rewards for creative activities.

What is the major contribution of new growth theory? It has changed the way we think about the growth process and public policies. If technological differences are the major reason for differences in living standards among nations, and if technology is a produced factor, then economic-growth policy should focus much more sharply on how nations can improve their technological performance. This is just the lesson drawn by Stanford’s Paul Romer, one of the leaders of new growth theory:

Economists can once again make progress toward a complete understanding of the determinants of long-run economic success. Ultimately, this will put us in position to offer policymakers something more insightful than the standard neoclassical prescription—more saving and more schooling. We will be able to rejoin the ongoing policy debates about tax subsidies for private research, antitrust exemptions for research joint ventures, the activities of multinational firms, the effects of government procurement, the feedback between trade policy and innovation, the scope of protection for intellectual property rights, the links between private firms and universities, the mechanisms for selecting the research areas that receive public support, and the costs and benefits of an explicit government-led technology policy.⁵

To summarize:

Technological change—which increases output produced for a given bundle of inputs—is a crucial ingredient in the growth of nations. The new growth theory seeks to uncover the processes which generate technological change. This approach emphasizes that technological change is an output that is subject to severe market failures because technology is a public good that is expensive to produce but cheap to reproduce. Governments increasingly seek to provide strong intellectual property rights for those who develop new technologies.

⁵ See Paul Romer in this chapter’s Further Reading section.

B. THE PATTERNS OF GROWTH IN THE UNITED STATES

The Facts of Economic Growth

The first part of this chapter described the basic theories of economic growth. But economists have not been content to rest with theory. A major research area all around the world has been measuring the different components of the economic-growth process and applying them to the important theories. An understanding of the patterns of economic growth will help sort out the reasons that some nations prosper while others decline.

Figure 25-5 depicts the key trends of economic development for the United States since the start of the twentieth century. Similar patterns have been found in most of the major industrial countries.

Figure 25-5(a) shows the trends in real GDP, the capital stock, and population. Population and employment have more than tripled since 1900. At the same time, the stock of physical capital has risen by a factor of 14. Thus, the amount of capital per worker (the K/L ratio) has increased by a factor of more than 4. Clearly, capital deepening has been an important feature of twentieth- and early-twenty-first-century American capitalism.

What about the growth in output? In a world without technological change, output growth would be somewhere between labor growth and capital growth. In fact, the output curve in Figure 25-5(a) is not in between the two factor curves, but actually lies above both curves. This indicates that technological progress must have increased the productivity of capital and labor.

For most people, an economy's performance is measured by their wages, salaries, and fringe benefits. This is shown in Figure 25-5(c) in terms of real hourly compensation (or wages and fringe benefits corrected for inflation). Hourly earnings have grown impressively for most of the post-1900 period, as we would expect from the growth in the capital-labor ratio and from steady technological advance.

The real interest rate (which is calculated as the interest rate on long-term Treasury securities corrected for inflation) is shown in Figure 25-5(d). The rate of profit on capital is larger than this risk-free

interest rate to reflect risk and taxes, but it shows a similar pattern. Real interest rates and profit rates fluctuated greatly in business cycles and wars but have displayed no strong upward or downward trend over the whole period. Either by coincidence or because of an economic mechanism inducing this pattern, technological change has largely offset diminishing returns to capital.

Output per worker-hour is the solid blue curve in Figure 25-5(c). As could be expected from the deepening of capital and from technological advance, output per worker has risen steadily.

The fact that wages rise at the same rate as output per worker does not mean that labor has captured all the fruits of productivity advance. Rather, it means that labor has kept about the same *share* of total product, with capital also earning about the same relative share throughout the period. A close look at Figure 25-5(c) shows that real wages have grown at about the same rate as output per worker since 1900. More precisely, the average growth rate of real wages was 1.8 percent per year, while that of output per worker was 2.2 percent per year. These figures imply that labor's share of national income (and therefore also property's share) was near-constant over the last century.



Seven Basic Trends of Economic Growth

Economists studying the economic history of advanced nations have found that the following trends apply in most countries:

1. The capital stock has grown more rapidly than population and employment, resulting from capital deepening.
2. For most of the period since 1900, there has been a strong upward trend in real average hourly earnings.
3. The share of labor compensation in national income has been remarkably stable over the last century.
4. There were major oscillations in real interest rates and the rate of profit, particularly during business cycles, but there has been no strong upward or downward trend over the post-1900 period.
5. Instead of steadily rising, which would be predicted by the law of diminishing returns with unchanging technology, the capital-output ratio has actually declined since the start of the twentieth century.
6. For most of the period since 1900, the ratios of national saving and of investment to GDP were stable. Since

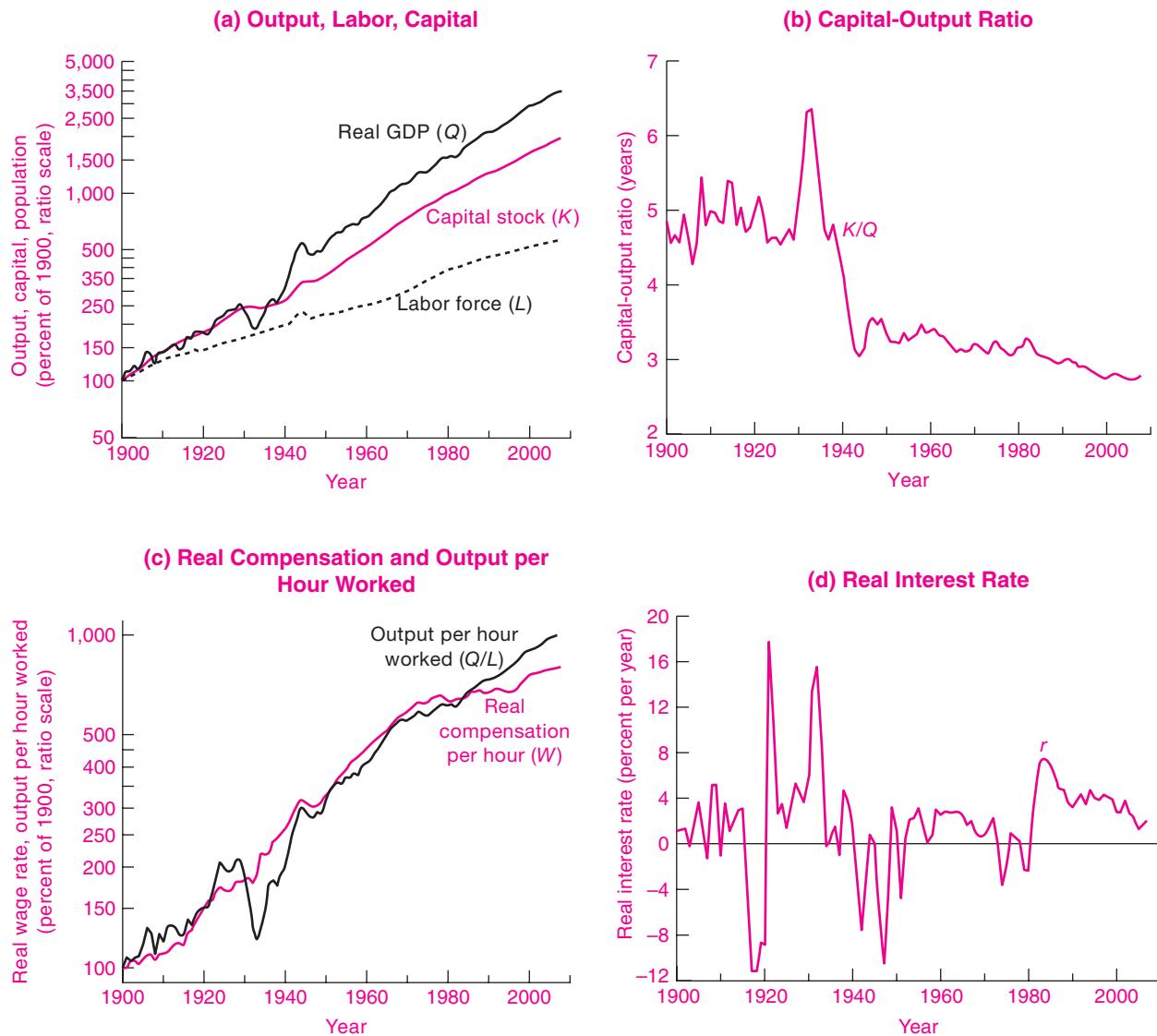


FIGURE 25-5. Economic Growth Displays Striking Regularities

- (a) The capital stock has grown faster than population and labor supply. Nonetheless, total output has grown even more rapidly than capital because of improving technology. (b) The capital-output ratio dropped sharply during the first half of the twentieth century and has declined slowly since then. (c) Real earnings have grown steadily and at almost the same rate as average product per worker-hour over the entire period. (d) The real interest rate has been trendless since 1900, suggesting that technological change has offset diminishing returns to capital accumulation.

Source: U.S. Departments of Commerce and Labor, Federal Reserve Board, U.S. Bureau of the Census, and Susan Carter et al., *Historical Statistics of the United States: Millennial Edition* (Cambridge University Press, Cambridge, U.K., 2006), available online.

1980, the national saving rate has declined sharply in the United States.

7. After effects of the business cycle are removed, national product has grown at an average rate of 3.3 percent per year. Output growth has been much higher than a weighted average of the growth of capital, labor, and resource inputs, suggesting that technological innovation must be playing a key role in economic growth.

Relationship of the Seven Trends to Economic-Growth Theories

While the seven trends of economic history are not like the immutable laws of physics, they do portray fundamental facts about growth in the modern era. How do they fit into our economic-growth theories?

Trends 2 and 1—higher wage rates when capital deepens—fit nicely into our neoclassical growth model shown in Figure 25-3. Trend 3—that the wage share has been remarkably stable—is an interesting coincidence that is consistent with a wide variety of production functions relating Q to L and K .

Trends 4 and 5, however, show us that technological change must be playing a role here, so Figure 25-4, with its picture of advancing technology, is more realistic than the steady state depicted in Figure 25-3. A steady profit rate and a declining, or steady, capital-output ratio cannot hold if the K/L ratio rises in a world with unchanging technology; taken together, they contradict the basic law of diminishing returns under deepening of capital. We must therefore recognize the key role of technological progress in explaining the seven trends of modern economic growth. Our models confirm what our intuition suggests.

The Sources of Economic Growth

We have seen that advanced market economies grow through increases in labor and capital and by technological change as well. But what are the relative contributions of labor, capital, and technology? To answer this question, we turn to an analysis of the quantitative aspects of growth and of the useful approach known as growth accounting. This approach is the first step in the quantitative analysis of economic growth for any country.

The Growth-Accounting Approach. Detailed studies of economic growth rely on what is called **growth**

accounting. This technique is not a balance sheet or national product account of the kind we met in earlier chapters. Rather, it is a way of separating out the contributions of the different ingredients driving observed growth trends.

Growth accounting usually begins with the aggregate production function we met earlier in this chapter, $Q = AF(K, L, R)$. Often resources are omitted because land is constant. Using elementary calculus and some simplifying assumptions, we can express the growth of output in terms of the growth of the inputs plus the contribution of technological change. Growth in output (Q) can be decomposed into three separate terms: growth in labor (L) times its weight, growth in capital (K) times its weight, and technological change itself (T.C.).

Momentarily ignoring technological change, an assumption of constant returns to scale means that a 1 percent growth in L together with a 1 percent growth in K will lead to a 1 percent growth in output. But suppose L grows at 1 percent and K at 5 percent. It is tempting, but wrong, to guess that Q will then grow at 3 percent, the simple average of 1 and 5. Why is this wrong? Because the two factors do not necessarily contribute equally to output. Rather, the fact that three-fourths of national income goes to labor while only one-fourth goes to capital suggests that labor growth will contribute more to output than will capital growth.

If labor's growth rate gets 3 times the weight of capital's growth, we can calculate the answer as follows: Q will grow at 2 percent per year (= $\frac{3}{4}$ of 1 percent + $\frac{1}{4}$ of 5 percent). To growth of inputs, we add technological change and thereby obtain all the sources of growth.

Hence, output growth per year follows the *fundamental equation of growth accounting*:

$$\begin{aligned} \% Q_{\text{growth}} &= \frac{3}{4} (\% L_{\text{growth}}) + \frac{1}{4} (\% K_{\text{growth}}) + \text{T.C.} \end{aligned} \quad (1)$$

where “T.C.” represents technological change (or total factor productivity) that raises productivity and where $\frac{3}{4}$ and $\frac{1}{4}$ are the relative contributions of each input to economic growth. Under conditions of perfect competition, these fractions are equal to the shares of national income of the two factors; naturally, these fractions would be replaced by new fractions if the relative shares of the factors were to change or if other factors were added.

To explain per capita growth, we can eliminate L as a separate growth source. Now, using the fact that capital gets one-fourth of output, we have from equation (1)

$$\begin{aligned}\% \frac{Q}{L} \text{ growth} &= \% Q \text{ growth} - \% L \text{ growth} \\ &= \frac{1}{4} (\% \frac{K}{L} \text{ growth}) + \text{T.C.}\end{aligned}\quad (2)$$

This relation shows clearly how capital deepening would affect per capita output if technological advance were zero. Output per worker would grow only one-fourth as fast as capital per worker, reflecting diminishing returns.

One final point remains: We can measure Q growth, K growth, and L growth, as well as the shares of K and L . But how can we measure T.C. (technological change)? We cannot. Rather, we must *infer* T.C. as the residual or leftover after the other components of output and inputs are calculated. We can therefore calculate technological change (or total factor productivity) by rearranging the terms in equation (1) as follows:

$$\begin{aligned}\text{T.C.} &= \% Q \text{ growth} - \frac{1}{4} (\% L \text{ growth}) \\ &\quad - \frac{1}{4} (\% K \text{ growth})\end{aligned}\quad (3)$$

This equation allows us to answer critically important questions about economic growth. What part of per capita output growth is due to capital deepening,

and what part is due to technological advance? Does society progress chiefly by dint of thrift and the forgoing of current consumption? Or is our rising living standard the reward for the ingenuity of inventors and the daring of innovator-entrepreneurs?

Numerical Example. To determine the contributions of labor, capital, and other factors to output growth, we substitute representative numbers for the period 1900–2008 into equation (2) for the growth of Q/L . Since 1900, hours worked have grown 1.4 percent per year, and K has grown 2.6 percent per year, while Q has grown 3.3 percent per year. Thus, by arithmetic, we find that

$$\% \frac{Q}{L} \text{ growth} = \frac{1}{4} (\% \frac{K}{L} \text{ growth}) + \text{T.C.}$$

becomes

$$1.9 = \frac{1}{4} (1.2) + \text{T.C.} = 0.3 + 1.6$$

Thus of the 1.9 percent-per-year increase in output per hour worked, about 0.3 percentage point is due to capital deepening, while the largest portion, 1.6 percent per year, stems from T.C. (technological change).

Detailed Studies. More thorough studies refine the simple calculation but show quite similar conclusions. Table 25-3 presents the results of studies by

Contribution of Different Elements to Growth in Real GDP, United States, 1948–2007		
	In percent per year	As percent of total
Real GDP growth (private business sector)	3.52	100
Sources of growth:		
Contribution of inputs	2.14	61
Capital	1.21	34
Labor	0.94	27
Total factor productivity growth (research and development, education, advances in knowledge, and other sources)	1.39	39

TABLE 25-3. Advances in Knowledge Outweigh Capital in Contributing to Economic Growth

Using the techniques of growth accounting, studies break down the growth of GDP in the private business sector into contributing factors. Recent comprehensive studies find that capital growth accounted for 34 percent of output growth. Education, research and development, and other advances in knowledge made up 39 percent of total output growth and more than half of the growth of output per unit of labor.

Source: U.S. Department of Labor, "Historical Multifactor Productivity Measures (SIC 1948–87 Linked to NAICS 1987–2007)," at www.bls.gov/mfp/home.htm.

the Department of Labor for the 1948–2007 period. During this time, output (measured as gross output of the private business sector) grew at an average rate of 3.5 percent per year, while input growth (of capital, labor, and land) contributed 2.1 percentage points per year. Hence **total factor productivity**—the growth of output less the growth of the weighted sum of all inputs, or what we have called T.C.—averaged 1.4 percent annually.

About 60 percent of the growth in output in the United States can be accounted for by the growth in labor and capital. The remaining 40 percent is a residual factor that can be attributed to education, research and development, innovation, economies of scale, advances in knowledge, and other factors.

Other countries show different patterns of growth. For example, scholars have used growth accounting to study the Soviet Union, which grew rapidly during the period from 1930 until the mid-1960s. It appears, however, that the high growth rate came primarily from forced-draft increases in capital and labor inputs. For the last few years of the U.S.S.R.'s

existence, productivity actually *declined* as the central-planning apparatus became more dysfunctional, as corruption deepened, and as incentives worsened. The estimated growth of total factor productivity for the Soviet Union over the half-century before its collapse was slower than that for the United States and other major market economies. Only the ability of the central government to divert output into investment (and away from consumption) offset the system's inefficiency.

RECENT TRENDS IN PRODUCTIVITY

A careful look at productivity trends indicates that there are sharp movements from year to year as well as long swings. The growth of labor productivity is shown in Figure 25-6. Productivity grew briskly from World War II until the late 1960s.

Then, beginning around 1973, there were several years of poor performance, and even decline. Surveys of this period indicate that the poor productivity record stemmed from the sharp increases in

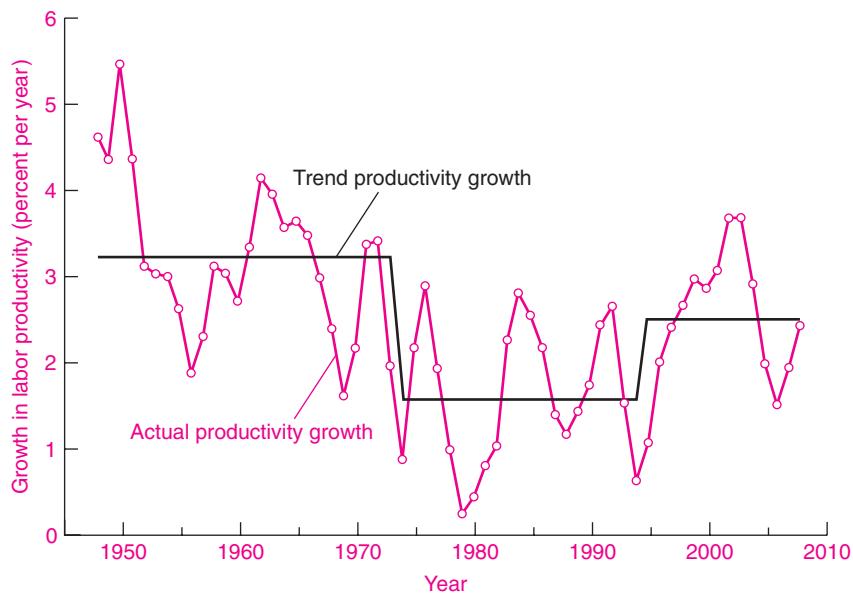


FIGURE 25-6. Labor Productivity Growth in U.S. Business, 1948–2008

Labor productivity grew rapidly until the troubled 1970s and then declined. Bolstered by impressive gains in information technology, especially computers, productivity growth has rebounded over the last decade.

Source: Bureau of Labor Statistics. Data were downloaded from the St. Louis Fed database at research.stlouisfed.org/fred2.

Productivity and Real Wages		
Period	Average Annual Percentage Growth in:	
	Labor productivity	Real wages
1948–1973	3.1	3.3
1973–1995	1.3	1.5
1995–2008	2.6	2.6

TABLE 25-4. Real Wages Mirror Productivity Growth

Over the long run, real wages tend to move with trends in labor productivity. After the productivity slowdown in 1973, real wage growth slowed sharply.

Source: U.S. Department of Labor. Productivity is for the U.S. business sector; nominal compensation is deflated using the price index for private business.

oil prices, increasing stringency of regulations, and impacts of price and wage controls and pervasive regulation of the energy industries, as well as a slowdown in research and development spending.

Economists worry about productivity because of its close association with growth in real wages and living standards. Figure 25-5(c) showed how growth in real wages has tracked productivity per hour worked since 1900. This point is presented quantitatively in Table 25-4. Some elementary arithmetic shows that if labor's share of national income is constant, this implies that real wages will grow at the rate of growth of labor productivity.⁶

The Productivity Rebound

Economists have been waiting for an upturn in productivity growth, hoping that the revolution in information technology would spur rapid growth throughout the economy. Indeed, innovations in information technology (computer hardware, software, and communications) have produced astonishing improvements in every corner of the economy.

⁶ To see this relationship, write labor's share as $W \times L = s \times P \times Q$, where s = labor's share, W = money wage rate, L = hours of work, P = price index, and Q = output. Dividing both sides by L and P yields $(W/P) = s \times (Q/L)$, which signifies that the real wage equals labor's share times labor productivity. Hence, if the share of labor of national income is constant, real wages will grow at the same rate as labor productivity.

The prices of computers have fallen more than a thousandfold in the last three decades. Electronic mail and the Internet are changing the face of retailing. Computers are the nerve system of business—running airline pricing and reservation systems, scanning price and quantity data in stores, dispatching electricity, clearing checks, dunning taxpayers, and sending students their tuition bills. Some economists think that computers are like a new fourth factor of production.

The impact of the computer revolution became apparent in the productivity statistics beginning around 1995. Having grown slowly during the 1973–1995 period, labor productivity then surged ahead at 2.6 percent per year from 1995 to 2008.

As is predicted by the model with constant income shares, real compensation moved in parallel with labor productivity (see Table 25-4). Real wages grew at an average rate of 3.3 percent from 1948 to 1973, slowed to 1.5 percent per year from 1973 to 1995, and then increased sharply to 2.6 percent from 1995 to 2008.

Enthusiasts spoke of a “new era” and a “brave new world of American capitalism.” Fed chair Alan Greenspan, known for his Delphic pronouncements, joined the technological enthusiasts, arguing, “A perceptible quickening in the pace at which technological innovations are applied argues for the hypothesis that the recent acceleration in labor productivity is not just a cyclical phenomenon or a statistical aberration, but reflects, at least in part, a more deep-seated, still developing, shift in our economic landscape.”

Economists who have looked at the numbers under a statistical microscope have uncovered some interesting facts about the productivity rebound. Among the important factors are the following:

- *Productivity explosion in computers.* The productivity explosion (and consequent price decline) in computers has been extraordinary. Economists who have studied computer technology estimate that the growth of productivity in this sector has been between 20 and 30 percent per year. This became economically important as computers penetrated ever deeper into the U.S. economy. By the late 1990s, production of information technology was contributing almost half of all productivity growth, although that slowed sharply after the bursting of the technology bubble in 2000.

- *Capital deepening.* There has been a very sharp increase in investment since 1995. Companies invested heavily in computers and software to take advantage of their falling prices and the increasing power of new software.
- *Unmeasured outputs.* Many of the advances of the new economy have not been captured by the productivity statistics. The phenomenal advances of the Internet, e-mail, and cellular phones are largely missed in the productivity statistics. Some economists have found that productivity is significantly underestimated for software and communications equipment (see the discussion of price measurement in Chapter 20). Or consider, the time that consumers save by shopping on the Internet, the saving of time and postage involved in the switch from snail-mail to e-mail, and the convenience of

cellular telephones—none of these shows up in measured productivity. Others think the true gains from computers lie in the future. Stanford economic historian Paul David, who has studied past inventions, believes that it takes decades for the economy to reap the full benefits of fundamental inventions.

Whether or not the more rapid productivity growth is a permanent feature of our economy, it is clear that computers continue to shape our economy and our lives in surprising ways.

This concludes our introduction to the principles of economic growth. The next chapter applies these principles to the struggle of poor countries to improve their living standards. In the remaining chapters in this part, we open our inquiry to international trade and finance.



SUMMARY

A. Theories of Economic Growth

1. The analysis of economic growth examines the factors that lead to the growth of potential output over the long run. The growth in output per capita is an important objective of government because it is associated with rising average real incomes and living standards.
2. Reviewing the experience of nations over space and time, we see that the economy rides on the four wheels of economic growth: (a) the quantity and quality of its labor force; (b) the abundance of its land and other natural resources; (c) the stock of accumulated capital; and, perhaps most important, (d) the technological change and innovation that allow greater output to be produced with the same inputs. There is no unique combination of these four ingredients, however; the United States, Europe, and Asian countries have followed different paths to economic success.
3. The classical models of Smith and Malthus describe economic development in terms of land and population. In the absence of technological change, increasing population ultimately exhausts the supply of free land. The resulting increase in population density triggers the law of diminishing returns, so growth produces higher land rents with lower competitive wages. The Malthusian equilibrium is attained when the wage rate has fallen to the subsistence level, below which population cannot sustain itself. In reality, however,
4. Capital accumulation with complementary labor forms the core of modern growth theory in the neoclassical growth model. This approach uses a tool known as the aggregate production function, which relates inputs and technology to total potential GDP. In the absence of technological change and innovation, an increase in capital per worker (capital deepening) would not be matched by a proportional increase in output per worker because of diminishing returns to capital. Hence, capital deepening would lower the rate of return on capital (equal to the real interest rate under risk-free competition) while raising real wages.
5. Technological change increases the output producible with a given bundle of inputs. This pushes upward the aggregate production function, making more output available with the same inputs of labor and capital. Recent analysis in the “new growth theory” seeks to uncover the processes which generate technological change. This approach emphasizes (a) that technological change is an output of the economic system, (b) that technology is a public or nonrival good that can be used simultaneously by many people, and (c) that new inventions are expensive to produce but

inexpensive to reproduce. These features mean that governments must pay careful attention to ensuring that inventors have adequate incentives, through strong intellectual property rights, to engage in research and development.

B. The Patterns of Growth in the United States

6. Numerous trends of economic growth are seen in data for the twentieth and early twenty-first centuries. Among the key findings are that real wages and output per hour worked have risen steadily; that the real interest rate has shown no major trend; and that the capital-output ratio has declined. The major trends are consistent with the neoclassical growth model augmented by technological advance. Thus economic theory confirms what economic history tells us—that

technological advance increases the productivity of inputs and improves wages and living standards.

7. The last trend, continual growth in potential output since 1900, raises the important question of the sources of economic growth. Applying quantitative techniques, economists have used growth accounting to determine that “residual” sources—such as technological change and education—outweigh capital deepening in their impact on GDP growth and labor productivity.
8. After 1970, productivity growth slowed under the weight of energy-price increases, increasing environmental regulation, and other structural changes. In the late 1990s, however, the explosion of productivity and the investment in computers and other information technologies have led to a sharp upturn in measured productivity growth.

CONCEPTS FOR REVIEW

four wheels of growth:

labor
resources
capital
technology

aggregate production function
Smith's golden age

capital-labor ratio

Malthus's subsistence wage
neoclassical growth model
 K/L rise as capital deepens
new growth theory
technology as a produced good
seven trends of economic growth

growth accounting:

$$\begin{aligned} \% Q \text{ growth} &= \frac{3}{4} (\% L \text{ growth}) \\ &\quad + 1/4 (\% K \text{ growth}) \\ &\quad + \text{T.C.} \\ \% Q/L \text{ growth} &= \frac{1}{4} (\% K/L \text{ growth}) + \text{T.C.} \end{aligned}$$

FURTHER READING AND INTERNET WEBSITES

Further Reading

One of the best surveys of economic growth is Robert Solow, *Economic Growth* (Oxford University Press, Oxford, U.K., 1970). See his pathbreaking article, “A Contribution to the Theory of Economic Growth,” *Quarterly Journal of Economics*, 1956. The text reference is William Baumol, “Entrepreneurship: Productive, Unproductive, and Destructive,” *Journal of Political Economy*, October 1990, pp. 893–921.

You may want to read some excellent books on economic growth. David N. Weil, *Economic Growth* (Pearson, Addison-Wesley, New York, 2006) is an advanced survey of the subject. David Warsh is an excellent economic journalist; his *Knowledge and the Wealth of Nations* (Norton, New York, 2006) explores the origins of the new growth theory.

Benjamin Friedman, *The Moral Consequences of Economic Growth* (Knopf, New York, 2006) explores the moral and historical dimensions of economic growth, with some surprising conclusions.

Websites

A website devoted to economic growth is maintained by Jonathan Temple of Oxford, www.bristol.ac.uk/Depts/Economics/Growth/, and contains many references and links, as well as access to growth data. The articles by Solow and Baumol are available at www.jstor.org.

Technological change is often associated with particular inventions. The lives and patents of great inventors can be found at www.invent.org/hall_of_fame/1_0_0_hall_of_fame.asp.

QUESTIONS FOR DISCUSSION

- 1. Reminder on compound growth:** Like financial economics, economic growth theory and measurement rely on calculations of growth rates. The one-period growth rate in percent per year is

$$g_t = 100 \times \left(\frac{x_t}{x_{t-1}} - 1 \right)$$

Similarly, the n -period growth rate in percent per year is calculated as

$$g_t^{(n)} = 100 \times \left[\left(\frac{x_t}{x_{t-n}} \right)^{1/n} - 1 \right]$$

- a. Now look back to the table of macroeconomic data in the Appendix to Chapter 19. Calculate the annual growth rate of real GDP for 1980–1981 and 1980–1982.
- b. Next, calculate the growth of labor productivity from 1995 to 2000, assuming the following shows indexes of real output and labor inputs.

Year	Labor inputs	Output
1995	100.00	100.00
2000	110.29	126.16

- 2. “If the government strengthens intellectual property rights, subsidizes basic science, and controls business cycles, we will see economic growth that would astound the classical economists.” Explain what the writer meant by this statement.
- 3. “With zero population growth and no technological change, persistent capital accumulation would ultimately destroy the capitalist class.” Explain why such a scenario might lead to a zero real interest rate and to a disappearance of profits.
- 4. Recall the growth-accounting equation [equation (1) on page 514]. Calculate the growth of output if labor grows at 1 percent per year, capital grows at 4 percent per year, and technological change is $1\frac{1}{2}$ percent per year.

How would your answer change if:

- a. Labor growth slowed to 0 percent per year?
- b. Capital growth increased to 5 percent per year?
- c. Labor and capital had equal shares in GDP?

Also, calculate for each of these conditions the rate of growth of output per hour worked.

- 5. Use the *PPF* to illustrate the Malthusian prediction and why it is flawed. Put per capita food production on one axis and per capita manufactures on the other. Assume that there are diminishing returns to labor in food production but that manufactures have constant returns to labor.
- 6. **Advanced problem for those who know calculus:** Those who understand calculus can easily grasp the essentials of the growth-accounting framework of this chapter. We rely for this problem on the important Cobb-Douglas production function. This is a specific algebraic formula that is written as $Q_t = A_t K_t^\alpha L_t^{(1-\alpha)}$. It is widely used in empirical studies.

- a. Show that the growth rate of output is given by

$$g(Q_t) = g(A_t) + \alpha g(K_t) + (1 - \alpha) g(L_t)$$

where $g(x_t)$ is the growth rate of that variable.

- b. Advanced courses will show that under perfect competition, α = the share of capital in national income and $(1 - \alpha)$ = labor’s share. If the share of labor in national income is 75 percent, derive the growth-accounting equation in the text.

- 7. **Advanced problem:** Many fear that computers will do to humans what tractors and cars did to horses—the horse population declined precipitously early in this century after technological change made horses obsolete. If we treat computers as a particularly productive kind of K , what would their introduction do to the capital-labor ratio in Figure 25-3? Can total output go down with a fixed labor force? Under what conditions would the real wage decline? Can you see why the horse analogy might not apply?

The Challenge of Economic Development

26



I believe in materialism. I believe in all the proceeds of a healthy materialism—good cooking, dry houses, dry feet, sewers, drain pipes, hot water, baths, electric lights, automobiles, good roads, bright streets, long vacations away from the village pump, new ideas, fast horses, swift conversation, theaters, operas, orchestras, bands—I believe in them all for everybody. The man who dies without knowing these things may be as exquisite as a saint, and as rich as a poet; but it is in spite of, not because of, his deprivation.

Francis Hackett

Planet Earth today contains people at vastly different living standards. At one end are the affluent of North America and Western Europe, where the richest 1 percent of the people enjoy about 20 percent of world income and consumption. At the other extreme are the destitute of Africa and Asia—1 billion people living in absolute poverty, with few comforts, seldom knowing where the next meal will come from.

What causes the great differences in the wealth of nations? Can the world peacefully survive with such poverty in the midst of plenty? What steps can poorer nations take to improve their living standards? What are the responsibilities of affluent countries?

These questions concerning the obstacles facing developing countries are among the greatest challenges facing modern economics. It is here that the tools of economics can make the greatest difference in people's daily lives. It is here that economics can literally make the difference between life and death. We

begin with an analysis of population and then describe the characteristics of developing countries. The second part of this chapter examines alternative approaches to economic growth in developing countries, particularly the more successful models in Asia along with the failed communist experiment in Russia.

A. POPULATION GROWTH AND DEVELOPMENT

MALTHUS AND THE DISMAL SCIENCE

Can technology keep pace with population growth in poor countries? Is Africa doomed to live on the ragged edge of subsistence because of its high birth rate and the burden of diseases like AIDS? These

questions have been a prominent part of economics for almost two centuries.

Economic analysis of population dates back to the Reverend T. R. Malthus, whom we met in the context of the analysis of economic growth in the last chapter. Malthus developed his views while arguing against his father's perfectionist opinion that the human race was always improving. Finally, the son became so agitated that he wrote *An Essay on the Principle of Population* (1798), which was a best-seller and has since influenced the thinking of people all over the world about population and economic growth.

Malthus began with the observation of Benjamin Franklin that in the American colonies, where resources were abundant, population tended to double every 25 years or so. He then postulated a universal tendency for population—unless checked by limited food supply—to grow exponentially, or by a geometric progression. Eventually, a population which doubles every generation—1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, . . .—becomes so large that there is not enough space in the world for all the people to stand.

After invoking exponential growth, Malthus had one further argument. At this point he unleashed the devil of diminishing returns. He argued that, because land is fixed, the supply of food would tend to grow only at an arithmetic progression. It could not keep pace with the exponential growth (or geometric progression) of labor. (Compare 1, 2, 3, 4, . . ., with 1, 2, 4, 8, . . .). We paraphrase Malthus's gloomy conclusions as follows:

As population doubles and redoubles, it is as if the globe were halving and halving again in size—until finally it has shrunk so much that food production is below the level necessary to support the population.

When the law of diminishing returns is applied to a fixed supply of land, food production tends not to keep up with a population's geometric-progression rate of growth.

Actually, Malthus did not say that population would necessarily increase at a geometric rate. This was only its tendency if unchecked. He described the checks that operate, in all times and places, to hold population down. In his first edition, he stressed the “positive” checks that increase the death rate: pestilence, famine, and war. Later, he held out hope that population growth could be slowed by “moral restraint” such as abstinence and postponed marriages.

This important application of diminishing returns illustrates the profound effects that a simple theory can have. Malthus's ideas had wide repercussions. His book was used to support a stern revision of the English poor laws. Under the influence of Malthus's writings, people argued that poverty should be made as uncomfortable as possible. In this view, the government cannot improve the welfare of the poor population because any increase in the incomes of the poor would only cause workers to reproduce until all were reduced to a bare subsistence.



Compound Interest and Exponential Growth

Let us pause for a reminder on exponential growth and compound interest, which are important tools in economics. Exponential (or geometric) growth occurs when a variable increases at a constant proportional rate from period to period. Thus, if a population of 200 is growing at 3 percent per year, it would equal 200 in year 0, 200×1.03 in year 1, $200 \times 1.03 \times 1.03$ in year 2, . . ., $200 \times (1.03)^{10}$ in year 10, and so on.

When money is invested continuously, it earns compound interest, meaning that interest is earned on past interest. Money earning compound interest grows geometrically. An intriguing calculation is to determine how much the \$26 received by the Indians for Manhattan Island would, if deposited at compound interest, be worth today. Say that this fund was placed in an endowment that earned 6 percent each year from 1626. It would be worth \$136 billion in 2010.

A useful rule about compound interest is the **rule of 70**, which states that a magnitude growing at a rate of g percent per year will double in $(70/g)$ years. For example, a human population growing at 2 percent per year will double in 35 years, whereas if you invest your funds at 7 percent per year, the funds will double in value every 10 years.

Flawed Prophecies of Malthus. Despite Malthus's careful statistical studies, demographers today think that his views were oversimplified. In his discussion of diminishing returns, Malthus did not anticipate the technological miracle of the Industrial Revolution; nor did he understand that the birth-control movement and new technologies would provide families with the capability to reduce the birth rate. In fact, population growth in most Western nations began to

decline after 1870 just as living standards and real wages grew most rapidly.

In the century following Malthus, technological advance shifted out the production-possibility frontiers of countries in Europe and North America. Technological change outpaced population, resulting in a rapid rise in real wages. Nevertheless, the germs of truth in Malthus's doctrines are still important for understanding population trends in some poor countries where the race between population and food supply continues today.

Population Implosion? Before we turn to issues facing poor countries, it is important to recognize that the problem facing many rich countries is *declining population growth*, not population explosion. Virtually every rich country in the world today has zero or negative native population growth, meaning that the average number of adult children per woman is 2 or less. Population in most advanced countries is today growing only because of immigration. Stable or declining population with increasing life expectancy puts great stress on countries' fiscal conditions because of the need to fund health care and public pensions.

Limits to Growth and Neo-Malthusianism

Often, earlier ideas reemerge in light of new social trends or scientific findings. Again and again, neo-Malthusian ideas have surfaced as many antigrowth advocates and environmentalists argue that economic growth is limited due to the finiteness of our natural resources and because of environmental constraints.

Worries about the viability of growth emerged prominently in the early 1970s with a series of studies by an ominous-sounding group called the "Club of Rome." The analysis of this school appeared in a famous computer study called *The Limits to Growth* and its 1992 sequel *Beyond the Limits*. The predictions of the neo-Malthusians were even more dismal than those of Malthus himself:

If present growth trends in world population, industrialization, pollution, food problems, and resource depletion continue unchanged, the limits to growth on this planet will be reached within the next one hundred years. The most probable results will be a rather sudden and uncontrollable decline in both population and industrial capacity.

These growth critics found a receptive audience because of mounting alarm about rapid population growth in developing countries and, in the 1970s, an upward spiral in oil prices and the sharp decline in the growth of productivity. A second wave of growth pessimism emerged over the last decade because of concerns about environmental constraints on long-term economic growth. Among today's concerns are global warming, in which the use of fossil fuels is warming the climate; widespread evidence of acid rain; the appearance of the Antarctic "ozone hole," along with ozone depletion in temperate regions; deforestation, especially of the tropical rain forests, which may upset the global ecological balance; soil erosion, which threatens the long-term viability of agriculture; ocean acidification from increased atmospheric carbon dioxide; and species extinction, which threatens many ecosystems and precious biological resources.

The economic analysis underlying the neo-Malthusian analysis is closely related to the Malthusian theory. Whereas Malthus held that production would be limited by diminishing returns in food production, today's growth pessimists argue that growth will be limited by the absorptive capacity of our environment. We can, some say, burn only a finite amount of fossil fuel before we face the threat of dangerous climate change. The need to reduce the use of fossil fuels might well slow our long-term economic growth.

There is a key difference, however. The earlier analysis related to *market commodities* such as land, food, and oil. Many of today's concerns relate to *externalities* and *public goods*, where unregulated market prices provide distorted signals.

What is the empirical evidence on the effects of resource exhaustion and environmental limits on economic growth? The facts are that the prices of most basic commodities such as grains, energy, and timber have risen *more slowly* than the general price level. However, many economists are concerned about externalities, particularly global public goods such as global warming. Nations have not found it easy to negotiate cooperative agreements to slow global warming. We can look to the troubled history of nuclear proliferation as another example where global cooperation has been difficult to achieve. The future of the global economy may depend upon finding solutions to these new Malthusian dilemmas.

B. ECONOMIC GROWTH IN POOR COUNTRIES

ASPECTS OF A DEVELOPING COUNTRY

Exactly what is a **developing country**? The most important characteristic of a developing country is that it has low per capita income. In addition, people in developing countries usually have poor health, low levels of literacy, extensive malnutrition, and little capital to work with. Many poor countries have weak market and government institutions, corruption, and civil strife. These countries often have high native population growth, but they also suffer from out-migration, particularly among skilled workers.

Table 26-1 is a key source of data for understanding the major players in the world economy, as well as important indicators of underdevelopment. Low- and middle-income countries are grouped into six major regions.

A number of interesting features emerge from the table. Clearly, low-income countries are much poorer than advanced countries like the United States. People in the poorest countries earn only about one-twentieth as much as people in high-income countries. For the table's data, *purchasing-power-parity* (PPP) calculations were used to measure incomes. Market exchange rates tend to underestimate the incomes of low-wage countries. (The use of purchasing-power-parity exchange rates to evaluate living standards is discussed in Chapter 27.) Note also that the early 2000s were a period of strong

Region	Population		Life expectancy at birth (years)	Per capita GDP		Education	Net Migration
	Total number, 2006 (millions)	Growth rate, 2000–2006 (% per year)		2006 (\$)	Growth, 2000–2006 (% per year)		
East Asia and Pacific (China, Indonesia, . . .)	1,900	0.9	71	6,820	7.6	9	-2.0
Eastern Europe and Central Asia (Russia, Poland, . . .)	460	0.0	69	9,660	5.7	2	-0.4
Latin America and Caribbean (Brazil, Mexico, . . .)	556	1.3	73	8,800	1.8	10	-1.2
Middle East and North Africa (Egypt, Iran, . . .)	311	1.8	70	6,450	2.3	27	-0.9
South Asia (India, Pakistan, . . .)	1,493	1.7	63	3,440	5.1	42	-0.2
Sub-Saharan Africa (Nigeria, Ethiopia, . . .)	770	2.3	47	2,030	2.3	41	-0.1

TABLE 26-1. Important Indicators for Different Country Groups

The World Bank groups developing countries into six regions. For each, a number of important indicators of economic development are shown. Note that low-income countries tend to have high illiteracy and out-migration. Some low-income countries have life expectancies close to those of rich countries.

Source: World Bank, *World Development Report*, and data at www.worldbank.org.

growth in the world economy, and that spilled over to most poor regions as well.

In addition, many social and health indicators show the effects of poverty on low-income nations. Life expectancy is lower than in high-income countries, and educational attainment and literacy are often minimal.

There is a great diversity among developing countries. Some remain at the ragged edge of starvation—these are the poorest countries like Congo, Ethiopia, and Liberia. Other countries that were in that category two or three decades ago have moved to the rank of middle-income countries. The more successful ones—Slovenia, Singapore, and South Korea—have graduated from the developing group, and the most successful of these have per capita incomes that have reached the ranks of high-income countries. Yesterday's successful developing countries will be tomorrow's high-income countries.



Life in Low-Income Countries

To bring out the contrasts between advanced and developing economies, imagine that you are a typical 21-year-old in a low-income country such as Mali, India, or Bangladesh. You are poor. Even after making allowance for the goods that you produce and consume, your annual income barely averages \$2000. Your counterpart in North America might have more than \$30,000 in average earnings. Perhaps you can find cold comfort in the thought that only 1 person in 4 in the world averages more than \$5000 in annual income.

For each of your fellow citizens who can read, there is one like you who is illiterate. Your life expectancy is four-fifths that of the average person in an advanced country; already, two of your brothers and sisters have died before reaching adulthood. Birth rates are high, particularly for families where women receive no education, but mortality rates are also much higher here than in countries with good health-care systems.

Most people in your country work on farms. Few can be spared from food production to work in factories. You work with but one-sixtieth the horsepower of a prosperous North American worker. You know little about science, but much about your village traditions.

You are often hungry, and the food you eat is mainly roughage or rice. While you were among those who got

some primary schooling, like most of your friends, you did not go on to high school, and only the wealthiest go to a university. You work long hours in the fields without the benefit of machinery. At night, you sleep on a mat. You have little household furniture, perhaps a table and a radio. Your only mode of transportation is an old pair of boots.

Human Development

This review of life in the poorest countries of the world reminds us of the importance of adequate incomes in meeting basic needs as well as the fact that life involves more than market incomes. Thoughtful economists such as Nobel Prize recipient Amartya Sen and Yale's Gustav Ranis emphasize that other factors should be considered in appraising a country's progress: Factors such as health and life expectancy, school enrollment, adult literacy, and independence of women are important goals for developing countries along with increasing per capita market consumption.

Figure 26-1 shows a plot of life expectancy and per capita GDP. The correlation is strong, but there are exceptions to the general positive relationship. Some countries, such as Botswana, Equatorial Guinea, and South Africa, have low life expectancies relative to income because of the scourge of AIDS. No poor countries have high life expectancies, but countries like Greece and Costa Rica have life expectancies as high as or higher than those in the United States because of the poorly designed health-care system in the United States.

THE FOUR ELEMENTS IN DEVELOPMENT

Having seen what it means to be a developing country, we now turn to an analysis of the process by which low-income countries improve their living standards. We saw in Chapter 25 that economic growth in the United States—growth in its potential output—rides on four wheels. These are (1) human resources, (2) natural resources, (3) capital, and (4) technology. These four wheels operate in rich and poor countries, although the mix and strategy for combining them will differ depending on the state of development. Let's see how each of the four wheels operates in developing countries and consider how public policy can steer the growth process in favorable directions.

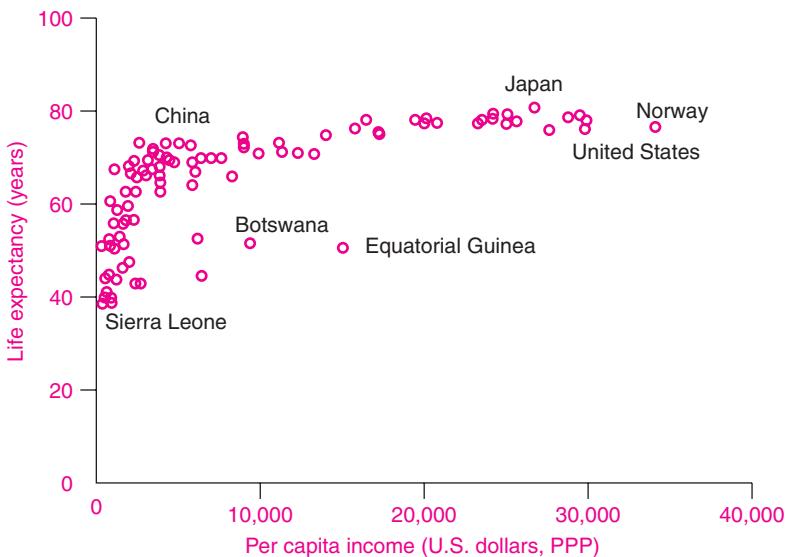


FIGURE 26-1. Life Expectancy and Incomes, 2000

Life expectancies are highly correlated with per capita incomes. Higher incomes allow greater investments in health care, but a healthier population is also more productive. Note that some middle-income African countries have been hard hit by the AIDS epidemic, threatening both health and economic development.

Source: United Nations Development Programme, *Human Development Report*, 2002.

Human Resources

Population Explosion: The Legacy of Malthus. Many poor countries are forever running hard just to stay in place. Even as a poor nation's GDP rises, so does its population. Recall our discussion of the Malthusian population trap, where population grows so rapidly that incomes remain at subsistence levels. While the high-income countries left Malthus behind long ago, Africa is still caught in the Malthusian bind of high birth rates and stagnant incomes. And the population expansion has not stopped—demographers project that the poor countries will add about 1 billion people over the next 25 years.

It's hard for poor countries to overcome poverty with birth rates so high. But there are escape routes from overpopulation. One strategy is to take an active role in curbing population growth, even when such actions run against prevailing religious norms. Many countries have introduced educational campaigns and subsidized birth control.

And for countries which manage to boost their per capita incomes, there is the prospect of making the *demographic transition*, which occurs when a

population stabilizes with low birth rates and low death rates. Once countries get rich enough, and infant mortality drops, people voluntarily reduce their birth rates. When women are educated and emerge from subservience, they usually decide to spend less of their lives in childbearing. Families substitute quality for quantity—devoting time and incomes to a better education for fewer children. Mexico, Korea, and Taiwan have all seen their birth rates drop sharply as their incomes have risen and their populations have received more education.

Slowly, the results of economic development and birth control are being felt. The birth rate in poor countries has declined from 44 per 1000 per year in 1960 to 27 per 1000 in 2005, but that is still far higher than the birth rate of 11 per 1000 in the high-income countries. The struggle against poverty induced by excessive population growth continues.

However, the demographic transition has not been reached in every corner of the world. Fertility continues at a high rate in much of tropical Africa even as the AIDS epidemic rages through the population and lowers life expectancies in a way not experienced

since the great plagues of earlier centuries. The specter of Malthus hangs over much of central Africa.

Human Capital. In addition to dealing with excessive population growth, developing countries must also be concerned with the quality of their human resources. Economic planners in developing countries emphasize the following strategies:

1. *Control disease and improve health and nutrition.* Raising the population's health standards not only makes people happier but also makes them more productive workers. Health-care clinics and provision of safe drinking water are vitally useful social capital.
2. *Improve education, reduce illiteracy, and train workers.* Educated people are more productive workers because they can use capital more effectively, adopt new technologies, and learn from their mistakes. For advanced learning in science, engineering, medicine, and management, countries will benefit by sending their best minds abroad to bring back the newest advances. But countries must beware of the brain drain, in which the most able people get drawn off to high-wage countries.
3. *Above all, do not underestimate the importance of human resources.* Most other factors can be bought in the international marketplace. Most labor is home-grown, although labor can sometimes be augmented through immigration. The crucial role of skilled labor has been shown again and again when sophisticated mining, defense, or manufacturing machinery fell into disrepair and disuse because the labor force of developing countries had not acquired the necessary skills for its operation and maintenance.

Natural Resources

Some poor countries of Africa and Asia have meager endowments of natural resources, and such land and minerals that they do possess must be divided among large populations. Perhaps the most valuable natural resource of developing countries is arable land. Much of the labor force in developing countries is employed in farming. Hence, the productive use of land—with appropriate conservation, fertilizers, and tillage—will go far in increasing a poor nation's output.

Moreover, land ownership patterns are a key to providing farmers with strong incentives to invest in capital and technologies that will increase their

land's yield. When farmers own their own land, they have better incentives to make improvements, such as in irrigation systems, and undertake appropriate conservation practices.

Some economists believe that natural wealth from oil or minerals is not an unalloyed blessing. Countries like the United States, Canada, and Norway have used their natural wealth to form the solid base of industrial expansion. In other countries, the wealth has been subject to plunder and *rent seeking* by corrupt leaders and military cliques. Countries like Nigeria and Congo (formerly Zaire), which are fabulously wealthy in terms of mineral resources, failed to convert their underground assets into productive human or tangible capital because of venal rulers who drained that wealth into their own bank accounts and conspicuous consumption.

Capital

A modern economy requires a vast array of capital. Countries must abstain from current consumption to engage in fruitful roundabout production. But there's the rub, for the poorest countries are near a subsistence standard of living. When you are poor to begin with, reducing current consumption to provide for future consumption seems impossible.

The leaders in the growth race invest at least 20 percent of output in capital formation. By contrast, the poorest agrarian countries are often able to save only 5 percent of national income. Moreover, much of the low level of saving goes to provide the growing population with housing and simple tools. Little is left over for development.

But let's say a country has succeeded in hiking up its rate of saving. Even so, it takes many decades to accumulate the highways, telecommunications systems, hospitals, electricity-generating plants, and other capital goods that underpin a productive economic structure.

Even before acquiring the most sophisticated capital, however, developing countries must first build up their *infrastructure*, or social overhead capital, which consists of the large-scale projects upon which a market economy depends. For example, a regional agricultural adviser helps farmers in an area learn of new seeds or crops; a road system links up the different markets; a public-health program inoculates people against typhoid or diphtheria and protects the population beyond those inoculated. In each of these cases it would be impossible for an enterprising firm to capture the social benefits involved, because the firm cannot collect fees from the thousands or even millions of

beneficiaries. Because of the large indivisibilities and external effects of infrastructure, the government must step in to make or ensure the necessary investments.

In many developing countries, the single most pressing problem is too little saving. Particularly in the poorest regions, urgent current consumption competes with investment for scarce resources. The result is too little investment in the productive capital so indispensable for rapid economic progress.



Foreign Borrowing and Debt Crises

If there are so many obstacles to finding domestic saving for capital formation, why not borrow abroad? Economic theory tells us that a rich country, which has tapped its own high-yield investment projects, can benefit both itself and the recipient by investing in high-yield projects abroad.

However, risks are the necessary companion of reward in foreign lending. The history of lending from rich to poor regions shows a cycle of opportunity, lending, profits, overexpansion, speculation, crisis, and drying-up of funds, followed by a new round of lending by yet another group of starry-eyed investors. No sooner has one crisis been forgotten than another one erupts.

It is instructive to review the saga of *emerging markets*, which is the name often given to rapidly growing low- and middle-income countries that are promising areas for foreign investment. In the 1990s, investors in wealthy countries sent their funds abroad in search of higher returns; poor countries, hungry for capital, welcomed this flow of foreign funds. From Thailand to South Africa, both loans and equity investments grew rapidly during the 1990s.

Figure 26-2 shows the interest-rate spread on emerging market securities. This represents the risk premium that borrowers from emerging-market countries would need to pay to attract funds. When the perceived risk is

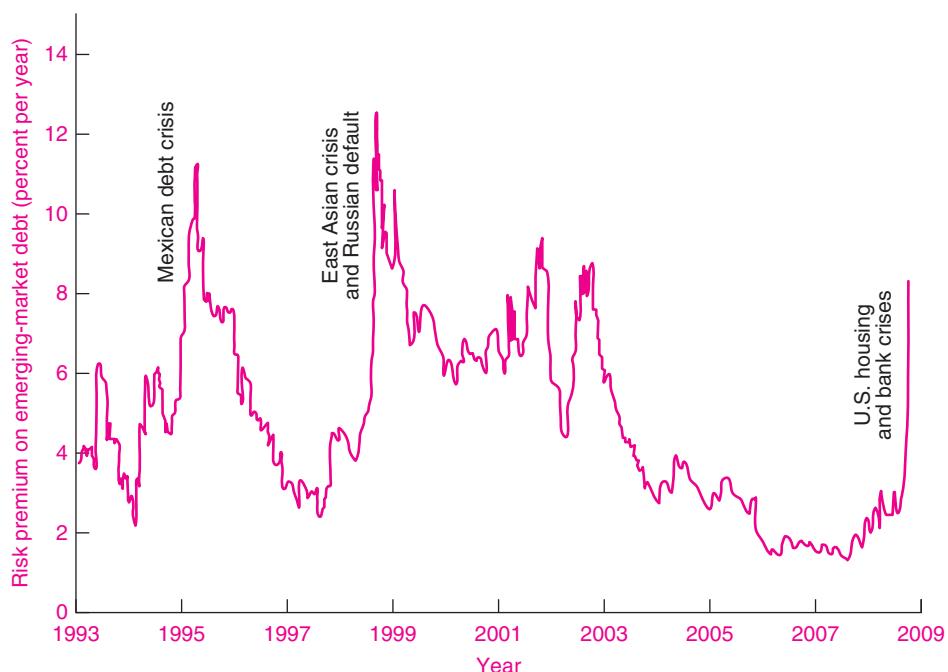


FIGURE 26-2. Spread on Emerging-Market Bonds, 1993–2008

The spread shows the risk premium that borrowers from emerging-market countries paid. It is the premium over safe U.S. dollar securities. Note how the premium shot up during the Mexican crisis in 1995 and the emerging-market crisis and Russian default in 1998. Then market participants became optimistic during the long market boom of the 2000s. All this came to an end with the credit crisis of 2007–2009 as the spread increased.

Source: International Monetary Fund.

low, the spread is low. When investors become concerned that countries will not pay back their loans, or during periods when the price of risk rises, the spreads skyrocket.

As long as the growth in emerging markets continued, all was quiet and returns were solid. But a slowdown in growth, combined with a series of banking crises, led to massive outflows of short-term funds from Thailand, Indonesia, and South Korea. Bankers who had invested heavily called in their loans. This led to a sharp increase in the supply of the currencies of these countries. Most countries were on fixed-exchange-rate systems, and the selling overwhelmed the countries' foreign exchange reserves. One after another, the currencies of the East Asian countries depreciated sharply. Many called upon the International Monetary Fund (IMF) to provide short-term funds, but the IMF required contractionary monetary and fiscal policies. All these factors together produced sharp business recessions throughout East Asia. When Russia defaulted on its debt in 1998, the emerging-country market panicked and credit spreads shot up.

Within 3 years, most of these countries had recovered from the crisis after a period of *adjustment*—slow output growth, declining real wages, debt reschedulings, and trade surpluses. Economic growth had resumed. The world had survived another financial crisis. As Figure 26-2 shows, the spread or risk premium declined gradually over the next decade—until the next crisis erupted in the U.S. financial system in 2007.

Technological Change and Innovations

The final and most important wheel is technological advance. Here, developing countries have one major advantage: They can hope to benefit by relying on the technological progress of more advanced nations.

Imitating Technology. Poor countries need not find modern Newtons to discover the law of gravity; they can read about it in any physics book. They don't have to repeat the slow, meandering route to the Industrial Revolution; they can buy tractors, computers, and power looms undreamed of by the great merchants of the past.

Japan and the United States clearly illustrate this in their historical developments. The United States provides a hopeful example to the rest of the world. The key inventions involved in the automobile originated almost exclusively abroad. Nevertheless, Ford and General Motors applied foreign inventions and

rapidly became the world leaders in the automotive industry.

Japan joined the industrial race late, and only at the end of the nineteenth century did it send students abroad to study Western technology. The Japanese government took an active role in stimulating the pace of development and in building railroads and utilities. By adopting productive foreign technologies, Japan moved into its position today as the world's second-largest industrial economy. The examples of the United States and Japan show how countries can thrive by adapting foreign science and technology to local market conditions.

Entrepreneurship and Innovation. From the histories of the United States and Japan, it might appear that adaptation of foreign technology is an easy recipe for development. You might say: "Just go abroad; copy more-efficient methods; put them into effect at home; then sit back and wait for the extra output to roll in."

Alas, implementing technological change is not that simple. You can send a textbook on chemical engineering to Poorovia, but without skilled scientists, engineers, entrepreneurs, and adequate capital, Poorovia couldn't even think about building a working petrochemical plant. The advanced technology was itself developed to meet the special conditions of the advanced countries—including ample skilled engineers and workers, reliable electrical service, and quickly available spare parts and repair services. These conditions do not prevail in poor countries.

One of the key tasks of economic development is promoting an entrepreneurial spirit. A country cannot thrive without a group of owners or managers willing to undertake risks, open new businesses, adopt new technologies, and import new ways of doing business. At the most fundamental level, innovation and entrepreneurship thrive when property rights are clear and complete and taxes and other drains on profits (such as corruption) are low and predictable. Government can also foster entrepreneurship through specific investments: by setting up extension services for farmers, by educating and training the workforce, and by establishing management schools.

Poor countries often suffer from pervasive corruption. The following discussion by economic

development specialist Robert Klitgaard explains how corruption undermines economic development:

At the broadest level, corruption is the misuse of office for unofficial ends. The catalogue of corrupt acts includes bribery, extortion, influence-peddling, nepotism, fraud, speed money, embezzlement, and more.

Corruption that undercuts the rules of the game—for example, the justice system or property rights or banking and credit—devastates economic and political development. Corruption that allows polluters to foul rivers or hospitals to extort patients can be environmentally and socially corrosive. When corruption becomes the norm, its effects are crippling. So, although every country has corruption, the varieties and extent differ. The killer is systematic corruption that destroys the rules of the game. It is one of the principal reasons why the most underdeveloped parts of our planet stay that way.

Battling corruption is particularly difficult because the state, which is the instrument of justice, is often itself corrupt.

Vicious Cycles to Virtuous Circles

We have emphasized that poor countries face great obstacles in combining the four elements of progress—labor, capital, resources, and innovation. In addition, countries find that the difficulties reinforce each other in a *vicious cycle of poverty*.

Figure 26-3 illustrates how one hurdle raises yet other hurdles. Low incomes lead to low saving; low saving retards the growth of capital; inadequate capital prevents introduction of new machinery and rapid growth in productivity; low productivity leads to low incomes. Other elements in poverty are also self-reinforcing. Poverty is accompanied by low levels of education, literacy, and skill; these in turn prevent the adoption of new and improved technologies and lead to rapid population growth, which eats away at improvements in output and food production.

Countries that suffer from a vicious cycle can get caught in a *poverty trap*. This syndrome arises when there are multiple equilibria, and one of the equilibria may be particularly pernicious. Low-level traps are found in many areas of the social and natural sciences and are illustrated in Figure 26-4. This graph shows average income in period t on the horizontal axis and average income in period $(t + 1)$ on the

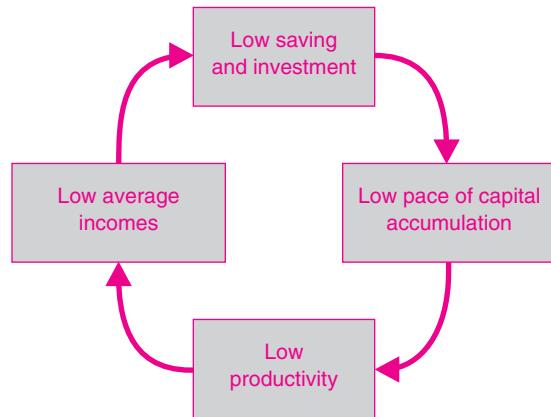


FIGURE 26-3. The Vicious Cycle of Poverty

Many obstacles to development are self-reinforcing. Low levels of income prevent saving, retard capital growth, hinder productivity growth, and keep income low. Successful development may require taking steps to break the chain at many points.

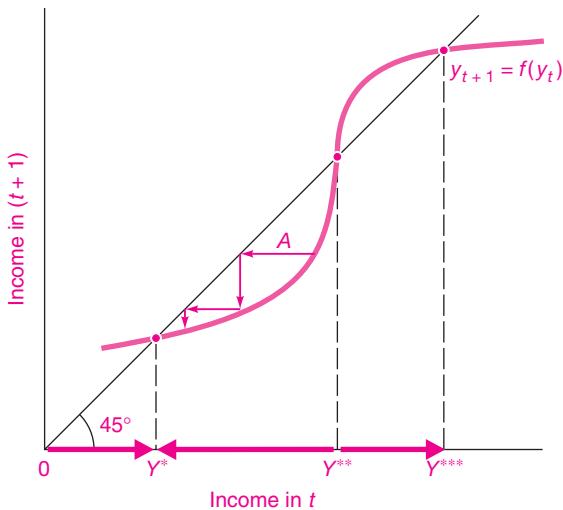


FIGURE 26-4. Countries Can Get Caught in Poverty Traps

When vicious cycles lead to downward spirals, countries can get caught in low-level traps such as Y^* . Note how a country that starts out between 0 and Y^{**} will gravitate back to the low-level trap. Follow the arrows starting at A and see how they lead to Y^* . However, if a country can make a big push to get out of the trap by pushing beyond Y^{**} , then the country enjoys a virtuous cycle of growth to the high-level of income at Y^{***} . Low-level traps can arise because of the interaction of low income, poor health, low saving, low investment, and low productivity.

vertical axis. The nonlinear growth curve $y_{t+1} = f(y_t)$ shows how income moves over time. The 45° line shows the dividing line between positive growth and decline. When a point on the growth curve is above the 45° line, income in $(t + 1)$ is greater than income in t , so income is growing. When the growth curve intersects the 45° line, income is constant and we have an economic equilibrium.

The unusual feature of the S-shaped growth curve is that it leads to multiple equilibria. The lower crossing represents a nasty low-level equilibrium trap at Y^* , while the upper one is a benign high-level equilibrium at Y^{***} . Modern economic-development theory points to low-level traps coming from rapid population growth, low productivity, or low “connectivity.”

Overcoming the poverty trap may require a concerted effort on many fronts, and some development economists recommend a “big push” forward to break the vicious cycle. If a country is fortunate, simultaneous steps to invest more, improve health and education, develop skills, and curb population growth can break the vicious cycle of poverty and stimulate a virtuous circle of rapid economic development. If the country can push itself to the right of Y^{**} in Figure 26-4, then it will take off into sustained economic growth.

STRATEGIES OF ECONOMIC DEVELOPMENT

We see how countries must combine labor, resources, capital, and technology in order to grow rapidly. But this is no real formula; it is the equivalent of saying that an Olympic sprinter must run like the wind. Why do some countries succeed in running faster than others? How do poor countries ever get started down the road of economic development?

Historians and social scientists have long been fascinated by the differences in the pace of economic growth among nations. Some early theories stressed climate, noting that all advanced countries lie in the earth’s temperate zone. Others have pointed to custom, culture, or religion as a key factor. Max Weber emphasized the “Protestant ethic” as a driving force behind capitalism. More recently, Mancur Olson has argued that nations begin to decline when their decision structures become brittle and interest groups or oligarchies prevent social and economic change.

No doubt each of these theories has some validity for a particular time and place. But they do not hold up as universal explanations of economic development. Weber’s theory leaves unexplained why the cradle of civilization appeared in the Near East and Greece while the later-dominant Europeans lived in caves, worshiped trolls, and wore bear-skins. Where do we find the Protestant ethic in bustling China? How can we explain that a country like Japan, with a rigid social structure and powerful lobbies, has become one of the world’s most productive economies?

Even in the modern era, people become attached to simple, holistic explanations of economic development. People once considered import substitution (the replacement of imports with domestically produced goods) to be the most secure development strategy. Then, in the 1970s, reliance on labor-intensive techniques was thought advantageous. Today, as we will see, economists tend to emphasize reliance on market forces with an outward orientation. This history should serve as a warning to be wary of oversimplified approaches to complex processes.

Nonetheless, historians and development economists have learned much from the study of the varieties of economic growth. What are some of the lessons? The following account represents a montage of important ideas developed in recent years. Each approach describes how countries might break out of the vicious cycle of poverty and begin to mobilize the four wheels of economic development.

The Backwardness Hypothesis

One view emphasizes the international context of development. We saw above that poorer countries have important advantages that the first pioneers along the path of industrialization did not. Developing nations can now draw upon the capital, skills, and technology of more-advanced countries. A hypothesis advanced by Alexander Gerschenkron of Harvard suggests that *relative backwardness* itself may aid development. Countries can buy modern textile machinery, efficient pumps, miracle seeds, chemical fertilizers, and medical supplies. Because they can lean on the technologies of advanced countries, today’s developing countries can grow more rapidly than did Britain or Western Europe in the period 1780–1850. As low-income countries draw upon the

more productive technologies of the leaders, we would expect to see *convergence* of countries toward the technological frontier. Convergence occurs when those countries or regions that have initially low incomes tend to grow more rapidly than ones with high incomes.

Industrialization vs. Agriculture

In most countries, incomes in urban areas are almost double those in rural areas. And in affluent nations, much of the economy is in industry and services. Hence, many nations jump to the conclusion that industrialization is the cause rather than the effect of affluence.

We must be wary of such inferences, which confuse the association of two characteristics with causality. Some people say, “Rich people drive BMWs, but driving a BMW will not make you a rich person.” Similarly, there is no economic justification for a poor country to insist upon having its own national airline and large steel mill. These are not the fundamental necessities of economic growth.

The lesson of decades of attempts to accelerate industrialization at the expense of agriculture has led many analysts to rethink the role of farming. Industrialization is capital-intensive, attracts workers into crowded cities, and often produces high levels of unemployment. Raising productivity on farms may require less capital, while providing productive employment for surplus labor. Indeed, if Bangladesh could increase the productivity of its farming by 20 percent, that advance would do more to release resources for the production of comforts than would trying to construct a domestic steel industry to displace imports.

State vs. Market

The cultures of many developing countries are hostile to the operation of markets. Often, competition among firms or profit-seeking behavior is contrary to traditional practices, religious beliefs, or vested interests. Yet decades of experience suggest that extensive reliance on markets provides the most effective way of managing an economy and promoting rapid economic growth.

What are the important elements of a market-oriented policy? The important elements include the

predominance of private property and ownership, an outward orientation in trade policy, low tariffs and few quantitative trade restrictions, the promotion of small business, and the fostering of competition. Moreover, markets work best in a stable macroeconomic environment—one in which taxes are predictable and inflation is low.

Growth and Outward Orientation

A fundamental issue of economic development concerns a country’s stance toward international trade. Should developing countries attempt to be self-sufficient, to replace most imports with domestic production? (This is known as a strategy of *import substitution*.) Or should a country strive to pay for the imports it needs by improving efficiency and competitiveness, developing foreign markets, and keeping trade barriers low? (This is called a strategy of *outward orientation* or *openness*.)

Policies of import substitution were often popular in Latin America until the 1980s. The policy most frequently used toward this end was to build high tariff walls around domestic manufacturing industries so that local firms could produce and sell goods that would otherwise be imported.

A policy of openness keeps trade barriers as low as practical, relying primarily on tariffs rather than quotas and other nontariff barriers. It minimizes the interference with financial flows and allows supply and demand to operate in financial markets. It avoids a state monopoly on exports and imports. It keeps government regulation to the minimum necessary for an orderly market economy. Above all, it relies primarily on a private market system of profits and losses to guide production, rather than depending on public ownership and control or the commands of a government planning system.

The success of outward-oriented policies is best illustrated by the successful East Asian countries. A generation ago, countries like Taiwan, South Korea, and Singapore had per capita incomes one-quarter to one-third of those in the wealthiest Latin American countries. Yet, by saving large fractions of their national incomes and channeling these to high-return export industries, the East Asian countries overtook every Latin American country by the late 1980s. The secret to success was not a doctrinaire laissez-faire policy, for the governments in

fact engaged in selective planning and intervention. Rather, the openness and outward orientation allowed the countries to reap economies of scale and the benefits of international specialization and thus to increase employment, use domestic resources effectively, enjoy rapid productivity growth, and provide enormous gains in living standards.

While openness provides many benefits, excessive openness, particularly to short-term financial flows, is an invitation to speculative attack. What investors lendeth, investors can taketh back. This syndrome can cause financial and banking crises, as we noted for the East Asian economies in our discussion earlier in this chapter.

Summary Judgment

Decades of experience in dozens of countries have led many development economists to the following summary view of the way government can best promote rapid economic development:

The government has a vital role in establishing and maintaining a healthy economic environment. It must ensure respect for the rule of law, enforce contracts, fight corruption, and orient its policies toward competition and innovation. Government must play a leading role in investments in social overhead capital—in education, health, communications, energy, and transportation—but it should look to the private sector where it has no comparative advantage. Government should resist the temptation to produce everything at home. A firm commitment to openness to trade and foreign investment will help ensure that a country moves quickly toward the best world practices in different sectors.

C. ALTERNATIVE MODELS FOR DEVELOPMENT

People continually look for ways to improve their living standards. Economic betterment is particularly compelling for poor countries seeking a path to the riches they see around them. This textbook has surveyed in depth the mixed market economy of the United States, which combines fundamentally

free markets with a sizable government sector. What other alternatives are available?

A BOUQUET OF “ISMS”

At one extreme is *free-market absolutism*, which holds that the best government is the least government. At the other extreme is complete communism, with the government operating a collectivized economic order in which the first-person singular hardly exists. Between the extremes of laissez-faire and communism lie mixed capitalism, managed markets, socialism, and many combinations of these models. In this section, we describe briefly some of the influential alternative strategies for growth and development:

1. *The Asian managed-market approach.* South Korea, Taiwan, Singapore, and other countries of East Asia have devised their own brands of economics that combine strong government oversight with powerful market forces.
2. *Socialism.* Socialist thinking encompasses a wide variety of different approaches. In Western Europe after World War II, socialist governments operating in a democratic framework expanded the welfare state, nationalized industries, and planned their economies. In recent years, however, these countries moved back toward a free-market framework with extensive deregulation and privatization.
3. *Soviet-style communism.* For many years, the clearest alternative to the market economy existed in the Soviet Union. Under the Soviet model, the state owned all the land and most of the capital, set wages and most prices, and directed the microeconomic operation of the economy.

The Central Dilemma: Market vs. Command

A survey of alternative economic systems may seem like a bewildering array of economic “isms.” And indeed, there is a great variety in the way countries organize their economies.

One central issue runs through all the great debates about alternative economic systems: Should economic decisions be taken primarily by the *private market* or by *government command*?

At one end of the spectrum is the *market economy*. In a market system, people act voluntarily and primarily for financial gain or personal satisfaction. Firms buy factors and produce outputs, selecting inputs and outputs in a way that will maximize their profits. Consumers supply factors and buy consumer goods to maximize their satisfactions. Agreements on production and consumption are made voluntarily and with the use of money, at prices determined in free markets, and on the basis of arrangements between buyers and sellers. Although individuals differ greatly in terms of economic power, the relationships between individuals and firms are horizontal in nature, essentially voluntary, and nonhierarchical.

At the other end of the spectrum is the *command economy*, where decisions are made by government bureaucracy. In this approach, people are linked by a vertical relationship, and control is exercised by a multilevel hierarchy. The planning bureaucracy determines *what* goods are produced, *how* they are produced, and *for whom* output is produced. The highest level of the pyramid makes the major decisions and develops the elements of the plan for the economy. The plan is subdivided and transmitted down the bureaucratic ladder, with the lower levels of the hierarchy executing the plan with increasing attention to detail. Individuals are motivated by coercion and legal sanctions; organizations compel individuals to accept orders from above. Transactions and commands may or may not use money; trades may or may not take place at established prices.

In between are the socialist and the managed-market economies. In both cases government plays an important role in guiding and directing the economy, though much less so than in a command economy. The tension between markets and command runs through all discussions about alternative economic systems. Let us look in more detail at some of the alternatives to the mixed market economies.

THE ASIAN MODELS

Asian Dragons

Development specialists sometimes look to the countries of East Asia as examples of successful development strategies. The rapid economic growth over the last half-century in South Korea, Singapore, and Taiwan is sometimes called the *East Asian miracle*. Table 26-2 compares the performance of the “Asian dragons” with those of other major areas over recent years. Latin America and sub-Saharan Africa have been growing at a positive rate. However, look at the East Asian and Pacific region, and especially China. Countries in this region have had a phenomenal rate of growth, particularly in the last three decades.

A World Bank study analyzed the economic policies of different regions to see whether any patterns emerged.¹ The results confirmed common

¹ See this chapter’s Further Reading section for the World Bank study on the East Asian miracle.

Region	Average Growth of Real per Capita GDP		
	1962–1973	1973–1995	1995–2006
East Asia and Pacific	3.6	4.8	6.4
China	4.0	4.7	8.2
South Asia	2.0	2.5	4.4
India	2.2	2.3	4.9
Latin America and Caribbean	4.0	1.7	1.5
Sub-Saharan Africa	2.8	0.7	1.7

TABLE 26-2. Attention to Fundamentals Spurred Growth for the Asian Dragons

Source: *World Development Indicators* (2008), available at www.worldbank.org/.

views but also found a few surprises. Here are the high points:

- *Investment rates.* The Asian dragons followed the classic recipe of high investment rates to ensure that their economies benefited from the latest technology and could build up the necessary infrastructure. Investment rates among the Asian dragons were almost 20 percentage points higher than those of other regions.
- *Macroeconomic fundamentals.* Successful countries had a steady hand on macroeconomic policies, keeping inflation low and saving rates high. They invested heavily in human capital as well as in physical capital and did more to promote education than any other developing region. The financial systems were managed to ensure monetary stability and a sound currency.
- *Outward orientation.* The Asian dragons were outward-oriented, often keeping their exchange rates undervalued to promote exports, encouraging exports with fiscal incentives, and pursuing technological advance by adopting best-practice techniques of high-income countries.

The Rise of China

One of the major surprises in economic development during the last three decades was the rapid growth of the Chinese economy. After the Chinese revolution of 1949, China initially adopted a Soviet-style central-planning system. The high-water mark of centralization came with the Cultural Revolution of 1966–1969, which led to an economic slowdown in China. After the death of the revolutionary leader Mao Tse-tung, a new generation concluded that economic reform was necessary if the Communist party was to survive. Under Deng Xiaoping's leadership from 1977 to 1997, China decentralized a great deal of economic power and promoted competition. Economic reform was, however, not accompanied by political reform; the democracy movement was ruthlessly repressed in Tiananmen Square in 1989, and the Communist party has continued to monopolize the political process.

To spur economic growth, the Chinese leadership has taken dramatic steps such as setting up “special economic zones” which allowed capitalist and foreign enterprises to operate. The most rapidly growing parts of China have been the coastal

regions, such as the southern region near Hong Kong and in greater Shanghai. These areas have become closely integrated with countries outside China and have attracted considerable foreign investment. In addition, China has allowed private and foreign firms, free from government planning or control, to operate alongside state-owned firms. These innovative forms of ownership have grown rapidly and by the 2000s were producing more than half of China's GDP.

The continued rapid growth of the Chinese economy has surprised observers almost as much as did the collapse of the Soviet economy. As shown in Table 26-2, the growth in per capita GDP accelerated from 4.0 percent per year in 1962–1973 to 8.2 percent per year in 1995–2006. Exports from China to the United States grew over 17 percent per year during the last decade. By 2008, China had annual exports of almost \$2 trillion and had accumulated \$1½ trillion in foreign exchange reserves.

The future of the Chinese economic model is being watched closely around the world. The undoubtedly success of outward orientation, particularly to foreign investment, is an especially striking feature of Chinese economic policy.

SOCIALISM

As a doctrine, socialism developed from the ideas of Karl Marx and other radical thinkers of the nineteenth century. Socialism is a middle ground between laissez-faire capitalism and the central-planning model, which we discuss in the next subsection. A few common elements characterize most socialist philosophies:

- *Government ownership of productive resources.* Socialists traditionally believed that the role of private property should be reduced. Key industries such as railroads and banking should be nationalized (that is, owned and operated by the state). In recent years, because of the poor performance of many state-owned enterprises, enthusiasm for nationalization has ebbed in most advanced democracies.
- *Planning.* Socialists are suspicious of the “chaos” of the marketplace and question the allocational efficiency of the invisible hand. They insist that a planning mechanism is needed to coordinate different sectors. In recent years, planners have

emphasized subsidies to promote the rapid development of high-technology industries, such as microelectronics, aircraft manufacturing, and biotechnology; these policies are sometimes called “industrial policies.”

- *Redistribution of income.* Inherited wealth and the highest incomes are to be reduced by the militant use of government taxing powers; in some Western European countries, marginal tax rates have reached 98 percent. Government social security benefits, free medical care, and cradle-to-grave welfare services paid for with progressive taxes increase the well-being of the less privileged and guarantee minimum standards of living for all.
- *Peaceful and democratic evolution.* Socialists often advocate the peaceful and gradual extension of government ownership—evolution by ballot rather than revolution by bullet.

Socialist approaches fell out of favor with the collapse of communism, the stagnation in Europe, and the success of market-oriented economies. Thoughtful socialists are combing through the wreckage to find a future role for this branch of economic thought.

THE FAILED MODEL: CENTRALLY PLANNED ECONOMIES

For many years, developing countries looked to the Soviet Union and other communist countries as role models on how to industrialize. Communism offered both a theoretical critique of Western capitalism and a seemingly workable strategy for economic development. We begin by reviewing the theoretical underpinnings of Marxism and communism and then examine how the Soviet-style command economy worked in practice.



Karl Marx: Economist as Revolutionary

On the surface, Karl Marx (1818–1883) lived an uneventful life, studiously poring through books in the British Museum, writing newspaper articles, and working on his scholarly studies of capitalism. Although originally attracted to German universities, his atheism, pro-constitutionalism, and radical

ideas led him to journalism. He was eventually exiled to Paris and London, where he wrote his massive critique of capitalism, *Capital* (1867, 1885, 1894).

The centerpiece of Marx’s work is an incisive analysis of the strengths and weaknesses of capitalism. Marx argued that all commodity value is determined by labor content—both the direct labor and the indirect labor embodied in capital equipment. For example, the value of a shirt comes from the efforts of the textile workers who put it together, plus the efforts of the workers who made the looms. By imputing all the value of output to labor, Marx attempted to show that profits—the part of output that is produced by workers but received by capitalists—amount to “unearned income.”

In Marx’s view, the injustice of capitalists’ receiving unearned income justifies transferring the ownership of factories and other means of production from capitalists to workers. He trumpeted his message in *The Communist Manifesto* (1848): “Let the ruling classes tremble at a Communist revolution. The proletarians have nothing to lose but their chains.” And the ruling capitalist classes did tremble at Marxism for more than a century!

Like many great economists, but with more passion than most, Marx was deeply moved by the struggle of working people and hoped to improve their lives. He penned the words that appear on his gravestone: “Up ‘til now philosophers have only interpreted the world in various ways. The point, though, is to change it!” Our epitaph for Marx might echo the appraisal of the distinguished intellectual historian, Sir Isaiah Berlin: “No thinker in the nineteenth century has had so direct, deliberate, and powerful an influence on mankind as Karl Marx.”

Baleful Prophesies

Marx saw capitalism as inevitably leading to socialism. In Marx’s world, technological advances enable capitalists to replace workers with machinery as a means of earning greater profits. But this increasing accumulation of capital has two contradictory consequences. As the supply of available capital increases, the rate of profit on capital falls. At the same time, with fewer jobs, the unemployment rate rises and wages fall. In Marx’s terms, the “reserve army of the unemployed” would grow, and the working class would become increasingly “immiserized”—by which he meant that working conditions would deteriorate and workers would grow progressively alienated from their jobs.

As profits decline and investment opportunities at home become exhausted, the ruling capitalist classes resort to imperialism. Capital tends to seek higher rates of profit abroad. And, according to this theory (particularly as later expanded by Lenin), the foreign policies of imperialist nations increasingly attempt to win colonies and then mercilessly milk surplus value from them.

Marx believed that the capitalist system could not continue this unbalanced growth forever. Marx predicted increasing inequality under capitalism, along with a gradual emergence of class consciousness among the downtrodden proletariat. Business cycles would become ever more violent as mass poverty resulted in macroeconomic underconsumption. Finally, a cataclysmic depression would sound the death knell of capitalism. Like feudalism before it, capitalism would contain the seeds of its own destruction.

The *economic interpretation of history* is one of Marx's lasting contributions to Western thought. Marx argued that economic interests lie behind and determine our values. Why do business executives vote for conservative candidates, while labor leaders support those who advocate raising the minimum wage or increasing unemployment benefits? The reason, Marx held, is that people's beliefs and ideologies reflect the material interests of their social and economic class. In fact, Marx's approach is hardly foreign to mainstream economics. It generalizes Adam Smith's analysis of self-interest from the dollar votes of the marketplace to the ballot votes of elections and the bullet votes of the barricades.

From Textbooks to Tactics: Soviet-Style Command Economy

Marx wrote extensively about the faults of capitalism, but he left no design for the promised socialist land. His arguments suggested that communism would arise in the most highly developed industrial countries. Instead, it was feudal Russia that adopted the Marxist vision. Let's examine this fascinating and horrifying chapter of economic history.

Historical Roots. An analysis of Soviet communism is of the utmost importance for economics because the Soviet Union served as a laboratory for theories about the functioning of a command economy. Some economists claimed that socialism simply could not

work; the Soviet experience proved them wrong. Its advocates argued that communism would overtake capitalism; Soviet history also refutes this thesis.

Although czarist Russia grew rapidly from 1880 to 1914, it was considerably less developed than industrialized countries like the United States or Britain. World War I brought great hardship to Russia and allowed the communists to seize power. From 1917 to 1933, the Soviet Union experimented with different socialist models before settling on central planning. But dissatisfaction with the pace of industrialization led Stalin to undertake a radical new venture around 1928—collectivization of agriculture, forced-draft industrialization, and central planning of the economy.

Under the collectivization of Soviet agriculture between 1929 and 1935, 94 percent of Soviet peasants were forced to join collective farms. In the process, many wealthy peasants were deported, and conditions deteriorated so much that millions perished. The other part of the Soviet "great leap forward" came through the introduction of economic planning for rapid industrialization. The planners created the first 5-year plan to cover the period 1928–1933. The first plan established the priorities of Soviet planning: heavy industry was to be favored over light industry, and consumer goods were to be the residual sector after all the other priorities had been met. Although there were many reforms and changes in emphasis, the Stalinist model of a command economy applied in the Soviet Union and Eastern Europe countries until the fall of Soviet communism at the end of the 1980s.

How the Command Economy Functioned. In the Soviet-style command economy, the broad categories of output were determined by political decisions. Military spending in the Soviet Union was always allocated a substantial part of output and scientific resources, while the other major priority was investment. Consumption claimed the residual output after the quotas of higher-priority sectors were filled.

In large part, decisions about how goods were to be produced were made by the planning authorities. Planners first decided on the quantities of final outputs (the *what*). Then they worked backward from outputs to the required inputs and the flows among different firms. Investment decisions were specified in great detail by the planners, while firms had

considerable flexibility in deciding upon their mix of labor inputs.

Clearly no planning system could specify all the activities of all the firms—this would have required trillions of commands every year. Many details were left to the managers of individual factories. It was here, in what is called the *principal-agent problem*, that the command economy ran into its deepest difficulties.

The principal-agent problem arises because the person at the top of a hierarchy (the “principal”) wants to provide appropriate incentives for the people making the decisions down the hierarchy (the “agents”) to behave according to the principal’s wishes. In a market economy, profits and prices serve as the mechanism for coordinating consumers and producers. A command economy is plagued by an inability to find an efficient substitute for profits and prices as a way of motivating the agents.

A useful example of the failure to solve the principal-agent problem is found in Soviet book publishing. In a market economy, commercial decisions about books are made primarily on the basis of profit and loss. In the Soviet Union, because profits were taboo, planners instead used quantitative targets. A first approach was to reward firms according to the number of books produced, so publishers printed thousands of thin unread volumes. Faced with a clear incentive problem, the center (principal) changed the system so that the producers (agents) were rewarded on the basis of the number of pages printed, and the result was fat books with onion-skin paper and large type. The planners then changed the criterion to the number of words—to which the publishers responded by printing huge volumes with tiny type. None of these mechanisms was capable of signaling consumer wants effectively.

The principal-agent problem crops up in organizations in all countries, but the Soviet model had few mechanisms (like bankruptcy in markets and elections for public goods) to provide an ultimate check on waste.

Comparative Economic Performance. From World War II until the mid-1980s, the United States and the Soviet Union engaged in a superpower competition for public opinion, military superiority, and economic dominance. How well did the command economies perform in the economic growth race? Any attempt at answering this question is bedeviled by the absence

of reliable statistics. Most economists believed until recently that the Soviet Union grew rapidly from 1928 until the mid-1960s, with growth rates perhaps surpassing those in North America and Western Europe. After the mid-1960s, growth in the Soviet Union stagnated and output actually began to decline.

A revealing comparison of the performance of market and command economies can be made by contrasting the experiences of East Germany and West Germany. These countries started out with roughly equal levels of productivity and similar industrial structures at the end of World War II. After four decades of capitalism in the West and Soviet-style socialism in the East, productivity in East Germany had fallen to a level estimated between one-fourth and one-third of that in West Germany. Moreover, the East German growth tended to emphasize production of intermediate goods and commodities of little value to consumers. Quantity, not quality, was the goal.

Balance Sheet. Is there a final balance sheet on Soviet central planning? The Soviet model demonstrated that a command economy can work—it is capable of mobilizing capital and labor and producing both guns and butter. But the Soviet economy, with borders closed to trade, technologies, and people, became increasingly obsolete over time. Innovation withered because of poor incentives. In competition with the open-market economies, particularly as the world turned to increasingly high-quality goods and services, Russia could export virtually nothing except raw materials and military equipment.

Growth slowed, and per capita income declined in the latest period of central planning. Its leaders finally abandoned Soviet central planning as it was seen to be morally, politically, and economically bankrupt.

From Marx to Market

Beginning in 1989, the countries of Eastern Europe and the former Soviet Union rejected the communist experiment and introduced market economies. A cruel joke heard in Eastern Europe is “Question: What is communism? Answer: The longest road from capitalism to capitalism.”

The road back to capitalism proved a rocky one for many countries. Among the challenges were the following: (1) liberalizing prices to allow supply and demand to determine prices, (2) imposing

hard budget constraints on subsidized enterprises, (3) privatizing enterprises so that the decisions about buying, selling, pricing, producing, borrowing, and lending would be made by private agents, and (4) establishing the institutions of the market, such as a modern banking system, the legal framework for commerce, and the tools for monetary and fiscal policy.

Some countries, like Slovenia and the Czech Republic, made the transition relatively quickly and are now increasingly integrated into the European Union as functioning market democracies. Russia has renationalized much of its energy industry and has become an energy powerhouse. Other countries, particularly the former Soviet Republics in Asia, are still mired in autocracy, corruption, and rigid economic structures. The lessons here are useful for any country attempting to establish the institutions of a market economy.

A Final Note of Cautious Optimism

This chapter has described the problems and prospects of poor countries struggling to be rich and free—to provide the dry houses, education, electric

lights, fast horses, automobiles, and long vacations of the excerpt that opened this chapter. What are the prospects of attaining these goals?

We close with a sober assessment by Jeffrey Sachs of Columbia University and the Earth Institute, one of the outstanding development economists of today, and his co-author Andrew Warner:

The world economy [today] looks much like the world economy at the end of the nineteenth century. A global capitalist system is taking shape, drawing almost all regions of the world into arrangements of open trade and harmonized economic institutions. As in the nineteenth century, this new round of globalization promises to lead to economic convergence for the countries that join the system. . . .

And yet there are also profound risks for the consolidation of market reforms in Russia, China, and Africa, as well as for the maintenance of international agreements among the leading countries. . . . The spread of capitalism in the [last] twenty-five years is an historic event of great promise and significance, but whether we will be celebrating the consolidation of a democratic and market-based world system [twenty-five years hence] will depend on our own foresight and good judgments in the years to come.



SUMMARY

A. Population Growth and Development

1. Malthus's theory of population rests on the law of diminishing returns. He contended that population, if unchecked, would tend to grow at a geometric (or exponential) rate, doubling every generation or so. But each member of the growing population would have less land and natural resources to work with. Because of diminishing returns, income could grow at an arithmetic rate at best; output per person would tend to fall so low as to stabilize population at a subsistence level of near-starvation.
2. Over the last two centuries, Malthus and his followers have been criticized on several grounds. Among the major criticisms are that Malthusians ignored the possibility of technological advance and overlooked the significance of birth control as a force in lowering population growth. The neo-Malthusians see limits to growth from environmental constraints, particularly global warming, where markets provide distorted signals.

B. Economic Growth in Poor Countries

3. Most of the world's population lives in developing countries, which have relatively low per capita incomes. Such countries often exhibit rapid population growth, a low level of literacy, poor health, and a high proportion of their population living and working on farms.
4. The key to development lies in four fundamental factors: human resources, natural resources, capital, and technology. Explosive population causes problems as the Malthusian prediction of diminishing returns haunts the poorest countries. On the constructive agenda, improving the population's health, education, and technical training has high priority.
5. Investment and saving rates in poor countries are low because incomes are so depressed that little can be saved for the future. International financing of investment in poor countries has witnessed many crises over the last two centuries.

6. Technological change is often associated with investment and new machinery. It offers much hope to the developing nations because they can adopt the more productive technologies of advanced nations. This requires entrepreneurship. One task of development is to spur internal growth of the scarce entrepreneurial spirit.
7. Numerous theories of economic development help explain why the four fundamental factors are present or absent at a particular time. Development economists today emphasize the growth advantage of relative backwardness, the need to respect the role of agriculture, and the art of finding the proper boundary between state and market. The most recent consensus is on the advantages of openness.
8. Countries should be concerned about falling into the poverty trap, in which a vicious cycle of poverty leads to poor performance and locks a country into continued poverty.
9. Recall our summary judgment on the role of government policies: (a) Foster the rule of law. (b) Make the critical investments in human and social overhead capital. (c) Limit the public sector to clear areas of comparative advantage. (d) Maintain an economy open to trade and foreign investment.

C. Alternative Models for Development

10. Many “isms” have competed with the mixed market economy as models for economic development. Alternative strategies include the managed-market

- approach of the East Asian countries, socialism, and the Soviet-style command economy.
11. The managed-market approach of Japan and the Asian dragons, such as South Korea, Hong Kong, Taiwan, and Singapore, proved remarkably successful over the last quarter-century. Among the key ingredients were macroeconomic stability, high investment rates, a sound financial system, rapid improvements in education, and an outward orientation in trade and technology policies.
12. Socialism is a middle ground between capitalism and communism, stressing government ownership of the means of production, planning by the state, income redistribution, and peaceful transition to a more egalitarian world.
13. Historically, Marxism took its deepest economic roots in semi-feudal Russia and was then imposed on the rest of the Soviet Union and Eastern Europe. Studies of resource allocation in these countries show that resources were allocated by central planning with severe distortions of prices and outputs. The Soviet economy depended primarily on energy-intensive heavy industry and the military in its early decades. Stagnation and poor incentives for innovation left Russia and other centrally planned countries at income levels far below those of North America, Japan, and Western Europe. These countries have all rejected the centralized command economy for some variant of the mixed market economy.

CONCEPTS FOR REVIEW

Population Theory

Malthus's population theory
geometric vs. arithmetic growth

vicious cycles, virtuous circles,
poverty trap
backwardness hypothesis

socialism, communism
the principal-agent problem
command economy

Economic Development

developing country
indicators of development
four elements in development

Alternative Models for Development

the central dilemma of
market vs. command

FURTHER READING AND INTERNET WEBSITES

Further Reading

One of the most influential books of all times is T. R. Malthus, *Essay on Population* (1798, many publishers). An online version can be found at www.ac.wvu.edu/~stephan/malthus/

malthus.0.html. The influential books by the new Malthusians Donella H. Meadows, Dennis L. Meadows, and Jørgen Randers are *The Limits to Growth* (Potomac, Washington, D.C., 1972) and *Beyond the Limits* (Chelsea Green, Post Mills, Vt., 1992).

The study on the East Asian miracle is contained in World Bank, *The East Asia Miracle: Economic Growth and Government Policies* (World Bank, Washington, D.C., 1993). The quotation at the end is from Jeffrey Sachs and Andrew Warner, “Economic Reform and the Process of Global Integration,” *Brookings Papers on Economic Activity*, no. 1, 1995, pp. 63–64.

A highly readable account of developments in Soviet economic history is contained in Alec Nove, *An Economic History of the U.S.S.R.*, 3d ed. (Penguin, Baltimore, 1990). A careful study of the Soviet economic system is provided by Paul R. Gregory and Robert C. Stuart, *Russian and Soviet Economic Performance and Structure*, 6th ed. (Harper & Row, New York, 1997).

Websites

The World Bank has information on its programs and publications at its site, www.worldbank.org; the International Monetary Fund (IMF) provides similar information

at www.imf.org. The United Nations website has links to most international institutions and their databases at www.unsystem.org. A good source of information about high-income countries is the Organisation for Economic Cooperation and Development (OECD) website, www.oecd.org. U.S. trade data are available at www.census.gov. You can find information on many countries through their statistical offices. A compendium of national agencies is available at www.census.gov/main.

Population data are available from the United Nations at www.un.org/popin/. One of the best sources for studies of developing countries is the World Bank, especially the annual *World Development Review* at www.worldbank.org. The quote from Klitgaard was published in *Finance and Development*, March 1998, and can be found at www.gwdg.de/~www/icr.htm.

QUESTIONS FOR DISCUSSION

1. A geometric progression is a sequence of terms $(g_1, g_2, \dots, g_t, g_{t+1}, \dots)$, in which each term is the same multiple of its predecessor:

$$\frac{g_2}{g_1} = \frac{g_3}{g_2} = \dots = \frac{g_{t+1}}{g_t} = \beta$$

If $\beta = 1 + i > 1$, the terms grow exponentially like compound interest, where i is the interest rate. An arithmetic progression is a sequence $(a_1, a_2, a_3, \dots, a_t, a_{t+1}, \dots)$, in which the difference between each term and its predecessor is the same constant:

$$a_2 - a_1 = a_3 - a_2 = \dots = a_{t+1} - a_t = \dots = \lambda$$

Give examples of each. Satisfy yourself that any geometric progression with $\beta > 1$ must eventually surpass any arithmetic progression. Relate this to Malthus’s theory.

2. Recall that Malthus asserted that unchecked population would grow geometrically, while food supply—constrained by diminishing returns—would grow only arithmetically. Use a numerical example to show why per capita food production must decline if population is unchecked while diminishing returns lead food production to grow more slowly than labor inputs.
3. Do you agree with the celebration of material well-being expressed in the chapter’s opening quotation? What would you add to the list of the benefits of economic development?

4. Delineate each of the four important factors driving economic development. With respect to these, how was it that the high-income oil-exporting countries became rich? What hope is there for a country like Mali, which has very low per capita resources of capital, land, and technology?
5. Some fear the “vicious cycle of underdevelopment.” In a poor country, rapid population growth eats into whatever improvements in technology occur and lowers living standards. With a low per capita income, the country cannot save and invest and mainly engages in subsistence farming. With most of the population on the farm, there is little hope for education, decline in fertility, or industrialization. If you were to advise such a country, how would you break the vicious cycle?
6. Compare the situation a developing country faces today with the one it might have faced (at an equivalent level of per capita income) 200 years ago. Considering the four wheels of economic development, explain the advantages and disadvantages that today’s developing country might experience.
7. Some economists today question whether it is wise to allow complete openness on both financial and current accounts. They argue that allowing free flow of short-term financial movements increases vulnerability to speculative attacks. Give the pros and cons of limiting short-term financial movements. Might you want to

use a tax on short-term flows rather than quantitative restrictions?

8. Analyze the way that *what*, *how*, and *for whom* are solved in a Soviet-style command economy, and compare your analysis with the solution of the three central questions in a market economy.
9. **Advanced problem** (relying upon the growth accounting of Chapter 25): We can extend our growth-accounting equation to include three factors and write the following equation:

$$g_Q = s_L g_L + s_K g_K + s_R g_R + \text{T.C.}$$

where g_Q = the growth rate of output, g_i = the growth rate of inputs (i = inputs to production: L for labor, K for capital, and R for land and other natural resources), and s_i = the contribution of each input to output growth as measured by its share of national income ($0 \leq s_i \leq 1$ and $s_L + s_K + s_R = 1$). T.C. measures technological change.

- a. In the poorest developing countries, the share of capital is close to zero, the main resource is agricultural land (which is constant), and there is little technological change. Can you use this to explain the Malthusian hypothesis in which per capita output is likely to be stagnant or even to decline (i.e., $g_Q < g_L$)?
- b. In advanced economies, the share of land resources drops to virtually zero. Why does this lead to the growth-accounting equation studied in the previous chapter? Can you use this to explain how countries can avoid the Malthusian trap of stagnant incomes?
- c. According to economists who are pessimistic about future prospects (including a group of *neo-Malthusians* from the Club of Rome), T.C. is close to zero, the available supply of natural resources is declining, and the share of resources is large and rising. Does this explain why the future of industrial societies might be bleak? Which assumptions of the neo-Malthusians might you question?

Exchange Rates and the International Financial System

27



The benefit of international trade—a more efficient employment of the productive forces of the world.

John Stuart Mill

Economically, no nation is an island unto itself. When the bell tolls recession or financial crisis, the sound reverberates around the world.

We see this point illustrated dramatically in the twentieth century, which we can divide into two distinct periods. The period from 1914 to 1945 was characterized by destructive competition, shrinking international trade, growing financial isolation, hot and cold military and trade wars, dictatorships, and depression. By contrast, after World War II, most of the world enjoyed growing economic cooperation, widening trade linkages, increasingly integrated financial markets, an expansion of democracy, and rapid economic growth. This stark contrast emphasizes how high the stakes are in the wise management of our national and global economies.

What are the economic links among nations? The important economic concepts involve international trade and finance. International trade in goods and services allows nations to raise their standards of living by specializing in areas of comparative advantage, exporting products in which they are relatively efficient while importing ones in which they are relatively inefficient. In a modern economy, trade takes place using different currencies. The international financial system is the lubricant that facilitates trade and finance by allowing people to use and exchange different currencies.

International trade is sometimes seen as a zero-sum, Darwinian conflict. This view is misleading at best and wrong at worst. International trade and finance, like all voluntary exchange, can improve the well-being of all participants in the transactions. When the United States sells wheat to Japan and imports cars, using the medium of dollars and yen, these transactions lower prices and raise living standards in both countries.

But economic integration (sometimes called *globalization*) is not without its perils. Some periods, such as the early 2000s, were relatively tranquil, while others saw crisis after crisis. The 1930s saw the gold standard and the international trading regime collapse. The 1970s saw the failure of the fixed-exchange-rate system, oil embargoes, and a sharp increase in inflation. The 1990s saw a succession of financial crises: a crisis of confidence in the exchange-rate regime in Europe in 1991–1992, capital flight from Mexico in 1994–1995, banking and currency panics in East Asia in 1997, a default on Russian debt and a global liquidity freeze in 1998, and a series of currency problems in Latin America.

After a period of relative tranquility, the world was shocked in 2007–2009 by the bursting of a housing-price bubble, mortgage foreclosures, and financial failures in the world's most sophisticated

economy, the United States. The global nature of the economic system was seen in 2007–2009, when the financial crisis in the United States spread around the world. All of these crises required careful management by the fiscal and monetary authorities of the major countries involved.

This chapter and the next one survey international macroeconomics. This topic includes the principles governing the international monetary system, which is the major focus of the present chapter, as well as the impact of foreign trade on output, employment, and prices, which is covered in the next chapter.

International macroeconomics involves many of the most controversial questions of the day: Does foreign trade raise or lower our output and employment? What is the link between domestic saving, domestic investment, and the trade balance? What are the causes of the occasional financial crises that spread contagiously from country to country? What has been the effect of the European

Monetary Union on Europe's macroeconomic performance? And why has the United States become the world's largest debtor country in the last decade? The economic stakes are high in finding wise answers to these questions.

TRENDS IN FOREIGN TRADE

An economy that engages in international trade is called an **open economy**. A useful measure of openness is the ratio of a country's exports or imports to its GDP. Figure 27-1 shows the trend in the shares of imports and exports for the United States over the last half-century. It shows the large export surplus in the early years after World War II as America financed the reconstruction of Europe. But the share of imports and exports was low in the 1950s and 1960s. With growth abroad and a lowering of trade barriers, the share of trade grew steadily and reached an average of 13 percent of GDP in 2008.

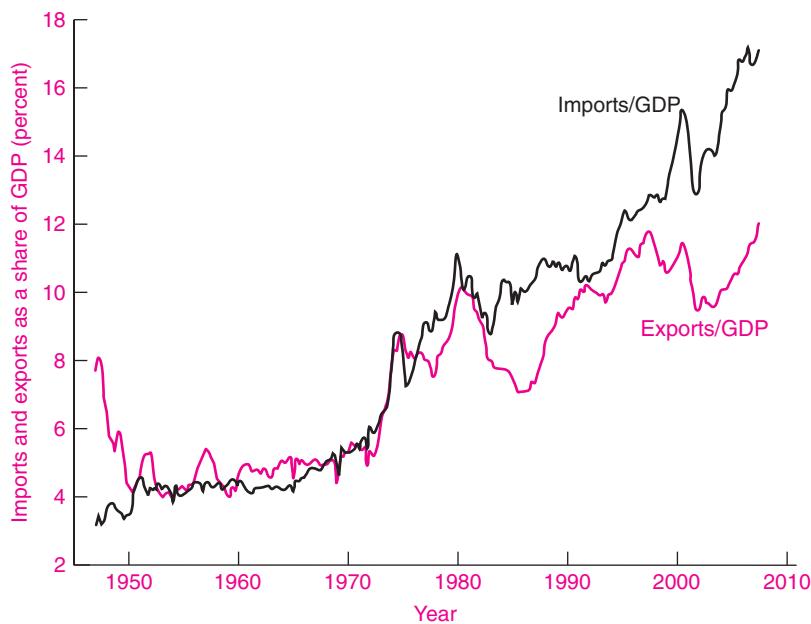


FIGURE 27-1. Growing U.S. Openness

Like all major market economies, the United States has increasingly opened its borders to foreign trade since World War II. This has led to a growing share of output and consumption involved in international trade. Since the 1980s, imports have far outdistanced exports, causing the United States to become the world's largest debtor nation.

Source: U.S. Bureau of Economic Analysis.

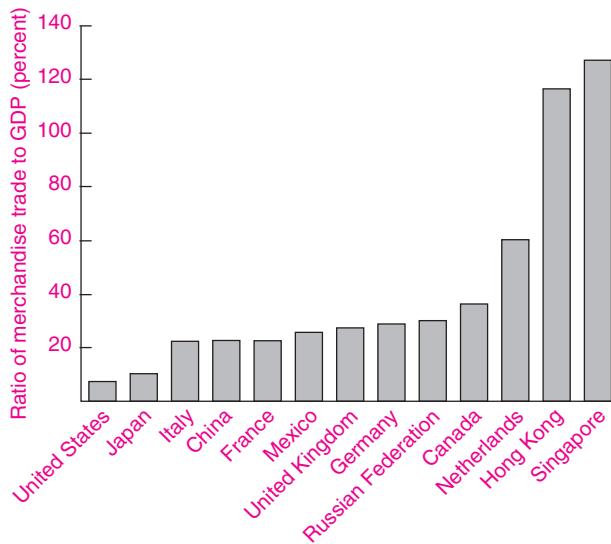


FIGURE 27-2. Openness Varies Enormously across Regions

Large countries like the United States have small trade shares, while tiny countries like Singapore trade more than they produce.

Source: World Trade Organization. Shares are the ratio of merchandise trade to GDP for the period 2002–2005.

You might be surprised to learn that the United States is a relatively self-sufficient economy. Figure 27-2 shows the trade proportions of selected countries. Small countries and those in highly integrated regions like Western Europe are more open than the United States. Moreover, the degree of openness is much higher in many U.S. industries than in the overall economy, particularly in manufacturing industries like steel, textiles, consumer electronics, and autos. Some industries, such as education and health care, are largely insulated from foreign trade.

A. THE BALANCE OF INTERNATIONAL PAYMENTS

BALANCE-OF-PAYMENTS ACCOUNTS

We begin this chapter with an overview of the way nations keep their international accounts. Economists keep score by looking at income statements

and balance sheets. In the area of international economics, the key accounts are a nation's **balance of international payments**. These accounts provide a systematic statement of all economic transactions between that country and the rest of the world. Its major components are the current account and the financial account. The basic structure of the balance of payments is shown in Table 27-1, and each element is discussed below.

Debits and Credits

Like other accounts, the balance of payments records each transaction as either a plus or a minus. The general rule in balance-of-payments accounting is the following:

If a transaction earns foreign currency for the nation, it is called a *credit* and is recorded as a plus item. If a transaction involves spending foreign currency, it is a *debit* and is recorded as a negative item. In general, exports are credits and imports are debits.

Exports earn foreign currency, so they are credits. Imports require spending foreign currency, so they are debits. How is the U.S. import of a Japanese camera recorded? Since we ultimately pay for it in Japanese yen, it is clearly a debit. How shall we

I. Current account

- Merchandise (or "trade balance")
- Services
- Investment income
- Unilateral transfers

II. Financial account

- Private
- Government
- Official reserve changes
- Other

TABLE 27-1. Basic Elements of the Balance of Payments

The balance of payments has two fundamental parts. The *current account* represents the spending and receipts on goods and services along with transfers. The *financial account* includes purchases and sales of financial assets and liabilities. An important principle is that the two must always sum to zero:

$$\text{Current account} + \text{financial account} = I + II = 0$$

treat interest and dividend income on investments received by Americans from abroad? Clearly, they are credit items like exports because they provide us with foreign currencies.

Details of the Balance of Payments

Balance on Current Account. The totality of items under section I in Table 27-1 is the **balance on current account**. This includes all items of income and outlay—imports and exports of goods and services, investment income, and transfer payments. The current-account balance is akin to the net income of a nation. It is conceptually similar to net exports in the national output accounts. In the past, many writers concentrated on the **trade balance**, which consists of merchandise imports and exports. The composition of merchandise imports and exports consists mainly of primary commodities (like food and fuels) and manufactured goods. In an earlier era, the mercantilists strove for a trade surplus (an excess of exports over imports), calling this a “favorable balance of trade.” They hoped to avoid an “unfavorable trade balance,” by which they meant a trade deficit (an excess of imports over exports). Even today, we find traces of mercantilism when nations seek to maintain trade surpluses.

Today, economists avoid this language because a trade deficit is not necessarily harmful. As we will see, the trade deficit is really a reflection of the imbalance between domestic investment and domestic saving. Often, a nation has a trade deficit because it has a low saving rate (perhaps because of a government deficit). It might also have a trade deficit because it has productive uses for domestic investment (as is the case for the United States). An opposite case of a trade surplus would arise when a country has high saving with few productive domestic investments for its saving (as, for example, Saudi Arabia, with vast oil revenues but meager investment opportunities).

In addition, *services* are increasingly important in international trade. Services consist of such items as shipping, financial services, and foreign travel. A third item in the current account is *investment income*, which includes the earnings on foreign investments (such as earnings on U.S. assets abroad). One of the major developments of the last two decades has

been the growth in services and investment income. A final element is transfers, which represent payments not in return for goods and services.

Table 27-2 presents a summary of the U.S. balance of international payments for 2007. Note its two main components: current account and financial account. Each item is listed by name in column (a). Credits are listed in column (b), while column (c) shows the debits. Column (d) then lists the net credits or debits; it shows a credit if on balance the item added to our stock of foreign currencies or a debit if the total subtracted from our foreign-currency supply.

In 2007, America’s merchandise exports led to credits of \$1149 billion. But at the same time, merchandise imports led to debits of \$1965 billion. The *net* difference was a merchandise trade deficit of \$815 billion. This trade deficit is listed in column (d). (Be sure you understand why the algebraic sign is shown as – rather than as +.) From the table we see that net services and net investment income were positive. The total current-account deficit including merchandise trade, services, investment income, and unilateral transfers was \$739 billion for 2007.

(We have omitted an additional item in the accounts called the capital account, which involves capital transfers. This item is extremely small and can be ignored in most circumstances.)

Financial Account. We have now completed our analysis of the current account. But how did the United States “finance” its \$739 billion current-account deficit in 2007? It must have either borrowed or reduced its foreign assets, for by definition, when you buy something, you must either pay for it or borrow for it. This identity means that *the balance of international payments as a whole must by definition show a final balance of zero*.

Financial-account transactions are asset transactions between Americans and foreigners. They occur, for example, when a Japanese pension fund buys U.S. government securities or when an American buys stock in a German firm.

Credits and debits are somewhat more complicated in the financial accounts. The general rule, which is drawn from double-entry business accounting, is this: Increases in a country’s assets and

U.S. Balance of Payments, 2007 (billions of dollars)			
(a) Items	(b) Credits (+)	(c) Debits (-)	(d) Net credits (+) or debits (-)
I. Current account			-739
a. Merchandise trade balance	1,149	-1,965	-815
b. Services	479	-372	107
c. Investment income	782	-708	74
d. Unilateral transfers			-104
II. Financial account [lending (-) or borrowing (+)]			739
a. Private borrowing or lending	1,451	-1,183	268
b. Government			
Official U.S. reserve assets, changes			-24
Foreign official assets in the U.S., changes			413
c. Statistical discrepancy			83
III. Sum of current and financial accounts			0

TABLE 27-2. Basic Elements of the U.S. Balance of Payments, 2007

Source: U.S. Bureau of Economic Analysis. Note that the totals may not equal the sum of the components because of rounding.

decreases in its liabilities are entered as debits; conversely, decreases in a country's assets and increases in its liabilities are entered as credits. A debit entry is represented by a negative (−) sign and a credit entry by a positive (+) sign.

You can usually get the right answer more easily if you remember this simplified rule: Think of the United States as exporting and importing stocks, bonds, or other securities. Then you can treat these exports and imports of securities like other exports and imports. When we borrow abroad, we are sending IOUs (in the form of Treasury bills or corporate stocks) abroad and getting foreign currencies. Is this a credit or a debit? Clearly, this is a credit because it brought foreign currencies into the United States.

Similarly, if U.S. banks lend abroad to finance a computer assembly plant in Mexico, the U.S. banks are importing IOUs from the Mexicans and the United States is losing foreign currencies; this is clearly a debit item in the U.S. balance of payments.

Line II shows that in 2007 the United States was a net *borrower*: we borrowed abroad more than we lent to foreigners. The United States was a net

exporter of IOUs (a net borrower) in the amount of \$739 billion.¹



The Paradox of Wealthy Borrowers

What is the typical pattern of surpluses and deficits of nations? You might think that poor countries would have higher productivity of capital and would therefore borrow from rich countries, while rich countries would have used up their investment opportunities and should therefore lend to poor countries.

Indeed, this pattern did hold for most of U.S. history. During the nineteenth century, the United States imported more than it exported. Europe lent the difference, which allowed the United States to build up its capital stock. The

¹ As with all economic statistics, the balance-of-payments accounts necessarily contain statistical errors (called the "statistical discrepancy"). These errors reflect the fact that many flows of goods and finance (from small currency transactions to the drug trade) are not recorded. We include the statistical discrepancy in line II(c) of Table 27-2.

United States was a typical young and growing debtor nation. From about 1873 to 1914, the U.S. balance of trade moved into surplus. Then, during World War I and World War II, America lent money to its allies England and France for war equipment and postwar relief needs. The United States emerged from the wars a creditor nation, with a surplus from earnings on foreign investments matched by a deficit on merchandise trade.

The pattern around the world is quite different today because of financial globalization. In an open financial world, the pattern of trade surpluses and deficits is largely determined by the balance of saving and investment. Table 27-3 shows a summary of the major regions today. This table shows that the pattern of lending and borrowing has virtually no relationship to levels of economic development but is primarily determined by saving and investment patterns. The most interesting situation on the list is that of the United States, which is a wealthy country borrowing abroad. We will explore the reasons for this paradox of wealthy borrowers in the next chapter.

B. THE DETERMINATION OF FOREIGN EXCHANGE RATES

FOREIGN EXCHANGE RATES

We are all familiar with domestic trade. When I buy Florida oranges or California computers, I naturally want to pay in dollars. Luckily, the orange grower and the computer manufacturer want payment in U.S. currency, so all trade can be carried out in dollars. Economic transactions within a country are relatively simple.

But suppose I am in the business of selling Japanese bicycles. Here, the transaction becomes more complicated. The bicycle manufacturer wants to be paid in Japanese currency rather than in U.S. dollars. Therefore, in order to import the Japanese bicycles, I must first buy Japanese yen (¥) and use those yen to pay the Japanese manufacturer. Similarly, if the Japanese want to buy U.S. merchandise, they must first obtain U.S. dollars. This new complication involves foreign exchange.

Foreign trade involves the use of different national currencies. The foreign exchange rate is the price of one currency in terms of another currency. The foreign exchange rate is determined in the

Current Account Balance (billions of dollars)	
Region	2007
Rich and low saving:	
United States	−739
Rich and high saving:	
Japan	211
Other rich countries	160
Resource-rich and diversifying:	
OPEC/Middle East	257
Russia	76
Poor and high saving:	
China	372
Poor and low saving:	
Sub-Saharan Africa	−25
Other	−45

TABLE 27-3. Pattern of Current Accounts around the World, 2007

The United States is the world's largest borrower with its low saving rate and stable investment climate. Important savers are rich and high-saving countries (such as Japan), resource-rich countries looking for financial diversification (such as Russia and OPEC countries), and poor and high-saving countries (such as China, which has a saving rate even higher than its high investment rate). The poorest countries do get some small net inflows.

Source: International Monetary Fund, *World Economic Outlook*, available online at www.imf.gov.

foreign exchange market, which is the market where different currencies are traded.

We begin with the fact that most major countries have their own currencies—the U.S. dollar, the Japanese yen, the Mexican peso, and so forth. (European countries are an exception in that they have a common currency, the Euro.) We follow the convention of measuring exchange rates, which we denote by the symbol e , as the amount of foreign currency that can be bought with 1 unit of the domestic currency. For example, the foreign exchange rate of the dollar might be 100 yen per U.S. dollar (¥100/\$).

When we want to exchange one nation's money for that of another, we do so at the relevant foreign exchange rate. For example, if you traveled to Mexico in the summer of 2008, you would have received

about 11 Mexican pesos for 1 U.S. dollar. There is a foreign exchange rate between U.S. dollars and the currency of every other country. In 2008, the foreign exchange rate per U.S. dollar was 0.68 Euro, 0.54 British pound, and 103 Japanese yen.

With foreign exchange, it is possible for me to buy a Japanese bicycle. Suppose its quoted price is 20,000 yen. I can look in the newspaper for the foreign exchange rate for yen. Suppose the rate is ¥100/\$. I could go to the bank to convert my \$200 into ¥20,000. With my Japanese money, I then can pay the exporter for my bicycle in the currency it wants.

You should be able to show what Japanese importers of American trucks have to do if they want to buy, say, a \$36,000 truck from an American exporter. Here yen must be converted into dollars. You will see that, when the foreign exchange rate is 100 yen per dollar, the truck costs them ¥3,600,000.

Businesses and tourists do not have to know anything more than this for their import or export transactions. But the economics of foreign exchange rates cannot be grasped until we analyze the forces underlying the supply and demand for foreign currencies and the functioning of the foreign exchange market.

The foreign exchange rate is the price of one currency in terms of another currency. We measure the foreign exchange rate (e) as the amount of foreign currency that can be bought with 1 unit of domestic currency:

$$e = \frac{\text{foreign currency}}{\text{domestic currency}} = \frac{\text{yen}}{\$} = \frac{\text{Euros}}{\$} = \dots$$

THE FOREIGN EXCHANGE MARKET

Like most other prices, foreign exchange rates vary from week to week and month to month according to the forces of supply and demand. The *foreign exchange market* is the market in which currencies of different countries are traded and foreign exchange rates are determined. Foreign currencies are traded at the retail level in many banks and firms specializing in that business. Organized markets in New York, Tokyo, London, and Zurich trade hundreds of billions of dollars of currencies each day.

We can use our familiar supply and demand curves to illustrate how markets determine the price

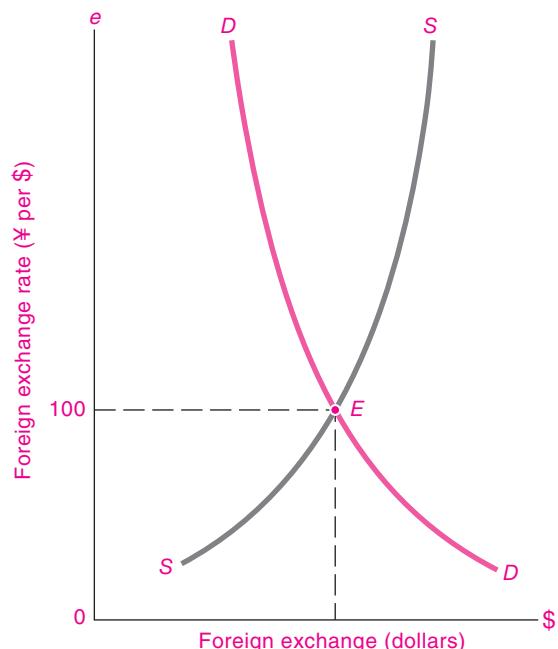


FIGURE 27-3. Exchange-Rate Determination

Behind the supplies and demands for foreign exchange lie purchases of goods, services, and financial assets. Behind the demand for dollars is the Japanese desire for American goods and investments. The supply of dollars comes from Americans desiring Japanese goods and assets. Equilibrium comes at E . If the foreign exchange rate were above E , there would be an excess supply of dollars. Unless the government bought this excess supply with official reserves, market forces would push the foreign exchange rate back down to balance supply and demand at E .

of foreign currencies. Figure 27-3 shows the supply and demand for U.S. dollars that arise in dealings with Japan.² The *supply* of U.S. dollars comes from people in the United States who need yen to purchase Japanese goods, services, or financial assets. The *demand* for dollars comes from people in Japan who buy U.S. goods, services, or investments and who, accordingly, need dollars to pay for these items. The price of foreign exchange—the foreign exchange rate—settles at that price where supply and demand are in balance.

² This is a simplified example in which we consider only the bilateral trade between Japan and the United States.

Let us first consider the supply side. The supply of U.S. dollars to the foreign exchange market originates when Americans need yen to buy Japanese automobiles, cameras, and other commodities, to vacation in Tokyo, and so forth. In addition, foreign exchange is required if Americans want to purchase Japanese assets, such as shares in Japanese companies. In short, *Americans supply dollars when they purchase foreign goods, services, and assets.*

In Figure 27-3, the vertical axis is the foreign exchange rate (e), measured in units of foreign currency per unit of domestic currency—that is, in yen per dollar, in Mexican pesos per dollar, and so forth. Make sure you understand the units here. The horizontal axis shows the quantity of dollars bought and sold in the foreign exchange market.

The supply of U.S. dollars is represented by the upward-sloping SS curve. The upward slope indicates that as the foreign exchange rate rises, the number of yen that can be bought per dollar increases. This means, with other things held constant, that the prices of Japanese goods fall relative to those of American goods. Hence, Americans will tend to buy more Japanese goods, and the supply of U.S. dollars therefore increases.

To see why the supply curve slopes upward, take the example of bicycles. If the foreign exchange rate were to rise from $\text{¥}100/\$$ to $\text{¥}200/\$$, the bicycle which costs $\text{¥}20,000$ would fall in price from $\$200$ to $\$100$. If other things are constant, Japanese bicycles would be more attractive, and Americans would sell more dollars in the foreign exchange market to buy more bicycles. Hence, the quantity supplied of dollars would be higher at a higher exchange rate.

What lies behind the demand for dollars (represented in Figure 27-3 by the DD demand curve)? Foreigners demand U.S. dollars when they buy American goods, services, and assets. For example, suppose a Japanese student buys an American economics textbook or takes a trip to the United States. She will require U.S. dollars to pay for these items. Or when Japan Airlines buys a Boeing 787 for its fleet, this transaction increases the demand for U.S. dollars. If Japanese pension funds invest in U.S. stocks, this would require a purchase of dollars. *Foreigners demand U.S. dollars to pay for their purchases of American goods, services, and assets.*

The demand curve in Figure 27-3 slopes downward to indicate that as the dollar's value falls

(and the yen therefore becomes more expensive), Japanese residents will want to buy more foreign goods, services, and investments. They will therefore demand more U.S. dollars in the foreign exchange market. Consider what happens when the foreign exchange rate on the dollar falls from $\text{¥}100/\$$ to $\text{¥}50/\$$. American computers, which had sold at $\$2000 \times (\text{¥}100/\$) = \text{¥}200,000$ now sell for only $\$2000 \times (\text{¥}50/\$) = \text{¥}100,000$. Japanese purchasers will therefore tend to buy more American computers, and the quantity demanded of U.S. foreign exchange will increase.

Market forces move the foreign exchange rate up or down to balance the supply and demand. The price will settle at the *equilibrium foreign exchange rate*, which is the rate at which the dollars willingly bought just equal the dollars willingly sold.

The balance of supply and demand for foreign exchange determines the foreign exchange rate of a currency. At the market exchange rate of 100 yen per dollar shown at point E in Figure 27-3, the exchange rate is in equilibrium and has no tendency to rise or fall.

We have discussed the foreign exchange market in terms of the supply and demand for dollars. But in this market, there are two currencies involved, so we could just as easily analyze the supply and demand for Japanese yen. To see this, you should sketch a supply-and-demand diagram with yen foreign exchange on the horizontal axis and the yen rate ($\$/\text{¥}$) on the vertical axis. If $\text{¥}100/\$$ is the equilibrium looking from the point of view of the dollar, then $\$0.01/\text{¥}$ is the *reciprocal exchange rate*. As an exercise, go through the analysis in this section for the reciprocal market. You will see that in this simple bilateral world, for every point made about dollars there is an exact yen counterpart: supply of dollars is demand for yen; demand for dollars is supply of yen.

There is just one further extension necessary to get to actual foreign exchange markets. In reality, there are many different currencies. We therefore need to find the supplies and demands for each and every currency. And in a world of many nations, it is the many-sided exchange and trade relationships, with demands and supplies coming from all parts of the globe, that determine the entire array of foreign exchange rates.



Terminology for Exchange-Rate Changes

Foreign exchange markets have a special vocabulary. By definition, a fall in the price of one currency in terms of one or all others is called a *depreciation*. A rise in the price of a currency in terms of another currency is called an *appreciation*. In our example above, when the price of the dollar rose from ¥100/\$ to ¥200/\$, the dollar appreciated. We also know that the yen depreciated.

In the supply-and-demand diagram for U.S. dollars, a fall in the foreign exchange rate (e) is a depreciation of the U.S. dollar, and a rise in e represents an appreciation.

A different set of terms is used when a currency has a fixed exchange rate. When a country lowers the official price of its currency in the market, this is called a *devaluation*. A *revaluation* occurs when the official foreign exchange rate is raised.

For example, in December 1994 Mexico devalued its currency when it lowered the official price or parity of the peso from 3.5 pesos per dollar to 3.8 pesos per dollar. Mexico soon found it could not defend the new parity and “floated” its exchange rate. At that point, the peso fell, or depreciated, even further.

When a country's currency falls in value relative to that of another country, we say that the domestic currency has undergone a **depreciation while the foreign currency has undergone an **appreciation**.**

When a country's official foreign exchange rate is lowered, we say that the currency has undergone a **devaluation**. An increase in the official foreign exchange rate is called a **revaluation**.

Effects of Changes in Trade

What would happen if there were changes in foreign exchange demand? For example, if Japan has a recession, its demand for imports declines. As a result, the demand for American dollars would decrease. The result is shown in Figure 27-4. The decline in purchases of American goods, services, and investments decreases the demand for dollars in the market. This change is represented by a leftward shift in the demand curve. The result will be a lower foreign exchange rate—that is, the dollar will depreciate and the yen will appreciate. At the lower exchange rate, the quantity of dollars supplied by Americans to the market will decrease because Japanese goods are now more expensive. Moreover, the

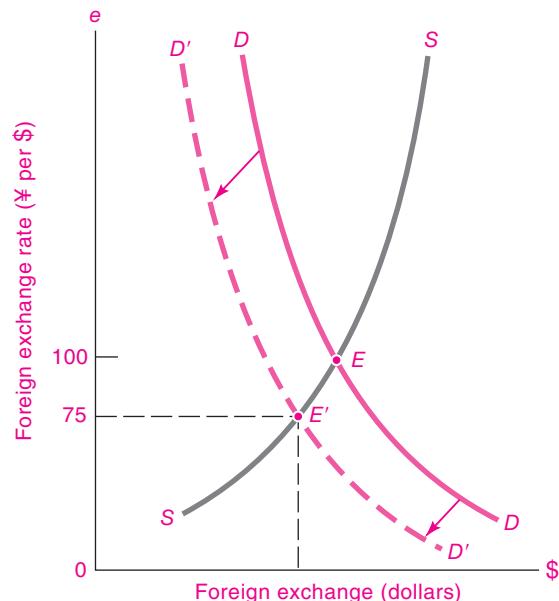


FIGURE 27-4. A Decrease in Demand for Dollars Leads to Dollar Depreciation

Suppose that a recession or deflation in Japan reduces the Japanese demand for dollars. This would shift the demand for dollars to the left from DD to $D'D'$. The exchange rate of the dollar depreciates, while the yen appreciates. Why would the new exchange rate discourage American purchases of Japanese goods?

quantity of dollars demanded by the Japanese will decline because of the recession. How much will exchange rates change? Just enough so that the supply and demand are again in balance. In the example shown in Figure 27-4, the dollar has depreciated from ¥100/\$ to ¥75/\$.

In today's world, exchange rates often react to changes involving the financial account. Suppose that the Federal Reserve raises U.S. interest rates. This would make U.S. dollar assets more attractive than foreign assets as dollar interest rates rise relative to interest rates on foreign securities. As a result, the demand for dollars increases and the dollar appreciates. This sequence is shown in Figure 27-5.

Exchange Rates and the Balance of Payments

What is the connection between exchange rates and adjustments in the balance of payments? In the simplest case, assume that exchange rates are

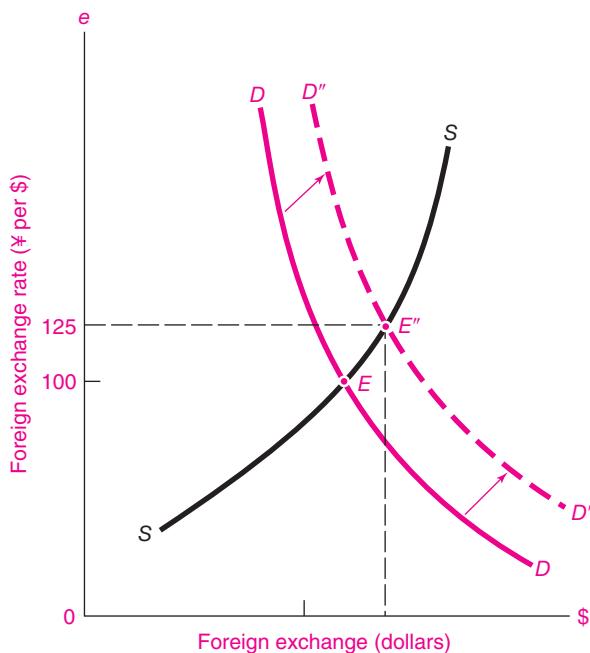


FIGURE 27-5. Monetary Tightening Increases Demand for Dollars and Produces Dollar Appreciation

Monetary policy can affect the exchange rate through the financial account. If the Federal Reserve raises dollar interest rates, this induces investors into dollar securities and raises the demand for dollar foreign exchange. The result is an appreciation of the dollar. (Explain why this leads to depreciation of the Euro.)

continued until the financial and current accounts were back in balance.

Such a change in the foreign exchange rate has an important effect on trade flows. As the German mark appreciated, German goods became more expensive in foreign markets and foreign goods became less expensive in Germany. This led to a decrease in German exports and an increase in German imports. As a result, the trade balance moved toward deficit. The current-account deficit was the counterpart of the financial-account surplus induced by the higher interest rates.

Exchange-rate movements serve as a balance wheel to remove disequilibria in the balance of payments.

Purchasing-Power Parity and Exchange Rates

In the short run, market-determined exchange rates are highly volatile in response to monetary policy, political events, and changes in expectations. But over the longer run, exchange rates are determined primarily by the relative prices of goods in different countries. An important implication is the *purchasing-power-parity (PPP) theory of exchange rates*. Under this theory, a nation's exchange rate will tend to equalize the cost of buying traded goods at home with the cost of buying those goods abroad.

The PPP theory can be illustrated with a simple example. Suppose the price of a market basket of goods (automobiles, jewelry, oil, food, and so forth) costs \$1000 in the United States and 10,000 pesos in Mexico. At an exchange rate of 100 pesos to a dollar, this bundle would cost \$100 in Mexico. Given these relative prices and the free trade between the two countries, we would expect to see American firms and consumers streaming across the border to take advantage of the lower Mexican prices. The result would be higher imports from Mexico and an increased demand for Mexican pesos. That would cause the Mexican peso to appreciate relative to the U.S. dollar, so you would need more dollars to buy the same number of pesos. As a result, the prices of the Mexican goods *in dollar terms* would rise even though the prices in pesos have not changed.

Where would this process end? Assuming that domestic prices are unchanged, it would end when the peso's exchange rate falls to 10 pesos to the dollar. Only at this exchange rate would the price of the

determined by private supply and demand with no government intervention. Consider what happened in 1990 after German unification when the German central bank decided to raise interest rates to curb inflation. After the monetary tightening, foreigners moved some of their assets into German marks to benefit from high German interest rates. This produced an excess demand for the German mark at the old exchange rate. In other words, at the old foreign exchange rate, people were, on balance, buying German marks and selling other currencies. (You can redraw Figure 27-5 to show this situation.)

Here is where the exchange rate plays its role as equilibrator. As the demand for German marks increased, it led to an appreciation of the German mark and a depreciation of other currencies, such as the U.S. dollar. The movement in the exchange rate

market basket of goods be equal in the two countries. At 10 pesos to the dollar, we say that the currencies have equal purchasing power in terms of the traded goods. (You can firm up your understanding of this discussion by calculating the price of the market basket in both Mexican pesos and U.S. dollars before and after the appreciation of the peso.)

The PPP doctrine also holds that countries with high inflation rates will tend to have depreciating currencies. For example, if Country A's inflation rate is 10 percent while inflation in Country B is 2 percent, the currency of Country A will tend to depreciate relative to that of Country B by the difference in the inflation rates, that is, 8 percent annually. Alternatively, let's say that runaway inflation leads to a hundredfold rise of prices in Russia over the course of a year, while prices in the United States are unchanged. According to the PPP theory, the Russian ruble should depreciate by 99 percent in order to bring the prices of American and Russian goods back into equilibrium.

We should caution that the PPP theory only approximates and cannot predict the precise movements in the exchange rate. One reason it does not hold exactly is that many of the goods and services covered in price indexes are not traded. For example, if the PPP uses the consumer price index, then we must take into account that housing is a nontraded service and that the prices for housing of comparable quality can vary greatly over space. Additionally, even for traded goods, there is no "law of one price" that applies uniformly to all goods. If you look at the price of the same item on amazon.com and amazon.co.uk, you will find that (even after applying the current exchange rate) the price is usually different. Price differences for the same good can arise because of tariffs, taxes, and transportation costs. In addition, financial flows can overwhelm the effects of prices in the short run. Therefore, while the PPP theory is a useful guide to exchange rates in the long run, exchange rates can diverge from their PPP levels for many years.



PPP and the Size of Nations

By any measure, the United States still has the largest economy in the world. But which country has the second largest? Is it Japan, Germany, Russia, or some other country? You would think this would be an easy question to answer, like

measuring height or weight. The problem, however, is that Japan totes up its national output in yen, while Russia's national output is given in rubles, and America's is in dollars. To be compared, they all need to be converted into the same currency.

The customary approach is to use the market exchange rate to convert each currency into dollars, and by that yardstick Japan has the second-largest economy. However, there are two difficulties with using the market rate. First, because market rates can rise and fall sharply, the "size" of countries might change by 10 or 20 percent overnight. Moreover, the use of market exchange rates tends to underestimate the national output of low-income countries.

Today, economists generally prefer to use PPP exchange rates to compare living standards in different countries. The difference between market exchange rates and PPP exchange rates can be dramatic, as Figure 27-6 shows. When market exchange rates are used, the incomes and outputs of low-income countries like China and India tend to be understated. This understatement occurs because a substantial part of the output of such countries comes from labor-intensive services, which are usually extremely inexpensive in low-wage countries. Hence, when we calculate PPP exchange rates including the prices of nontraded goods, the GDPs of low-income countries rise relative to those of high-income countries. For example, when PPP exchange rates are used, China's GDP is 2.3 times the level calculated using market exchange rates.

C. THE INTERNATIONAL MONETARY SYSTEM

While the simple supply-and-demand diagrams for the foreign exchange market explain the major determinants, they do not capture the drama and central importance of the international monetary system. We saw crisis after crisis in international finance—in Europe in 1991–1992, in Mexico and Latin America in 1994–1995, in East Asia and Russia in 1997–1998, and then back to Latin America in 1998–2002.

What is the **international monetary system**? This term denotes the institutions under which payments



FIGURE 27-6. PPP Calculations Change the Relative Sizes of Nations' Economies, 2006

Using PPP exchange rates instead of market exchange rates changes the economic ranking of nations. After correcting for the purchasing power of incomes, China moves from being the fourth largest to being the second largest. Note that points along the 45° line are ones for which GDPs calculated using the two exchange rates are equal. Points above the line, such as China, are ones for which the PPP estimates of GDP are above those estimated using market exchange rates. Japan is below the line because relative prices in Japan are high due to high rents and trade barriers.

Source: World Bank. Note that outputs are shown on a ratio scale.

are made for transactions that cross national boundaries. In particular, the international monetary system determines how foreign exchange rates are set and how governments can affect exchange rates.

The importance of the international monetary system was well described by economist Robert Solomon:

Like the traffic lights in a city, the international monetary system is taken for granted until it begins to malfunction and to disrupt people's lives. . . . A well-functioning monetary system will facilitate international trade and investment and smooth adaptation to change. A monetary system that functions poorly may not only discourage the development of trade and investment among nations but subject their economies to disruptive shocks when necessary adjustments to change are prevented or delayed.

The central element of the international monetary system involves the arrangements by which

exchange rates are set. In recent years, nations have used one of three major exchange-rate systems:

- A system of fixed exchange rates
- A system of flexible or floating exchange rates, where exchange rates are determined by market forces
- Managed exchange rates, in which nations intervene to smooth exchange-rate fluctuations or to move their currency toward a target zone

FIXED EXCHANGE RATES: THE CLASSICAL GOLD STANDARD

At one extreme is a system of **fixed exchange rates**, where governments specify the exact rate at which dollars will be converted into pesos, yen, and other currencies. Historically, the most important fixed-exchange-rate system was the **gold standard**, which

was used off and on from 1717 until 1936. In this system, each country defined the value of its currency in terms of a fixed amount of gold, thereby establishing fixed exchange rates among the countries on the gold standard.³

The functioning of the gold standard can be seen easily in a simplified example. Suppose people everywhere insisted on being paid in bits of pure gold metal. Then buying a bicycle in Britain would merely require payment in gold at a price expressed in ounces of gold. By definition there would be no foreign-exchange-rate problem. Gold would be the common world currency.

This example captures the essence of the gold standard. Once gold became the medium of exchange or money, foreign trade was no different from domestic trade; everything could be paid for in gold. The only difference between countries was that they could choose different *units* for their gold coins. Thus, Queen Victoria chose to make British coins about $\frac{1}{4}$ ounce of gold (the pound) and President McKinley chose to make the U.S. unit $\frac{1}{20}$ ounce of gold (the dollar). In that case, the British pound, being 5 times as heavy as the dollar, had an exchange rate of \$5/£1.

This was the essence of the gold standard. In practice, countries tended to use their own coins. But anyone was free to melt down coins and sell them at the going price of gold. So exchange rates were fixed for all countries on the gold standard. The exchange rates (also called “par values” or “parities”) for different currencies were determined by the gold content of their monetary units.

Hume’s Adjustment Mechanism

The purpose of an exchange-rate system is to promote international trade and finance while facilitating adjustment to shocks. How exactly does the *international adjustment mechanism* function? What happens if a country’s wages and prices rise so sharply that its goods are no longer competitive in the world market? Under flexible exchange rates, the country’s

exchange rate could depreciate to offset the domestic inflation. But under fixed exchange rates, equilibrium must be restored by deflation at home or inflation abroad.

Let’s examine the international adjustment mechanism under a fixed-exchange-rate system with two countries, America and Britain. Suppose that American inflation has made American goods uncompetitive. Consequently, America’s imports rise and its exports fall. It therefore runs a trade deficit with Britain. To pay for its deficit, America would have to ship gold to Britain. Eventually—if there were no adjustments in either America or Britain—America would run out of gold.

In fact, an automatic adjustment mechanism does exist, as was demonstrated by the British philosopher David Hume in 1752. He showed that the outflow of gold was part of a mechanism that tended to keep international payments in balance. His argument, though nearly 250 years old, offers important insights for understanding how trade flows get balanced in today’s economy.

Hume’s explanation rested in part upon the quantity theory of prices, which is a theory of the overall price level that is analyzed in macroeconomics. This doctrine holds that the overall price level in an economy is proportional to the supply of money. Under the gold standard, gold was an important part of the money supply—either directly, in the form of gold coins, or indirectly, when governments used gold as backing for paper money.

What would be the impact of a country’s losing gold? First, the country’s money supply would decline either because gold coins would be exported or because some of the gold backing for the currency would leave the country. Putting both these consequences together, a loss of gold leads to a reduction in the money supply. According to the quantity theory, the next step is that prices and costs would change proportionally to the change in the money supply. If the United States loses 10 percent of its gold to pay for a trade deficit, the quantity theory predicts that U.S. prices, costs, and incomes would fall 10 percent. In other words, the economy would experience a deflation.

³ Why was gold used as the standard of exchange and means of payment, rather than some other commodity? Certainly other materials could have been used, but gold had the advantages of being in limited supply, being relatively indestructible, and having few industrial uses. Can you see why wine, wheat, or cattle would not be a useful means of payment among countries?

The Four-Pronged Mechanism. Now consider Hume’s theory of international payments equilibrium. Suppose that America runs a large trade deficit and

begins to lose gold. According to the quantity theory of prices, this loss of gold reduces America's money supply, driving down America's prices and costs. As a result, (1) America decreases its imports of British and other foreign goods, which have become relatively expensive; and (2) because America's domestically produced goods have become relatively inexpensive on world markets, America's exports increase.

The opposite effect occurs in Britain and other foreign countries. Because Britain's exports are growing

rapidly, it receives gold in return. Britain's money supply therefore increases, driving up British prices and costs according to the quantity theory. At this point, two more prongs of the Hume mechanism come into play: (3) British and other foreign exports have become more expensive, so the volume of goods exported to America and elsewhere declines; and (4) British citizens, faced with a higher domestic price level, now import more of America's low-priced goods.

Figure 27-7 illustrates the logic in Hume's mechanism. Make sure you can follow the logical chain from

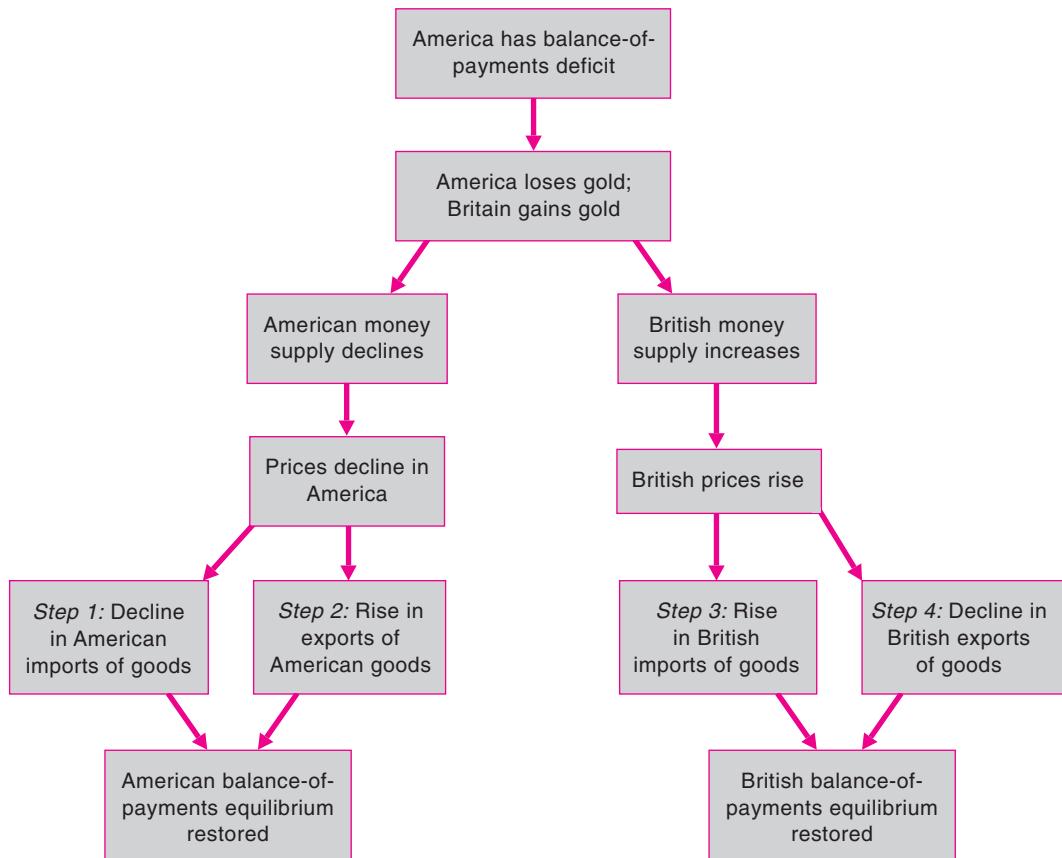


FIGURE 27-7. Hume's Four-Pronged International Adjustment Mechanism

Hume explained how a balance-of-payments disequilibrium would automatically produce equilibrating adjustments under a gold standard. Trace the lines from the original disequilibrium at the top through the changes in prices to the restored equilibrium at the bottom. This mechanism works in modified form under any fixed-exchange-rate system. Modern economics augments the mechanism by replacing the fourth row with "Prices, output, and employment decline in America" and "Prices, output, and employment rise in Britain."

the original deficit at the top through the adjustment to the new equilibrium at the bottom.

The result of Hume's four-pronged gold-flow mechanism is an improvement in the balance of payments of the country losing gold and a worsening in that of the country gaining gold. In the end, an equilibrium of international trade and finance is reestablished at new relative prices, which keep trade and international lending in balance with no net gold flow. This equilibrium is a stable one and requires no tariffs or other government intervention.

Updating Hume to Modern Macroeconomics

Hume's theories are no longer completely relevant today. We do not have a gold standard, and the quantity theory of prices is no longer used to explain price movements. However, the basis of Hume's theory can be reinterpreted in the light of modern macroeconomics. The essence of Hume's argument is to explain the adjustment mechanism for imbalances between countries under a fixed exchange rate. The fixed exchange rate might be a gold standard (as existed before 1936), a dollar standard (as under the Bretton Woods system from 1945 to 1971), or a Euro standard (among European Union countries today).

If exchange rates are not free to move when the prices or incomes of different countries get out of line, then *domestic output and prices must adjust to restore equilibrium*. If, under a fixed exchange rate, domestic prices become too high relative to import prices, full adjustment can come only when domestic prices fall. This will occur when domestic output falls sufficiently so that the country's price level will decline relative to world prices. At that point, the country's balance of payments will return to equilibrium. Suppose that Greece's prices rise too far above those in the rest of the European Union and it becomes uncompetitive in the market. Greece will find its exports declining and its imports rising, lowering net exports. Eventually, as wages and prices in Greece decline relative to those in the rest of Europe, Greece will once again be competitive and will be able to restore full employment.

When a country adopts a fixed exchange rate, it faces an inescapable fact: Domestic real output and employment must adjust to ensure that the country's relative prices are aligned with those of its trading partners.

INTERNATIONAL MONETARY INSTITUTIONS AFTER WORLD WAR II

In the early part of the twentieth century, even nations which were ostensibly at peace engaged in debilitating trade wars and competitive devaluations. After World War II, international institutions were developed to foster economic cooperation among nations. These institutions continue to be the means by which nations coordinate their economic policies and seek solutions to common problems.

The United States emerged from World War II with its economy intact—able and willing to help rebuild the countries of friends and foes alike. The postwar international political system responded to the needs of war-torn nations by establishing durable institutions that facilitated the quick recovery of the international economy. The major international economic institutions of the postwar period were the General Agreement on Tariffs and Trade (rechartered as the World Trade Organization in 1995), the Bretton Woods exchange-rate system, the International Monetary Fund, and the World Bank. These four institutions helped the industrial democracies rebuild themselves and grow rapidly after the devastation of World War II, and they continue to be the major international institutions today.

The International Monetary Fund

An integral part of the Bretton Woods system was the establishment of the International Monetary Fund (or IMF), which still administers the international monetary system and operates as a central bank for central banks. Member nations subscribe by lending their currencies to the IMF; the IMF then relends these funds to help countries in balance-of-payments difficulties. The main function of the IMF is to make temporary loans to countries which have balance-of-payments problems or are under speculative attack in financial markets.

The World Bank

Another international financial institution created after World War II was the World Bank. The Bank is capitalized by high-income nations that subscribe in proportion to their economic importance in terms of GDP and other factors. The Bank makes long-term low-interest loans to countries for projects which are

economically sound but which cannot get private-sector financing. As a result of such long-term loans, goods and services flow from advanced nations to developing countries.

The Bretton Woods System

After World War II, governments were determined to replace the gold standard with a more flexible system. They set up the **Bretton Woods system**, which was a system with fixed exchange rates. The innovation here was that exchange rates were *fixed but adjustable*. When one currency got too far out of line with its appropriate or “fundamental” value, the parity could be adjusted.

The Bretton Woods system functioned effectively for the quarter-century after World War II. The system eventually broke down when the dollar became overvalued. The United States abandoned the Bretton Woods system in 1973, and the world moved into the modern era.



How to Ensure a Credibly Fixed Exchange Rate through the “Hard Fix”

Although the collapse of the Bretton Woods system marked the end of a predominantly fixed exchange-rate system, many countries continue to opt for fixed exchange rates. A recurrent problem with fixed-exchange-rate systems is that they are prey to speculative attacks when the country runs low on foreign exchange reserves. (We will return to this problem in the next chapter.) How can countries improve the credibility of their fixed-exchange-rate systems? Are there “hard” fixed-exchange-rate systems that will better withstand speculative attacks?

Specialists in this area emphasize the importance of establishing credibility. In this instance, credibility may be enhanced by creating a system that would actually make it *hard* for the country to change its exchange rate. This approach is similar to a military strategy of burning the bridges behind the army so that there is no retreat and the soldiers will have to fight to the death. Indeed, Argentina’s president tried to instill credibility in Argentina’s system by proclaiming that he would choose “death before devaluation.”

One solution is to create **currency boards**. A currency board is a monetary institution that issues only currency that is fully backed by foreign assets in a key foreign currency, usually the U.S. dollar or the Euro. A currency board defends an exchange rate that is

fixed by law rather than just by policy, and the currency board is usually independent, and sometimes even private. Under currency boards, a payments deficit will generally trigger Hume’s automatic adjustment mechanism. That is, a balance-of-payments deficit will reduce the money supply, leading to an economic contraction, eventually reducing domestic prices and restoring equilibrium. A currency board system has worked effectively in Hong Kong, but the system in Argentina was unable to withstand economic and political turmoil and collapsed in 2002.

A fixed exchange rate is even more credible when countries adopt a **common currency** through monetary union. The United States has had a common currency since 1789. The most important recent example is the Euro, which has been adopted by 15 countries of the European Union. This is a most unusual arrangement because the currency joins together many powerful sovereign countries. From a macroeconomic point of view, a common currency is the hardest fix of all because the currencies of the different countries are all defined to be the same. A variant of this approach is called “dollarization,” which occurs when a country (usually a small one) adopts a key currency for its own money. About a dozen small countries, such as El Salvador, have gone this route.

Fixed exchange rates have fallen out of favor among large countries. Only China continues to use a fixed exchange rate, and it is under intense pressure from other countries to allow the yuan to float. Aside from China, every large region of the world has adopted some variant of flexible exchange rates, which we will analyze shortly.

Intervention

When a government fixes its exchange rate, it must “intervene” in foreign exchange markets to maintain the rate. Government exchange-rate **intervention** occurs when the government buys or sells foreign exchange to affect exchange rates. For example, the Japanese government on a given day might buy \$1 billion worth of Japanese yen with U.S. dollars. This would cause a rise in value, or an appreciation, of the yen.

Let’s take the case of China. China is the last major country to operate under a fixed exchange rate. The official exchange rate in 2008 was \$0.144 per yuan. However, at that exchange rate, China had an enormous current-account surplus, as Table 27-3 on page 548 shows. China has used a strategy of export-led growth, and this requires a below-market

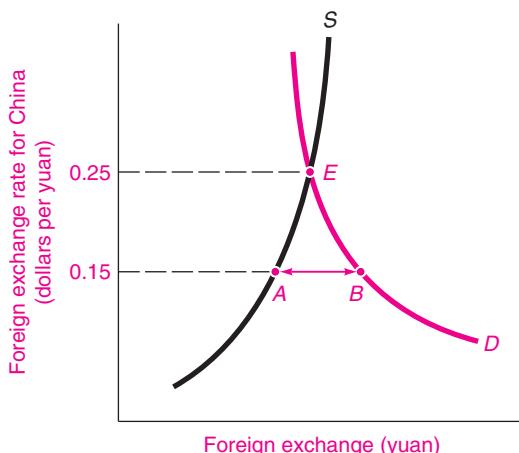


FIGURE 27-8. Chinese Government Intervenes to Maintain Fixed Exchange Rates

Because China has established a fixed exchange rate, it must intervene in the foreign exchange market to defend its established rate. Assume that the market equilibrium without intervention would be \$0.25 per yuan, shown as point *E* at the intersection of market supply and demand. However, the government has established an official exchange rate of \$0.15 per yuan. At that lower rate, there is excess demand for yuan, shown by the segment *AB*. (Make sure you understand why this is excess demand.) The Chinese government therefore sells a quantity of yuan, shown by the segment *AB*, to keep its exchange rate from appreciating.

exchange rate to make its exports so competitive. So while American and European policymakers have been urging China to revalue its currency, China has insisted that it will continue with its current fixed exchange-rate policy.

How exactly does China maintain this system? Figure 27-8 illustrates the mechanism. Let us assume that the forces of supply and demand would lead to an equilibrium at point *E*, with a market-determined exchange rate of \$0.25 per yuan. At the fixed exchange rate of \$0.15 per yuan, the yuan is “undervalued” relative to the market-determined rate. What can the Chinese government do to keep the yuan below its market value?

- One approach is to intervene by *buying dollars and selling yuan*. In this approach, if China’s central bank sells a quantity of yuan shown by the segment *AB*, this will increase the supply of yuan to match the quantity demanded and maintain the official exchange rate.

- An alternative would be to use monetary policy. China could *induce the private sector to increase its supply of yuan* by lowering interest rates. Lower interest rates would make dollar investments relatively more attractive and yuan investments relatively less attractive. This would lead investors to sell yuan and shift the yuan supply curve to the right so that it would pass through point *B* and produce the desired exchange rate. (You can pencil in a new *S'* curve that would lead to the induced equilibrium.)

These two operations are not really as different as they sound. In one case, the Chinese government sells yuan and buys dollars; in the other case, the private sector does the same. Both approaches involve monetary expansion. Indeed, we will see that one of the complications of managing an open economy with a fixed exchange rate is that the need to use monetary policy to manage the exchange rate can collide with the desire to use monetary policy to stabilize the domestic business cycle.

FLEXIBLE EXCHANGE RATES

The international monetary system for major countries today relies primarily on **flexible exchange rates**. (Another term often used is **floating exchange rates**, which means the same thing.) Under this system, exchange rates are determined by supply and demand. Here, the government neither announces an official exchange rate nor takes steps to enforce one, and the changes in exchange rates are determined primarily by private supply of and demand for goods, services, and investments.

As noted above, virtually all large and medium-sized countries except China rely upon flexible exchange rates. We can use the example of Mexico to illustrate how such a system works. In 1994, the peso was under attack in foreign exchange markets, and the Mexicans allowed the peso to float. At the original exchange rate of approximately 4 pesos per U.S. dollar, there was an excess supply of pesos. This meant that at that exchange rate, the supply of pesos by Mexicans who wanted to buy American and other foreign goods and assets outweighed the demand for pesos by Americans and others who wanted to purchase Mexican goods and assets.

What was the outcome? As a result of the excess supply, the peso depreciated relative to the dollar. How far did the exchange rates move? Just far enough so that—at the depreciated exchange rate of about 6 pesos to the dollar—the quantities supplied and demanded were balanced.

What is behind the equilibration of supply and demand? Two main forces are involved: (1) With the dollar more expensive, it costs more for Mexicans to buy American goods, services, and investments, causing the supply of pesos to fall off in the usual fashion. (2) With the depreciation of the peso, Mexican goods and assets become less expensive for foreigners. This increases the demand for pesos in the marketplace. (Note that this simplified discussion assumes that all transactions occur only between the two countries; a more complete discussion would involve the demands and supplies of currencies from all countries.)

TODAY'S HYBRID SYSTEM

Unlike the earlier uniform system under either the gold standard or Bretton Woods, today's exchange-rate system fits into no tidy mold. Without anyone's having planned it, the world has moved to a hybrid exchange-rate system. The major features are as follows:

- A few countries allow their currencies to *float freely*. In this approach, a country allows markets to determine its currency's value and it rarely intervenes. The United States has fit this pattern for most of the last three decades. While the Euro is just an infant as a common currency, Europe is clearly in the freely floating group.
- Some major countries have *managed but flexible* exchange rates. Today, this group includes Canada, Japan, and many developing countries. Under this system, a country will buy or sell its

currency to reduce the day-to-day volatility of currency fluctuations. In addition, a country will sometimes engage in systematic intervention to move its currency toward what it believes to be a more appropriate level.

- A few small countries and China peg their currencies to a major currency or to a "basket" of currencies in a *fixed exchange rate*. Sometimes, the peg is allowed to glide smoothly upward or downward in a system known as a gliding or crawling peg. A few countries have the hard fix of a currency board, and others set their currencies equal to the dollar in a process called dollarization.
- In addition, almost all countries tend to intervene either when markets become "disorderly" or when exchange rates seem far out of line with the "fundamentals"—that is, when they are highly inappropriate for existing price levels and trade flows.

Concluding Thoughts

The world has made a major transition in its international financial system over the last three decades. In earlier periods, most currencies were linked together in a system of fixed exchange rates, with parities linked either to gold or to the dollar. Today, with the exception of China, all major countries have flexible exchange rates. This new system has the disadvantage that exchange rates are volatile and can deviate greatly from underlying economic fundamentals. But this system also has the advantage of reducing the perils of speculation that undermined earlier fixed-rate systems. Even more important in a world of increasingly open financial markets is that flexible exchange rates allow countries to pursue monetary policies designed to stabilize domestic business cycles. It is this macroeconomic advantage that most economists find most important about the new regime.



SUMMARY

A. The Balance of International Payments

1. The balance of international payments is the set of accounts that measures all the economic transactions between a nation and the rest of the world. It includes exports and imports of goods, services, and financial

instruments. Exports are credit items, while imports are debits. More generally, credit items are transactions that increase a country's holdings of foreign currencies; debit items are ones that reduce its holdings of foreign currencies.

- 2.** The major components of the balance of payments are:
- I. Current account (merchandise trade, services, investment income, transfers)
 - II. Financial account (private, government, and official reserve changes)

The fundamental rule of balance-of-payments accounting is that the sum of all items must equal zero: $I + II = 0$

B. The Determination of Foreign Exchange Rates

3. International trade and finance involve the new element of different national currencies, which are linked by relative prices called foreign exchange rates. When Americans import Japanese goods, they ultimately need to pay in Japanese yen. In the foreign exchange market, Japanese yen might trade at ¥100/\$ (or, reciprocally, ¥1 would trade for \$0.01). This price is called the foreign exchange rate.
4. In a foreign exchange market involving only two countries, the supply of U.S. dollars comes from Americans who want to purchase goods, services, and investments from Japan; the demand for U.S. dollars comes from Japanese who want to import commodities or financial assets from America. The interaction of these supplies and demands determines the foreign exchange rate. More generally, foreign exchange rates are determined by the complex interplay of many countries buying and selling among themselves. When trade or financial flows change, supply and demand shift and the equilibrium exchange rate changes.
5. A fall in the market price of a currency is a depreciation; a rise in a currency's value is called an appreciation. In a system where governments announce official foreign exchange rates, a decrease in the official exchange rate is called a devaluation, while an increase is a revaluation.
6. According to the purchasing-power-parity (PPP) theory of exchange rates, exchange rates tend to move with

changes in relative price levels of different countries. The PPP theory applies better to the long run than the short run. When this theory is applied to measure the purchasing power of incomes in different countries, it raises the per capita outputs of low-income countries.

C. The International Monetary System

7. A well-functioning international economy requires a smoothly operating exchange-rate system, which denotes the institutions that govern financial transactions among nations. Two important exchange-rate systems are (a) flexible exchange rates, in which a country's foreign exchange rate is determined by market forces of supply and demand; and (b) fixed exchange rates, such as the gold standard or the Bretton Woods system, in which countries set and defend a given structure of exchange rates.
8. Classical economists like David Hume explained international adjustments to trade imbalances by the gold-flow mechanism. Under this process, gold movements would change the money supply and the price level. For example, a trade deficit would lead to a gold outflow and a decline in domestic prices that would (a) raise exports and (b) curb imports of the gold-losing country while (c) reducing exports and (d) raising imports of the gold-gaining country. This mechanism shows that under fixed exchange rates, countries which have balance-of-payments problems must adjust through changes in domestic price and output levels.
9. After World War II, countries created a group of international economic institutions to organize international trade and finance. Under the Bretton Woods system, countries "pegged" their currencies to the dollar and to gold, providing fixed but adjustable exchange rates. After the Bretton Woods system collapsed in 1973, it was replaced by today's hybrid system. Today, virtually all large and medium-sized countries (except China) have flexible exchange rates.

CONCEPTS FOR REVIEW

Balance of Payments

- balance of payments
- I. current account
 - II. financial account
- balance-of-payments identity:
 $I + II = 0$
- debits and credits

Foreign Exchange Rates

- foreign exchange rate, foreign exchange market
- supply of and demand for foreign exchange
- exchange-rate terminology:
- appreciation and depreciation
 - revaluation and devaluation

International Monetary System

- exchange-rate systems:
- flexible
 - fixed rates (gold standard, Bretton Woods, currency board)
 - common currency
- international adjustment mechanism
- Hume's four-pronged gold-flow mechanism

FURTHER READING AND INTERNET WEBSITES

Further Reading

A fascinating collection of essays on international macroeconomics is Paul Krugman, *Pop International* (MIT Press, Cambridge, Mass., 1997). The quotation on the international monetary system is from Robert Solomon, *The International Monetary System, 1945–1981: An Insider's View* (Harper & Row, New York, 1982), pp. 1, 7.

Websites

Data on trade and finance for different countries can be found in the websites listed for Chapter 26.

Some of the best popular writing on international economics is found in *The Economist*, which is available on the Web at www.economist.com. One of the best sources for policy writing on international economics is www.ite.com/homepage.htm, the website of the Peterson Institute for International Economics. One of the leading scholar-journalists of today is Paul Krugman of Princeton. His blog at krugman.blogs.nytimes.com contains many interesting readings on international economics.

QUESTIONS FOR DISCUSSION

- Table 27-4 shows some foreign exchange rates (in units of foreign currency per dollar) as of late 2008. Fill in the last column of the table with the reciprocal price of the dollar in terms of each foreign currency, being especially careful to write down the relevant units in the parentheses.
 - Describe and draw the reciprocal supply and demand schedules for Japanese yen. Explain why the supply of yen is equivalent to the demand for dollars. Also explain and draw the schedule that corresponds to the supply of dollars. Find the equilibrium price of yen in this new diagram and relate it to the equilibrium in Figure 27-3.
- Figure 27-3 shows the demand and supply for U.S. dollars in an example in which Japan and the United States trade only with each other.
 - Assume that Americans develop a taste for Japanese goods. Show what would happen to the supply and demand for yen. Would the yen appreciate or depreciate relative to the dollar? Explain.
 - Draw up a list of items that belong on the credit side of the balance of international payments and another list of items that belong on the debit side. What is meant by a trade surplus? By the balance on current account?
 - Suppose that China operates a fixed-exchange-rate system and is running a large current-account surplus. The government supports the system by buying large quantities of dollars in the foreign exchange market.

Currency	Units of foreign currency per U.S. dollar	Price	
		U.S. dollars per unit of foreign currency	
Dollar (Canada)	0.9861	1.014	(US\$/Canadian dollar)
Real (Brazil)	1.656	_____	(_____)
Yuan (China)	6.942	_____	(_____)
Peso (Mexico)	10.38	_____	(_____)
Pound (Britain)	0.5054	_____	(_____)
Euro	0.6368	_____	(_____)
Dollar (Zimbabwe)	255,771,415	_____	(_____)

TABLE 27-4.

Assume that the resulting increase in the supply of yuan leads to an increase in bank reserves.

- a. Explain why this would lead to a monetary expansion and lower interest rates in China. Further explain why this would lead to an expansion in aggregate demand, higher output, and a higher price level. (This answer relies on the analysis presented in Chapters 23 and 24.)
- b. Explain why, as prices rise because of the effects you described in a, Hume's four-pronged mechanism would eventually reduce the Chinese current-account surplus. Interpret your answer as the modern, updated version of Hume's mechanism.
5. Consider the situation for Germany described on page 552. Using a figure like Figure 27-3, show the supply and demand for German marks before and after the shock. Identify on your figure the excess demand for marks *before* the appreciation of the mark. Then show how an appreciation of the mark would wipe out the excess demand.
6. A Middle East nation suddenly discovers huge oil resources. Show how its balance of trade and current account suddenly turn to surplus. Show how it can acquire assets in New York as a financial-account offset. Later, when it uses the assets for domestic capital investment, show how its current and financial items reverse their roles.
7. Consider the following quotation from the 1984 *Economic Report of the President*:

In the long run, the exchange rate tends to follow the differential trend in the domestic and foreign price level. If one country's price level gets too far out of line with prices in other countries, there will eventually be a fall in demand for its goods, which will lead to a real depreciation of its currency.

Explain how the first sentence relates to the PPP theory of exchange rates. Explain the reasoning behind the PPP theory. In addition, using a supply-and-demand diagram like that of Figure 27-3, explain the sequence of events, described in the second sentence of the quotation, whereby a country whose price level is relatively high will find that its exchange rate depreciates.

8. A nation records the following data for 2008: exports of automobiles (\$100) and corn (\$150); imports of oil (\$150) and steel (\$75); tourist expenditures abroad (\$25); private lending to foreign countries (\$50); private borrowing from foreign countries (\$40); official-reserve changes (\$30 of foreign exchange bought by domestic central bank). Calculate the statistical discrepancy and include it in private lending to foreign countries. Create a balance-of-payments table like Table 27-2.
9. Consider the following three exchange-rate systems: the classical gold standard, freely flexible exchange rates, and the Bretton Woods system. Compare and contrast the three systems with respect to the following characteristics:
 - a. Role of government vs. market in determining exchange rates
 - b. Degree of exchange-rate volatility
 - c. Method of adjustment of relative prices across countries
 - d. Need for international cooperation and consultation in determining exchange rates
 - e. Potential for establishment and maintenance of severe exchange-rate misalignment
10. Consider the European monetary union. List the pros and cons. How do you come down on the question of the advisability of monetary union? Would your answer change if the question concerned the United States?



*Before I built a wall I'd ask to know
What I was walling in or walling out . . .*

Robert Frost

The international business cycle exerts a powerful effect on every nation of the globe. Shocks in one area can have ripple effects around the world. Political disturbances in the Middle East can set off a spiral in oil prices that triggers inflation and unemployment. Defaults can rock stock markets and shake business confidence in distant lands. The interconnectedness of countries was illustrated dramatically in the financial crisis of 2007–2009. When U.S. financial institutions suffered huge losses, stock and bond markets around the world also declined, and a banking crisis in Europe erupted almost simultaneously with that in the United States.

The previous chapter surveyed the major concepts of international macroeconomics—the balance of payments, the determination of exchange rates, and the international monetary system. The present chapter continues the story by showing how macroeconomic shocks in one country have ripple effects on the output and inflation of other countries. We explore the paradoxical finding that trade balances are largely determined by the balances between domestic saving and investment. The chapter concludes with a review of some of the key international issues of today.

A. FOREIGN TRADE AND ECONOMIC ACTIVITY

Net Exports and Output in the Open Economy

Open-economy macroeconomics is the study of how economies behave when the trade and financial linkages among nations are considered. The previous chapter described the basic concepts of the balance of payments. We can restate those concepts here in terms of the national income and product accounts.

Foreign trade involves imports and exports. Although the United States produces most of what it consumes, it nonetheless has a large quantity of **imports**, which are goods and services produced abroad and consumed domestically. **Exports** are goods and services produced domestically and purchased by foreigners.

Net exports are defined as exports of goods and services minus imports of goods and services. In 2007, net exports for the United States were minus \$708 billion, as calculated from \$1662 billion worth

of exports minus \$2370 billion worth of imports. When a country has positive net exports, it is accumulating foreign assets. The counterpart of net exports is **net foreign investment**, which denotes net U.S. savings abroad and is approximately equal to the value of net exports. Because the U.S. had negative net exports, its net foreign investment was negative, implying that the U.S. foreign indebtedness was growing.

In other words, *foreigners were making a significant contribution to U.S. investment*. Why is it that rich America borrowed so much from abroad? As we will see later in this chapter, this paradoxical phenomenon is explained by a relatively low U.S. saving rate, a high foreign saving rate, and an attractive investment climate in the United States.

In an open economy, a nation's expenditures may differ from its production. Total *domestic expenditures* (sometimes called *domestic demand*) are equal to consumption plus domestic investment plus government purchases. This measure differs from total *domestic product* (or GDP) for two reasons. First, some part of domestic expenditures will be on goods produced abroad, these items being imports (denoted by *Im*) like Mexican oil and Japanese automobiles. In addition, some part of America's domestic production will be sold abroad as exports (denoted by *Ex*)—items like Iowa wheat and Boeing aircraft. The difference between national output and domestic expenditures is exports minus imports, which equals net exports, or $Ex - Im = X$.

To calculate the *total production* of American goods and services, we need to add trade to domestic demand. That is, we need to know the total production for American residents as well as the net production for foreigners. This total includes domestic expenditures ($C + I + G$) plus sales to foreigners (*Ex*) minus domestic purchases from foreigners (*Im*). Total output, or GDP, equals consumption plus domestic investment plus government purchases plus net exports:

$$\begin{aligned} \text{Total domestic output} &= \text{GDP} \\ &= C + I + G + X \end{aligned}$$

Determinants of Trade and Net Exports

What determines the levels of exports and imports and therefore of net exports? It is best to think of

the import and export components of net exports separately.

Imports into the United States are positively related to U.S. income and output. When U.S. GDP rises, imports into the U.S. increase (1) because some of the increased $C + I + G$ purchases (such as cars and shoes) come from foreign production and also (2) because America uses foreign-made inputs (like oil or lumber) in producing its own goods. The demand for imports depends upon the relative price of foreign and domestic goods. If the price of domestic cars rises relative to the price of Japanese cars, say, because the dollar's exchange rate appreciates, Americans will buy more Japanese cars and fewer American ones. Hence *the volume and value of imports will be affected by domestic output and the relative prices of domestic and foreign goods*.

Exports are the mirror image of imports: U.S. exports are other countries' imports. American exports therefore depend primarily upon foreign output as well as upon the prices of U.S. exports relative to the prices of foreign goods. As foreign output rises, or as the exchange rate of the dollar depreciates, the volume and value of American exports tend to grow.

Figure 28-1 shows the ratio of U.S. net exports to GDP. For most of the period after World War II, the U.S. external accounts were in surplus or balance. Starting in the early 1980s, a decline in national saving, fueled by large federal budget deficits, led to a sharp appreciation of the dollar. Foreign economies grew less rapidly than the U.S. economy, depressing exports. The net effect was a large trade deficit and growing foreign indebtedness. Was it a good thing or a bad thing? The following discussion by the president's Council of Economic Advisers puts the U.S. trade deficit in an economic context:

By themselves, external trade and current account deficits are neither inherently good nor inherently bad. What matters are the reasons for the deficits. The main reason for the deficits today appears to be the strength of the U.S. economic expansion relative to the slow or negative growth in many other countries. . . . These deficits are essentially a macroeconomic phenomenon, reflecting a higher rate of domestic investment than of national saving. The deficit's growth . . . reflects rising investment rather than falling saving.

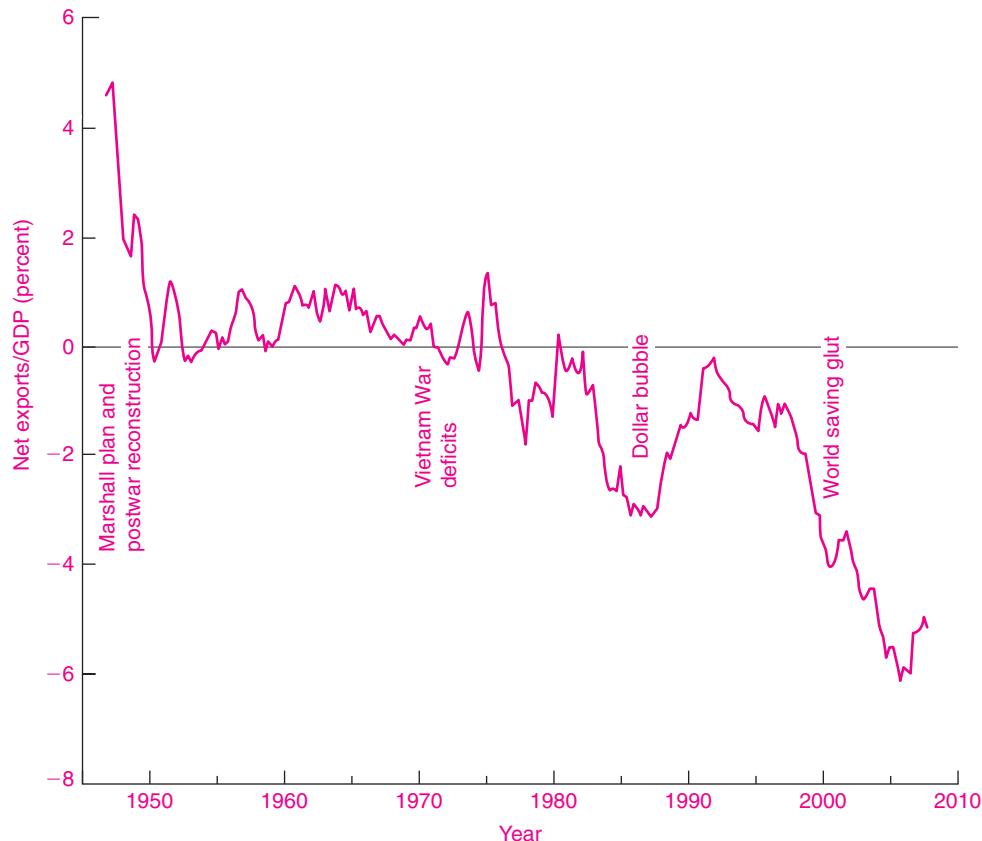


FIGURE 28-1. U.S. Net Exports Have Been in Deficit for Many Years

The United States had a large trade surplus after World War II as it helped rebuild Europe. Note how net exports turned sharply negative in the early 1980s as America's saving declined. Net exports grew even more negative in the last decade with the global savings glut.

Source: U.S. Bureau of Economic Analysis.

SHORT-RUN IMPACT OF TRADE ON GDP

How do changes in a nation's trade flows affect its GDP and employment? We first analyze this question in the context of our short-run model of output determination, the multiplier model of Chapter 22. The multiplier model shows how, in the short run when there are unemployed resources, changes in trade will affect aggregate demand, output, and employment.

There are two major new macroeconomic elements in the presence of international trade: First,

we have a fourth component of spending, net exports, which adds to aggregate demand. Second, an open economy has different multipliers for private investment and government domestic spending because some spending leaks out to the rest of the world.

Table 28-1 on the next page shows how introducing net exports affects output determination. This table begins with the same components as those for a closed economy. (Look back to Table 22-2 on page 440 to refresh your memory about the major components and the way they sum to total spending.) Total domestic demand in

Output Determination with Foreign Trade (billions of dollars)						
(1) Initial level of GDP	(2) Domestic demand $(C + I + G)$	(3) Exports Ex	(4) Imports Im	(5) Net exports $(X = Ex - Im)$	(6) Total spending $(C + I + G + X)$	(7) Resulting tendency of economy
4,100	4,000	250	410	-160	3,840	↓ Contraction
3,800	3,800	250	380	-130	3,670	↓ Contraction
3,500	3,600	250	350	-100	3,500	Equilibrium
3,200	3,400	250	320	-70	3,330	↑ Expansion
2,900	3,200	250	290	-40	3,160	↑ Expansion

TABLE 28-1. Net Exports Add to Aggregate Demand of Economy

To the domestic demand of $C + I + G$, we must add net exports of $X = Ex - Im$ to get total aggregate demand for a country's output. Higher net exports affect aggregate demand just as do investment and government purchases.

column (2) is composed of the consumption, investment, and government purchases we analyzed earlier. Column (3) then adds the exports of goods and services. As described above, exports depend upon foreign incomes and outputs and upon prices and exchange rates, all of which are also taken as given for this analysis. Exports are assumed to be a constant level of \$250 billion of foreign spending on domestic goods and services.

The interesting new element arises from imports, shown in column (4). Like exports, imports depend upon exogenous variables such as prices and exchange rates. But, in addition, imports depend upon domestic incomes and output, which clearly change in the different rows of Table 28-1. For simplicity, we assume that the country always imports 10 percent of its total output, so imports in column (4) are 10 percent of column (1).

Subtracting column (4) from column (3) gives net exports in column (5). Net exports are a negative number when imports exceed exports and a positive number when exports are greater than imports. Net exports in column (5) are the net addition to the spending stream contributed by foreign trade. Total spending on domestic output in column (6) equals domestic demand in column (2) plus net exports in column (5). Equilibrium output in an open economy

occurs where total net domestic and foreign spending in column (6) exactly equals total domestic output in column (1). In this case, equilibrium comes with net exports of -100, indicating that the country is importing more than it is exporting. At this equilibrium, note as well that domestic demand is greater than output.

Figure 28-2 shows the open-economy equilibrium graphically. The upward-sloping blue line marked $C + I + G$ is the same curve used in Figure 22-10. To this line we must add the level of net exports that is forthcoming at each level of GDP. Net exports from column (5) of Table 28-1 are added to get the green line of total aggregate demand or total spending. When the green line lies below the blue curve, imports exceed exports and net exports are negative. When the green line is above the blue line, the country has a net-export surplus and output is greater than domestic demand.

Equilibrium GDP occurs where the green line of total spending intersects the 45° line. This intersection comes at exactly the same point, at \$3500 billion, that is shown as equilibrium GDP in Table 28-1. Only at \$3500 billion does GDP exactly equal what consumers, businesses, governments, and foreigners want to spend on goods and services produced in the domestic economy.

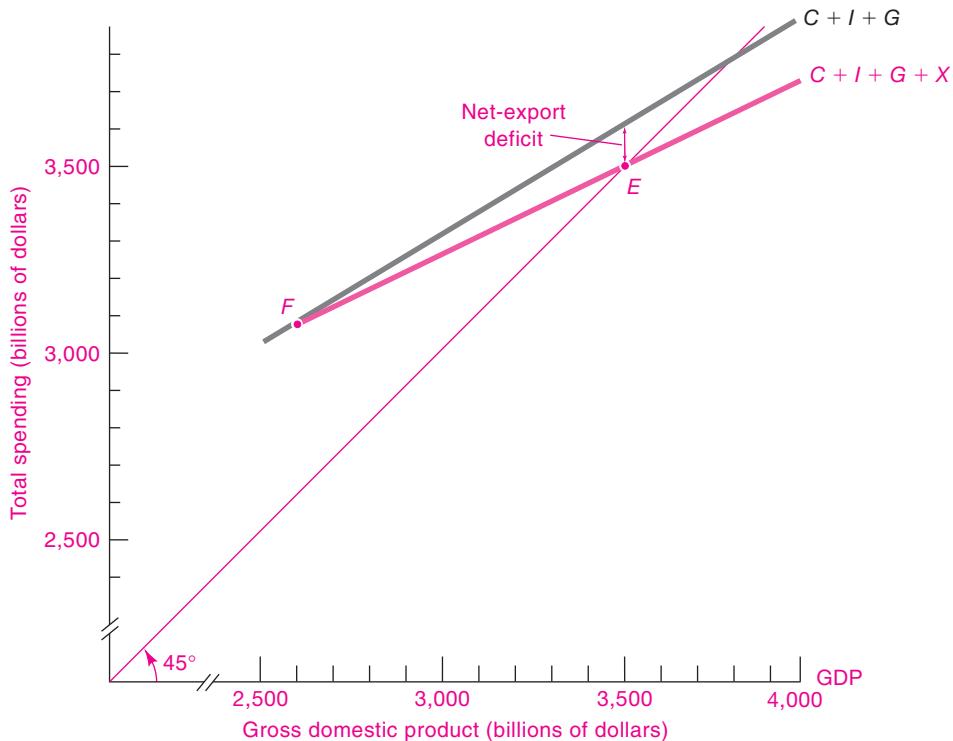


FIGURE 28-2. Adding Net Exports to Domestic Demand Gives Equilibrium GDP in the Open Economy

The blue line represents domestic demand ($C + I + G$), which are purchases by domestic consumers, businesses, and governments. To this must be added net foreign spending. Net exports plus domestic demand give the green line of total spending. Equilibrium comes at point E , where total GDP equals total spending on goods and services produced in the United States. Note that the slope of the green total demand curve is less than that of domestic demand to reflect the leakage from spending into imports.

The Marginal Propensity to Import and the Spending Line

Note that the aggregate demand curve, the green $C + I + G + X$ curve in Figure 28-2, has a slightly smaller slope than the blue curve of domestic demand. The explanation of this is that *there is an additional leakage from spending into imports*. This new leakage arises from our assumption that 10 cents of every dollar of income is spent on imports. To handle this requires introducing a new term, the **marginal propensity to import**. The marginal propensity to import, which we will denote MP_m , is the increase

in the dollar value of imports for each \$1 increase in GDP.

The marginal propensity to import is closely related to the marginal propensity to save (MPS). Recall that the MPS tells us what fraction of an additional dollar of income is not spent but leaks into saving. The marginal propensity to import tells how much of additional output and income leaks into imports. In our example, the MP_m is 0.10 because every \$300 billion of increased income leads to \$30 billion of increased imports. (What is the marginal propensity to import in an economy with no foreign trade? Zero.)

Now examine the slope of the total spending line in Figure 28-2—that line shows total spending on $C + I + G + X$. Note that the slope of the total spending line is less than the slope of the domestic demand line of $C + I + G$. As GDP and total incomes rise by \$300, spending on consumption rises by the income change times the MPC (assumed to be two-thirds), or by \$200. At the same time, spending on imports, or foreign goods, also rises by \$30. Hence spending on domestic goods rises by only \$170 (= \$200 – \$30), and the slope of the total spending line falls from 0.667 in our closed economy to $\$170/\$300 = 0.567$ in our open economy.

The Open-Economy Multiplier

Surprisingly, opening up an economy lowers the expenditure multiplier.

One way of understanding the expenditure multiplier in an open economy is to calculate the rounds of spending and responding generated by an additional dollar of government spending, investment, or exports. Suppose that Germany needs to buy American computers to modernize antiquated facilities in what used to be East Germany. Each extra dollar of U.S. computers will generate \$1 of income in the United States, of which $\$2/3 = \0.667 will be spent by Americans on consumption. However, because the marginal propensity to import is 0.10, one-tenth of the extra dollar of income, or \$0.10, will be spent on foreign goods and services, leaving only \$0.567 of spending on domestically produced goods. That \$0.567 of domestic spending will generate \$0.567 of U.S. income, from which $0.567 \times \$0.567 = \0.321 will be spent on consumption of domestic goods and services in the next round. Hence the total increase in output, or the open-economy multiplier, will be

$$\begin{aligned}\text{Open-economy multiplier} &= 1 + 0.567 + (0.567)^2 + \dots \\ &= 1 + (\frac{2}{3} - \frac{1}{10}) + (\frac{2}{3} - \frac{1}{10})^2 + \dots \\ &= \frac{1}{1 - \frac{2}{3} + \frac{1}{10}} = \frac{1}{\frac{13}{30}} = 2.3\end{aligned}$$

This compares with a closed-economy multiplier of $1/(1 - \frac{2}{3}) = 3$.

Another way of calculating the multiplier is as follows: Recall that the multiplier in our simplest model was $1/MPS$, where MPS is the “leakage” into saving. As we noted above, imports are another leakage.

The total leakage is the dollars leaking into saving (the MPS) plus the dollars leaking into imports (the MPm). Hence, the open-economy multiplier should be $1/(MPS + MPm) = 1/(0.333 + 0.1) = 1/0.433 = 2.3$. Note that both the leakage analysis and the rounds analysis provide exactly the same answer.

To summarize:

Because a fraction of any income increase leaks into imports in an open economy, the **open-economy multiplier** is smaller than the multiplier for a closed economy. The exact relationship is

$$\text{Open-economy multiplier} = \frac{1}{MPS + MPm}$$

where MPS = marginal propensity to save and MPm = marginal propensity to import.

TRADE AND FINANCE FOR THE UNITED STATES UNDER FLEXIBLE EXCHANGE RATES

We begin with a review of major trends in trade and finance for the United States over the period of flexible exchange rates, which began after the abandonment of the Bretton Woods system in 1973 (recall the discussion in the previous chapter).

First, examine the movements in the dollar exchange rate, shown in Figure 28-3. This is an index of the *real exchange rate* of the U.S. dollar against other major currencies. The real exchange rate corrects for movements in the price levels in different countries. Note how the exchange rate was relatively stable under fixed rates. Then, as with all market-determined asset prices, exchange rates became volatile in the flexible-rate era.

Figure 28-4 shows the *real* component of net exports. This is the ratio of real net exports to real GDP. We saw above that an increase in real net exports tends to be expansionary, while a decrease in real net exports tends to reduce output. We describe two periods in the history of the United States to help understand the role of international trade in domestic production.

Trade Movements Reinforce Tight Money in the 1980s. The decade of the 1980s witnessed a dramatic cycle of dollar appreciation and depreciation. The rise in the value of the dollar began in 1980 after tight

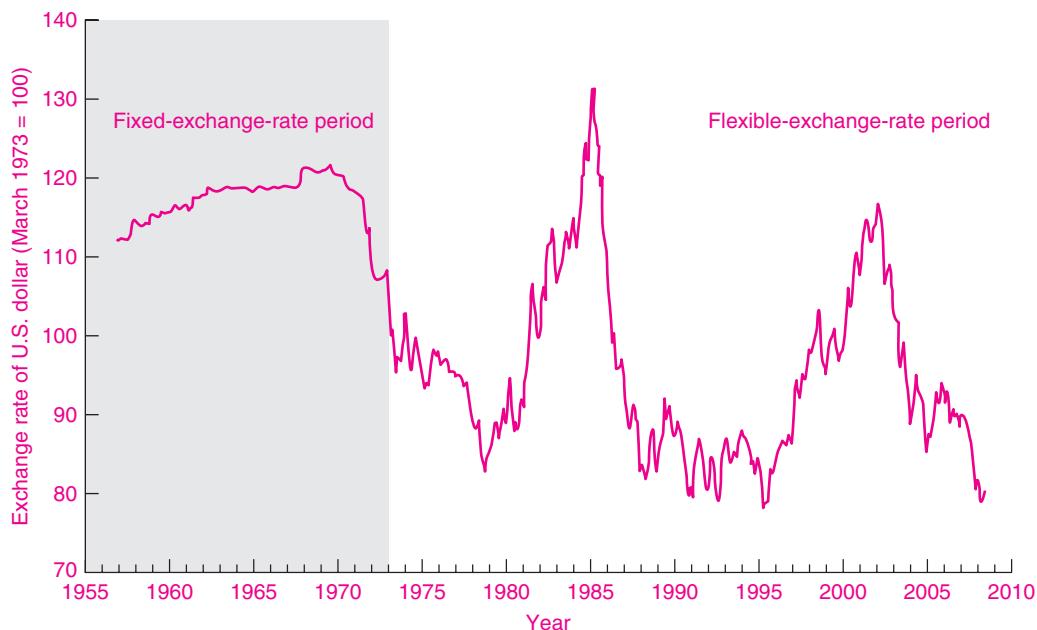


FIGURE 28-3. The Foreign Exchange Rate of the Dollar

During the fixed-exchange-rate (Bretton Woods) period, the dollar's value was stable in exchange markets. After the United States moved to flexible exchange rates in 1973, the dollar's value became more volatile. When the United States pursued its tight-money policies in the early 1980s, the high interest rates pulled up the dollar. With large current-account deficits and the foreign accumulation of dollar-denominated assets, the dollar began to depreciate after 2000.

Source: Federal Reserve System, at www.federalreserve.gov/releases/h10/summary.

U.S. monetary policy and loose U.S. fiscal policy drove interest rates up sharply. High interest rates at home and economic turmoil abroad attracted funds into financial investments in U.S. dollars. Figure 28-3 shows that during the period from 1979 to early 1985, the real exchange rate on the dollar rose by 80 percent. Many economists believe the dollar was overvalued in 1985—an *overvalued currency* is one whose value is high relative to its long-run or sustainable level.

As the dollar rose, American export prices increased and the prices of goods imported into the United States fell. Figure 28-5 shows the important relationship between real exchange rates and the trade deficit. It illustrates the dramatic effect of the appreciating dollar on trade flows. From the trough in 1980 to the peak in 1986, the trade deficit increased by 3 percent of GDP as the dollar appreciated.

By itself, this sharp increase in the trade deficit would be contractionary. The decline in net exports reinforced a decline in domestic demand induced by tight monetary policy. The result was the deepest recession in 50 years.

Countercyclical Net Exports in the 1995–2000 Period. The late 1990s were the opposite story. After 1995, the combination of low real interest rates and a booming stock market led to the rapid growth of domestic demand in the United States, particularly in private investment. Unemployment fell sharply. A rapid increase in foreign demand for U.S. assets led to the sharp appreciation of the dollar.

In contrast with the early 1980s, the macroeconomic impact of the dollar appreciation in this period was appropriate. As the American economy approached full employment, import prices rose, net exports declined, and the foreign sector exercised

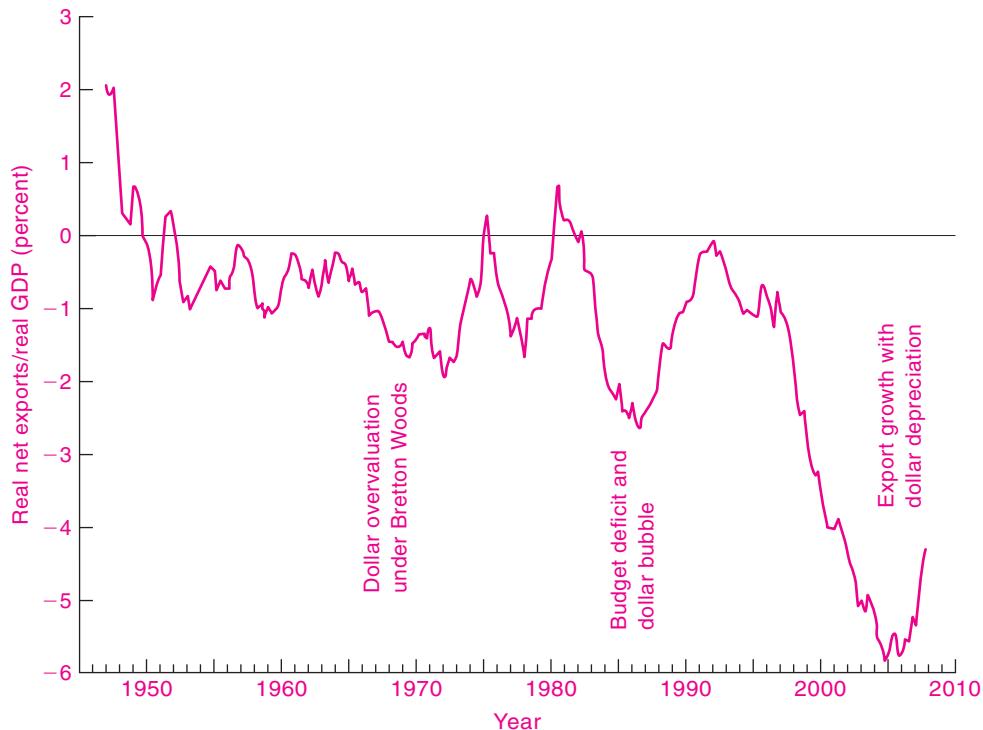


FIGURE 28-4. Real Net Exports Have Been an Important Component of Demand

With a strong rise in the dollar exchange rate and weak economic growth abroad, U.S. real net exports turned sharply negative in the early 1980s. This shift produced a massive drag on aggregate spending in the $C + I + G + X$ equation and helped produce the deep recession of 1982. The growing deficit from the period after 1990 moderated the growth of output. Note how net exports increased after the dollar's depreciation in the late 2000s.

Source: U.S. Bureau of Economic Analysis.

a drag on the economy. Had the dollar depreciated rather than appreciated, the foreign sector would have been expansionary, the American economy would have experienced rising inflation, and the Fed would have found it necessary to tighten money to choke off the boom. In the late 1990s, therefore, an appreciation of the dollar and a decline in net exports were just what the macroeconomic doctor ordered.

THE MONETARY TRANSMISSION MECHANISM IN AN OPEN ECONOMY

Our earlier multiplier analysis of business cycles and economic growth focused on policies in a closed economy. We analyzed the way that monetary and fiscal

policies can help stabilize the business cycle. How do the impacts of macroeconomic policies change in an open economy? How is the monetary transmission mechanism different in this situation? Surprisingly, the answer to these questions depends crucially on whether the country has a fixed or a flexible exchange rate.

Our survey here will concentrate on high-income countries whose financial markets are closely linked together—the United States, Japan, and the countries of the European Union. When financial investments can flow easily among countries and the regulatory barriers to financial investments are low, we say that these countries have *high mobility of financial capital*.

Fixed Exchange Rates. The key feature of countries with fixed exchange rates and high capital mobility is

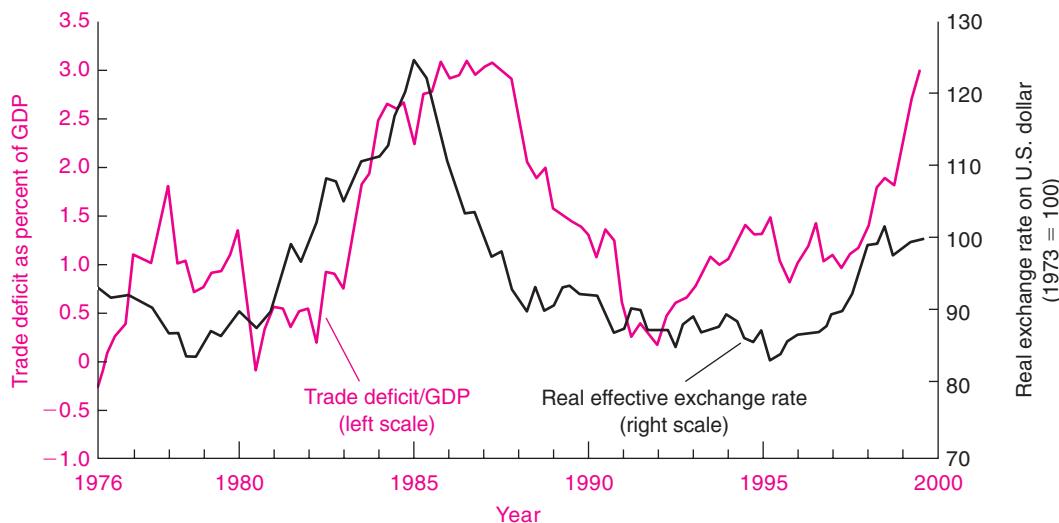


FIGURE 28-5. Trade and Exchange Rates

Trade flows respond to exchange-rate changes, but with a time lag. The real appreciation of the dollar during the early 1980s increased U.S. export prices and reduced prices of goods imported into the United States. As a result, the trade deficit rose sharply. When the dollar depreciated after 1985, the trade deficit began to shrink. The increase in the current-account deficit resulted from dollar appreciation and slow growth outside the United States.

Source: Council of Economic Advisers, *Economic Report of the President*, 2000.

that their interest rates must be very closely aligned. Any divergence in the interest rates between two such countries will attract speculators who will sell one currency and buy the other until the interest rates are equalized.

Consider a small country which pegs its exchange rate to the currency of a larger country. *Because the small country's interest rates are determined by the monetary policy of the large country, the small country can no longer conduct independent monetary policy.* The small country's monetary policy must be devoted to ensuring that its interest rates are aligned with those of its partner.

Macroeconomic policy in such a situation is therefore exactly the case described in our multiplier model discussed earlier. From the small country's point of view, investment is exogenous, because it is determined by world interest rates. Fiscal policy is highly effective because there is no monetary reaction to changes in government spending or taxes.

Flexible Exchange Rates. One important insight in this area is that macroeconomic policy with flexible

exchange rates operates in quite a different way from the case of fixed exchange rates. A flexible exchange rate has a reinforcing effect on monetary policy.

Let's consider the case of the United States. The monetary transmission mechanism in the United States has changed significantly in recent decades as a result of increased openness and the change to a flexible exchange rate. In the modern era, international trade and finance have come to play an increasingly important role in U.S. macroeconomic policy.

Figure 28-6 shows the monetary transmission mechanism under flexible exchange rates. Panel (a) shows the relationship between net exports and the exchange rate, the actual history of which we saw in Figure 28-5. This is an inverse relationship because a depreciation stimulates exports and discourages imports. Suppose that the Fed decides to reduce interest rates to stimulate the economy. The decline in interest rates would lead to a depreciation in the dollar as financial investors moved from

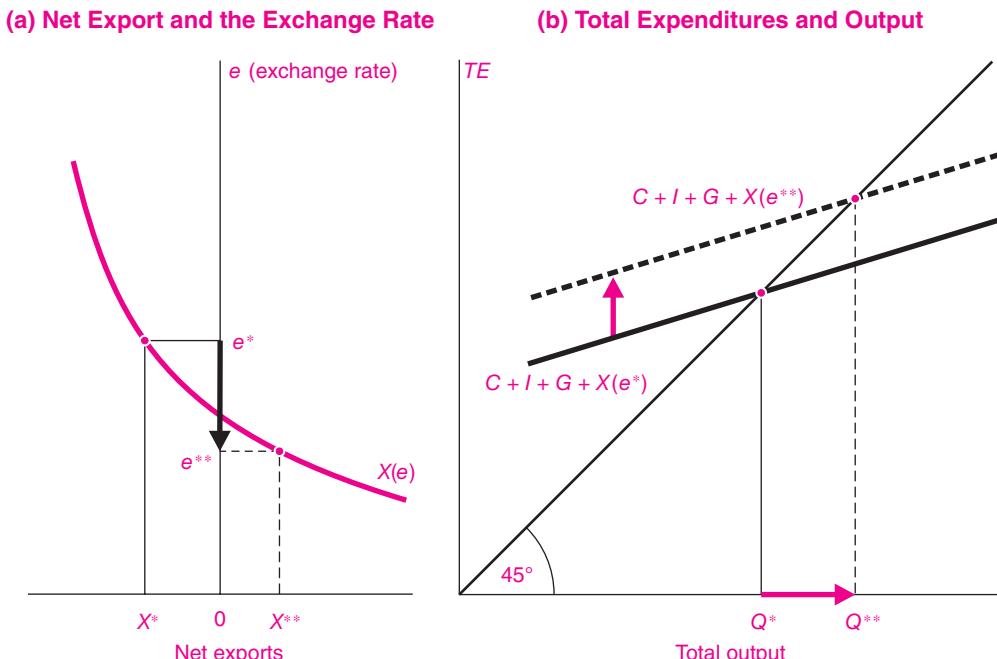


FIGURE 28-6. With Flexible Exchange Rates, the Monetary Transmission Mechanism Is Reinforced

Suppose that the central bank lowers interest rates. This will tend to lower the exchange rate from e^* to e^{**} in a flexible-exchange-rate system. Such a depreciation will stimulate net exports by moving down along the net-export curve. This increase in net exports from $X(e^*)$ to $X(e^{**})$ shifts up the total expenditure curve, increasing total output from Q^* to Q^{**} .

dollar to nondollar stocks and bonds. The depreciation is shown in Figure 28-6 as a movement from e^* to e^{**} . This depreciation changes a net export deficit of X^* to a net export surplus of X^{**} . The decline in interest rates would also tend to increase domestic investment, but we omit that effect from our discussion.

We show the result of this net export expansion in Figure 28-6(b). (This assumes, as with all our multiplier analyses, a situation where there are unemployed resources.) The increase in net exports shifts the total expenditure curve up from $C + I + G + X(e^*)$ to $C + I + G + X(e^{**})$. The result is an increase in total expenditure and an increase in output from Q^* to Q^{**} . All the changes shown in Figure 28-6 illustrate the policies and reactions during the 1995–2000 period discussed in the previous section.

Alternatively, take the opposite case. Suppose that the Fed decides to slow the economy, as it did

after 1979. The monetary tightening raised U.S. interest rates, which attracted funds into dollar securities. This increase in the demand for dollars led to an appreciation of the dollar. The high dollar exchange rate reduced net exports and contributed to the recession of 1981–1983, as we described earlier. The impact on net exports in such a situation would be the opposite of that shown in Figure 28-6.

Foreign trade produces a new and powerful link in the monetary transmission mechanism when a country has a flexible exchange rate. When monetary policy changes interest rates, this affects exchange rates and net exports as well as domestic investment. Monetary tightening leads to an appreciation in the exchange rate and a corresponding decline in net exports; monetary easing does the opposite. The impact of changes in interest rates on net exports reinforces the impact on domestic investment.

B. INTERDEPENDENCE IN THE GLOBAL ECONOMY

ECONOMIC GROWTH IN THE OPEN ECONOMY

The first section described the short-run impact of international trade and policy changes in the open economy. These issues are crucial for open economies combating unemployment and inflation. But countries must also keep their eye on the implications of their policies for long-run economic growth. Particularly for small open economies, effective use of international trade and international finance is central for promoting economic growth.

Economic growth involves a wide variety of issues, as we saw in Chapter 25. Perhaps the single most important approach for promoting rapid economic growth is to ensure high levels of saving and investment.

But economic growth involves more than just capital. It requires moving toward the technological frontier by adopting the best technological practices. It requires developing institutions that nurture investment and the spirit of enterprise. Other issues—trade

policies, intellectual property rights, policies toward direct investment, and the overall macroeconomic climate—are essential ingredients in the growth of open economies.

SAVING AND INVESTMENT IN THE OPEN ECONOMY

In a closed economy, total investment equals domestic saving. Open economies, however, can draw upon world financial markets for investment funds, and other countries can be an outlet for domestic saving. (Recall Table 27-3, which shows the net saving of important regions.) We first review the investment-saving relationship, and then we examine the mechanisms for allocating saving among different countries.

The Saving-Investment Relation in an Open Economy

Let's pause to recall our saving-investment identities from Chapter 20:

$$I_T = I + X = S + (T - G)$$

This states that total national investment (I_T) consists of investment in domestic capital (I) plus net foreign

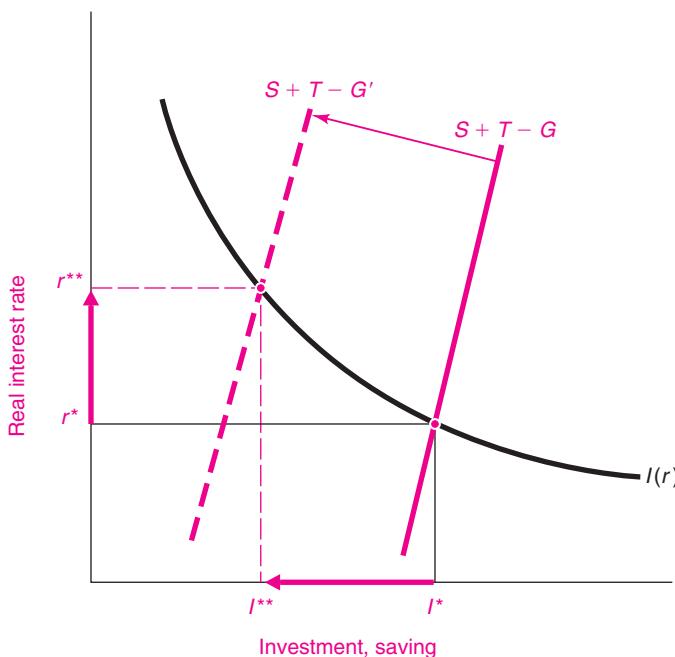


FIGURE 28-7. Saving and Investment in the Closed Economy

Investment is inversely related to the real interest rate, while private saving and public saving are relatively unresponsive to the interest rate. Equilibrium saving and investment comes at r^* . Suppose that government military spending increases. This increases the government deficit and therefore reduces public saving. The result is a shift in the national saving curve to the left to $S + T - G'$, raising the market interest rate to r^{**} and reducing national saving and investment to I^{**} .

investment or net exports (X). This must equal total private saving (S) by households and businesses plus total public saving, which is given by the government surplus ($T - G$).

We can rewrite the identity as follows to emphasize the components of net exports:

$$X = S + (T - G) - I$$

or

$$\text{Net exports} = (\text{private saving} + \text{government saving}) - \text{domestic investment}$$

This important equation shows that net exports are the difference between domestic saving and domestic investment. The components of total U.S. national investment for recent decades are shown in Table 28-2.

Determination of Saving and Investment at Full Employment

We need to go beyond the identities to understand the mechanism by which saving and investment are equalized in the open economy. This analysis concerns primarily the long run in which there is full employment and output equals its potential. That is, we consider how saving and investment are allocated in the long run in a “classical” economy.

Closed Economy. We begin with a closed economy where there is no inflation and no uncertainty. In

this situation, investment must equal private saving plus the government surplus. The equilibrating price is the real interest rate, which adjusts to balance the levels of saving and investment.

Figure 28-7 shows how national saving and investment are equilibrated in a full-employment closed economy. The $S + T - G$ curve shows national saving, which is assumed to increase slightly with the real interest rate. Additionally, as we learned in Chapter 21, there is an inverse relationship between investment and the interest rate. Higher interest rates reduce spending on housing and on business plant and equipment. We therefore write our investment schedule as $I(r)$ to indicate that investment depends upon the real interest rate, r .

The saving and investment schedules intersect in Figure 28-7 to determine an interest rate at r^* with high levels of saving and investment.

Now suppose that the government increases its purchases without increasing taxes, say, because of an increase in military spending to fight foreign wars. This will shift the saving schedule to the left to $S + T - G'$. As a result, the real interest rate increases to equilibrate saving and investment, and the level of investment falls. A similar outcome would occur if the government lowered taxes or if the private sector lowered its desired savings.

In a full-employment closed economy (always holding other things constant), higher government

Saving and Investment as Percentage of NNP			
Sector	1959–1981	1982–2001	2002–2007
Net domestic saving	11.5	6.4	1.7
Net private saving	11.6	8.8	4.6
Net government saving	-0.1	-2.5	-2.8
Net domestic investment (in capital)	11.1	8.5	7.7
Net foreign investment	0.4	-2.1	-6.0

TABLE 28-2. The Declining U.S. Saving Rate

This table shows the changing structure of U.S. saving over the last half-century. For most of the 1959–1981 period, saving and investment were about equal and at a high level. Then, after 1981, government saving declined as the federal budget moved into deficit. This decline was reinforced in the 2000s as personal and other private saving dropped sharply. By the 2002–2007 period, most U.S. capital investment was financed by foreign saving, which is the counterpart to the large current-account deficit.

Source: Bureau of Economic Analysis.

spending, lower taxes, or lower desired private saving will raise the real interest rate and lower equilibrium saving and investment.

Open-Economy Equilibrium. Now consider the situation of an open economy in which financial markets are integrated with world markets. An open economy has alternative sources of investment and alternative outlets for saving. We simplify by assuming that the economy is small and cannot affect world interest rates. We show this situation in Figure 28-8 for a small open economy with a high degree of mobility of financial capital. A small open economy must equate its domestic real interest rate with the world real interest rate, r^W . Because financial markets are

open, financial capital will move to equilibrate interest rates at home and abroad.

Figure 28-8 helps explain the determination of saving, investment, and net exports in the open economy. At the prevailing world interest rate, domestic investment is shown at point A, which is the intersection of the investment schedule and the interest rate. Total national saving is given at point B on the total saving schedule, $S + T - G$. The difference between them—given by the line segment AB—is net exports. (This equality is shown by the saving-investment identity in the box on page 574.)

Hence net exports are determined by the difference between national saving and national

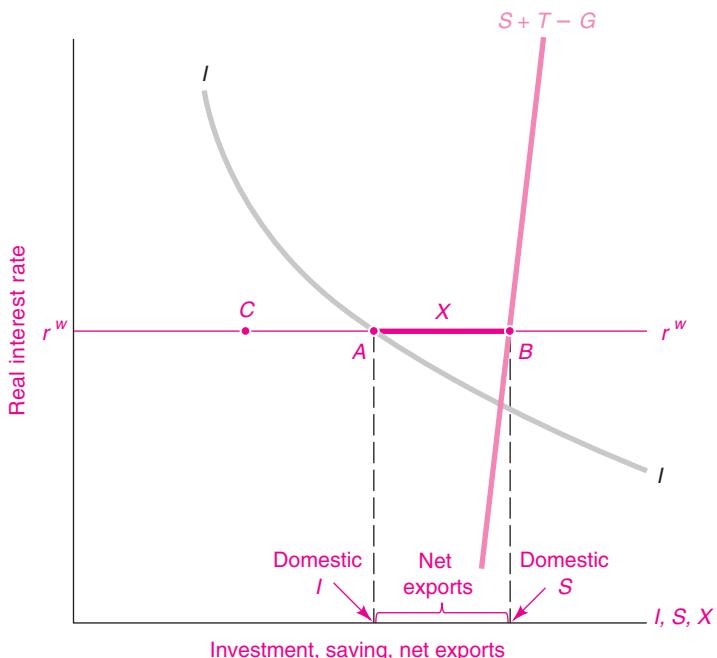


FIGURE 28-8. Saving and Investment in a Small Open Economy

Domestic investment and domestic saving are determined by income, interest rates, and government fiscal policy, as in Fig. 28-7. But the small open economy with mobile financial capital has its real interest rates determined in world financial markets. At the relatively high real interest rate at r^W , domestic saving exceeds domestic investment and the excess saving flows to more lucrative investment opportunities abroad. The difference between national saving and domestic investment is net exports (also equal to net foreign investment), shown as X in the figure. A trade surplus such as has been seen in Japan and China is caused by the interaction of high domestic saving and low domestic investment.

investment, which is determined by domestic factors plus the world interest rate.

This discussion pushes into the background the mechanism by which a country adjusts its trade, saving, and investment. It is here that the exchange rate plays the crucial equilibrating role. *Changes in exchange rates are the mechanism by which saving and investment adjust.* That is, exchange rates move to ensure that the level of net exports balances the difference between domestic saving and investment.

This analysis can help explain the trends in saving, investment, and trade patterns in major countries in recent years. Figure 28-8 describes well the role of Japan in the world economy. Japan has traditionally had a high domestic saving rate. Yet in recent years—because of high production costs at home and competitive conditions in neighboring newly industrialized countries—the return on Japanese capital has been depressed. Japanese saving therefore seeks outlets abroad, with the consequence that Japan has had a large trade surplus and high net exports.

The United States has seen an interesting twist in its saving and investment position, as was shown in Table 28-2. Until 1980, the United States had a modestly positive net-export position. But in the early 1980s the U.S. government's fiscal position shifted sharply toward deficit. You can depict this by drawing a new $S + T' - G'$ line in Figure 28-8 that intersects the real-interest-rate line at point C . You can see that total national saving would decline with a larger government deficit. Domestic investment would be unchanged. Net exports would turn negative and be given by the line segment CA .

We can also use this analysis to explain the mechanism by which net exports adjust to provide the necessary investment when the government runs a budget deficit. Consider a country with a net-export surplus as shown in Figure 28-8. Suppose that the government suddenly begins to run a large budget deficit. This change will lead to an imbalance in the saving-investment market, which would tend to push up domestic interest rates relative to world interest rates. The rise in domestic interest rates will attract funds from abroad and will lead to an appreciation in the foreign exchange rate of the country running the budget deficit. The appreciation will lead to falling exports and rising imports, or a decrease in net exports. This trend will continue until net exports

have fallen sufficiently to close the saving-investment gap.

Other important examples of the open-economy saving-investment theory in the small open economy are the following:

- An increase in private saving or lower government spending will increase national saving as represented by a rightward shift in the national saving schedule in Figure 28-8. This will lead to a depreciation of the exchange rate until net exports have increased enough to balance the increase in domestic saving.
- An increase in domestic investment, say, because of an improved business climate or a burst of innovations, will lead to a shift in the investment schedule. This will lead to an appreciation of the exchange rate until net exports decline enough to balance saving and investment. In this case, domestic investment crowds out foreign investment.
- An increase in world interest rates will reduce the level of investment. This will lead to an increase in the difference between saving and investment, to a depreciation in the foreign exchange rate, and to an increase in net exports and foreign investment. (This would be a shift along the investment schedule.)

Table 28-3 summarizes the major results for the small open economy. Make sure you can also work through the cases of decreases in the government's fiscal deficit, in private saving, in investment, and in world interest rates. This handy table and its explanation deserve careful study.¹

Integration of a country into the world economy adds an important new dimension to macroeconomic performance and policy. Key findings are:

- The foreign sector provides an important source of domestic investment and a potential outlet for domestic saving.
- Higher saving at home—whether in the form of higher private saving or higher public saving—will lead to higher net exports.

¹ This discussion covers “small” open economies that cannot affect the world interest rate. For “large” open economies like the United States, the impact would be somewhere between the small-economy and the closed-economy cases. This more complex case is covered in intermediate textbooks (see the Further Reading section in Chapter 19).

Change in policy or exogenous variable	Change in exchange rate	Change in investment	Change in net exports
Increase in G or decrease in T	$e \uparrow$	0	$X \downarrow$
Increase in private S	$e \downarrow$	0	$X \uparrow$
Increase in investment demand	$e \uparrow$	$I \uparrow$	$X \downarrow$
Increase in world interest rates	$e \downarrow$	$I \downarrow$	$X \uparrow$

TABLE 28-3. Major Conclusions of Saving-Investment Model in Small Open Economy

Make sure you understand the mechanism by which each of these occurs.

- A country's trade balance is primarily a reflection of its national saving and investment balance rather than of its absolute productivity or wealth.
- Adjustments in a country's trade accounts require a change in domestic saving or investment.
- In the long run, adjustments in trade accounts will be brought about by movements in the country's relative prices, often through exchange-rate changes.

PROMOTING GROWTH IN THE OPEN ECONOMY

Increasing the growth of output in open economies involves more than just waving a magic wand that will attract investors or savers. A favorable saving and investing climate involves a wide array of policies, including a stable macroeconomic environment, secure property rights, and, above all, a predictable and attractive returns on investment. We review in this section some of the ways that open economies can improve their growth rates by using the global marketplace to their best advantage.

Over the long run, the single most important way of increasing per capita output and living standards is to ensure that the country *adopts best-practice techniques* in its production processes. It does little good to have a high investment rate if the investments are in the wrong technology. This point was abundantly shown in the last years of Soviet central planning (discussed in Chapter 26), when the investment rate was extremely high but much investment was poorly designed, left unfinished, or put in unproductive sectors. Moreover, individual poor countries do not need to start from scratch in designing their own

turbines, machinery, computers, and management systems. Often, reaching the technological frontier will involve engaging in joint ventures with foreign firms, which in turn requires that the institutional framework be hospitable to foreign capital.

Another important set of policies is *trade policies*. Evidence shows that an open trading system promotes competitiveness and adoption of best-practice technologies. By keeping tariffs and other barriers to trade low, countries can ensure that domestic firms feel the spur of competition and that foreign firms are permitted to enter domestic markets when domestic producers sell at inefficiently high prices or monopolize particular sectors.

When countries consider their saving and investment, they must not concentrate entirely on physical capital. *Intangible capital* is just as important. Studies show that countries that invest in human capital through education tend to perform well and be resilient in the face of shocks. Many countries have valuable stocks of natural resources—forests, minerals, oil and gas, fisheries, and arable land—that must be managed carefully to ensure that they provide the highest yield for the country.

One of the most complex factors in a country's growth involves *immigration* and *emigration*. Historically, the United States has attracted large flows of immigrants that not only have increased the size of its labor force but also have enhanced the quality of its culture and scientific research. More recently, however, the immigrants have possessed less education and lower skills than the domestic labor force. As a result, according to some studies, immigration has depressed the relative wages of low-wage workers in the United States. Countries that "export" workers, such as Mexico, often

have a steady stream of earnings that are sent home by citizens to their relatives, and this can provide a nice supplement to export earnings.

One of the most important yet subtle influences concerns the *institutions of the market*. The most successful open economies—like the Netherlands and Luxembourg in Europe or Taiwan and Hong Kong in Asia—have provided a secure environment for investment and entrepreneurship. This involved establishing a secure set of property rights, guided by the rule of law. Increasingly important is the development of intellectual property rights so that inventors and creative artists are assured that they will be able to profit from their activities. Countries must fight corruption, which is a kind of private taxation system that preys on the most profitable enterprises, creates

uncertainty about property rights, raises costs, and has a chilling effect on investment.

A *stable macroeconomic climate* means that taxes are reasonable and predictable and that inflation is low, so lenders need not worry about inflation confiscating their investments. It is crucial that exchange rates be relatively stable, with a convertibility that allows easy and inexpensive entry into and exit out of the domestic currency. Countries that provide a favorable institutional structure attract large flows of foreign financial capital, while countries that have unstable institutions attract relatively little foreign funds and suffer “capital flight,” in which local residents move their funds abroad to avoid taxes, expropriation, or loss of value.

Figure 28-9 illustrates the impact of the investment climate on national investment. The left-hand panel

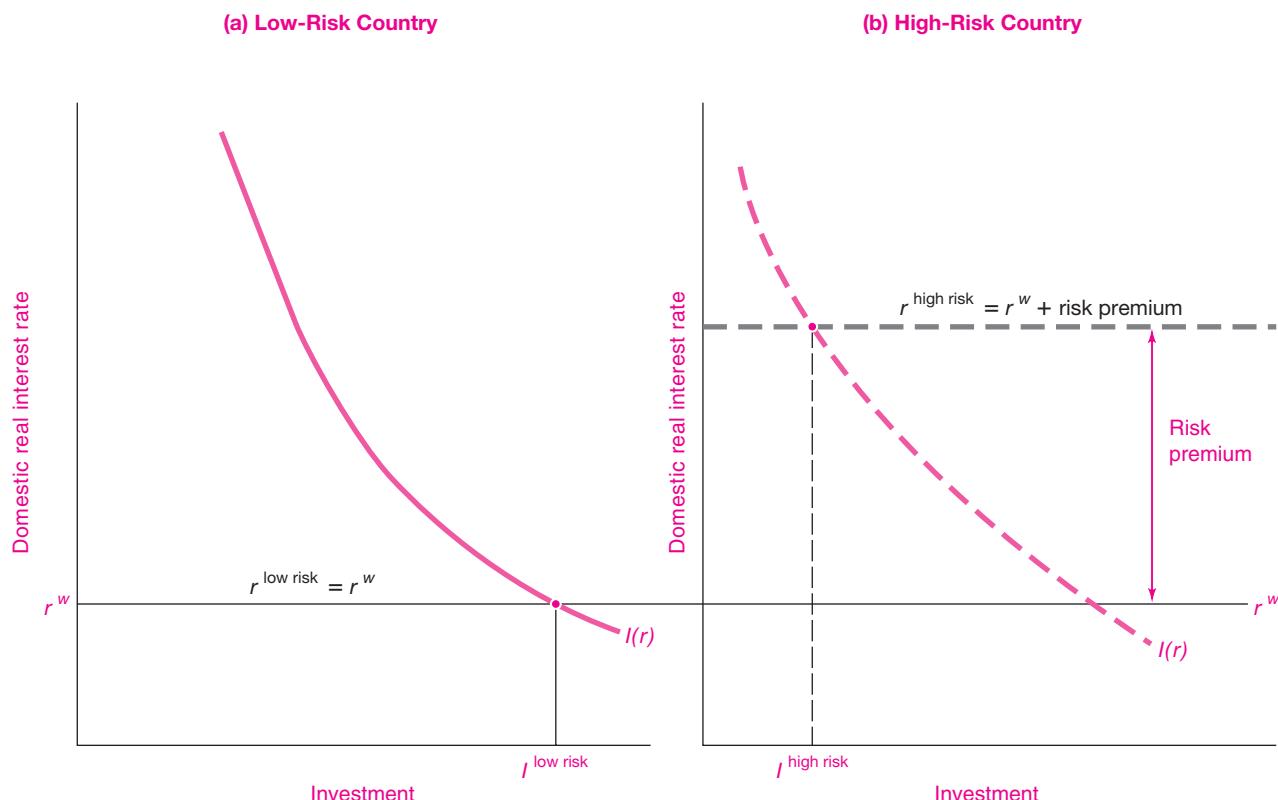


FIGURE 28-9. Business Climate Affects Interest Rate and Investment Level

In the low-risk country in (a), a stable economic climate leads to a low domestic interest rate at r^W and a high level of investment at $I^{\text{low risk}}$. In the high-risk country, racked by political turmoil, corruption, and economic uncertainty, investors require a large risk premium on their investments, so the domestic interest rate is far above the world interest rate. The result is a depressed level of investment as foreign investors seek safer terrain.

depicts a country that has a favorable investment climate, so the domestic interest rate is equal to the world interest rate. The overall level of investment there is high, and the country can attract foreign funds to finance domestic investment.

Panel (b) shows a high-risk country. Look back at Figure 26-2 on page 528, which shows the premium on emerging-market bonds. In periods of crisis, these countries might pay interest rates 8 or 10 or 12 percentage points above the rate paid by investors in advanced countries. The high risk premium might arise because of high inflation, unpredictable taxes, nationalizations, default, corruption, an unstable foreign exchange rate, or sometimes just panic and contagion. The real cost of capital would therefore be extremely high. The risky country will have trouble attracting both domestic *and* foreign investment, and the resulting level of investment will be low. Compare the equilibrium level of investment in low-risk panel (a) to that of high-risk panel (b).

Promoting economic growth in an open economy involves ensuring that business is attractive for foreign and domestic investors who have a wide array of investment opportunities in the world economy. The ultimate goals of policy are to have high rates of saving and investment in productive channels and to ensure that businesses use best-practice techniques. Achieving these goals involves setting a stable macroeconomic climate, guaranteeing dependable property rights for both tangible investments and intellectual property, providing exchange-rate convertibility that allows investors to take home their profits, and maintaining confidence in the political and economic stability of the country.

C. INTERNATIONAL ECONOMIC ISSUES

In this final section, we apply the tools of international economics to examine two of the central issues that have concerned nations in recent years. In the first part, we examine the issue of the difference between competitiveness and productivity. In the second part, we examine the birth of the European Monetary Union.

COMPETITIVENESS AND PRODUCTIVITY

“The Deindustrialization of America”

Often, when the trade deficit becomes large, people become concerned and worry about the nation’s productivity and competitiveness. Just such a situation occurred in the United States in the 1980s, and later resurfaced in the 2000s. A review of this history is a helpful reminder about the determinants of trade flows.

The appreciation of the dollar in the 1980s produced severe economic hardships in many U.S. sectors exposed to international trade. Industries like automobiles, steel, and textiles found the demand for their products shrinking as an appreciation of the exchange rate led to a rise in their prices relative to those of their foreign competitors. Unemployment in America’s manufacturing heartland increased sharply, factories were closed, and the Midwest became known as the “rust belt.”

Many noneconomists interpreted U.S. trade problems as indicative of “America in decline.” They fretted that America’s technological leadership was eroding because of what they saw as unfair trade practices, excessive regulation, declining innovation, and managerial sloth. Some called for a reversal of trade agreements such as the North American Free Trade Agreement (NAFTA). America was pictured as a land condemned to serving potato chips while others were manufacturing our computer chips.

Economists saw a different syndrome at work—this situation is a classic disease of an overvalued exchange rate. To understand the fundamentals, we must distinguish a nation’s competitiveness from its productivity. *Competitiveness* refers to the extent to which a nation’s goods can compete in the marketplace; this depends primarily upon the relative prices of domestic and foreign products. Competitiveness should not be confused with *productivity*, which is measured by the output per unit of input. Productivity is fundamental to the growth of living standards in a nation; to a first approximation, a nation’s real income grows in step with its productivity growth.

It is true that U.S. competitiveness fell sharply during the 1980s and again in the early 2000s. However, these changes were not caused by a deterioration in productivity growth. Actually, productivity

growth increased just as the trade deficit increased. Macroeconomists believe that deteriorating competitiveness arose because the decline in national saving in the United States led to an appreciation of the dollar and raised American prices relative to those of its trading partners.

Trends in Productivity

The real story about U.S. real incomes is not about competitiveness but about productivity. Recall that productivity measures the output per unit of input (such as labor-hours). Our chapter on economic growth showed that increases in real wages depend primarily on the growth of domestic labor productivity.

Competitiveness is important for trade but has no intrinsic relationship to the level or growth of real incomes. China enjoyed a massive trade surplus in the 2000s at the same time as the United States ran a large trade deficit. But would Americans therefore trade their living standards for those in China with jobs paying \$1 an hour? Loss of competitiveness in international markets results from a nation's *prices* being out of line with those of its trading partners; it has no necessary connection with how a nation's *productivity* compares with that of other countries.

Studies of productivity differences among countries emphasize the importance of *competition* and *outward orientation*. An essential aspect of policy designed to increase productivity is to force domestic industries to compete with foreign firms, who often have superior, frontier technologies. Foreign direct investment by the most productive countries (such as the Japanese automobile plants operating in the United States) has contributed to dramatic productivity improvements through both the introduction of cutting-edge technologies and the stimulation of competition.

Conclusion on productivity and competitiveness: As the theory of comparative advantage demonstrates, nations are not inherently uncompetitive. Rather, they become uncompetitive when their prices move out of line with those of their trading partners. The surest route to high productivity and high living standards is to expose domestic industries to world markets and to encourage vigorous domestic competition with foreign companies that have adopted the most advanced technologies.

THE EUROPEAN MONETARY UNION

An ideal exchange-rate system is one that allows high levels of predictability of relative prices while stabilizing the economy in the face of economic shocks. In a well-functioning system, people can trade and invest in other countries without worrying that exchange rates will suddenly change and make their ventures unprofitable.

From the early 1990s, however, fixed-exchange-rate systems were often *destabilizing* rather than stabilizing. Time and again, fixed-exchange-rate systems were the subject of intense speculative attacks that spread to other countries through contagion. They were seen in Europe in 1991–1992, Mexico in 1994–1995, Russia and East Asia in 1997–1998, and Latin America from 1998 to 2002.

Nowhere were problems with the exchange-rate system more persistent and profound than in Western Europe. As a result, the countries of the European Union took the giant step of linking their economic fortunes through the European Monetary Union, which forged a common currency, the Euro.



The Fundamental Trilemma of Fixed Exchange Rates

"You can't have it all" is one of the central tenets of economics. This was driven home in macroeconomic affairs on several occasions during the 1990s. As countries on fixed exchange rates liberalized their financial markets, they encountered a fundamental trilemma of fixed exchange rates: A country can have only two of the following (a) a fixed but adjustable exchange rate, (b) free capital and financial movements, and (c) an independent domestic monetary policy.

This inconsistency among the three objectives was explained by Paul Krugman as follows:

The point is that you can't have it all: A country must pick two out of three. It can fix its exchange rate without emasculating its central bank, but only by maintaining controls on capital flows (like China today); it can leave capital movement free and retain monetary autonomy, but only by letting the exchange rate fluctuate (like Britain—or Canada); or it can choose to leave capital free and stabilize the currency, but only by abandoning any ability to adjust interest rates to fight inflation or recession (like Argentina today, or for that matter most of Europe).²

² See this chapter's Further Reading section.

Toward a Common Currency: The Euro

Since World War II, the democratic countries of Western Europe have pursued ever-closer economic integration, primarily to promote political stability after two devastating wars. Peace and trade go hand in hand, according to many political scientists. Beginning in 1957 with a free-trade agreement, Western Europeans gradually removed all barriers to trade in goods, services, and finance. The final step in economic integration was to adopt a common currency. This would not only foster closer economic ties but also resolve the problem of unstable currencies that plagued the earlier fixed-exchange-rate systems.

Eleven European countries joined the European Monetary Union (EMU) in 1999. These countries, sometimes called Euroland, adopted the Euro as their unit of account and medium of exchange. The first step was to begin transactions in Euros. The trickiest step came on January 1, 2002, when the countries of Euroland replaced their national currencies with Euro coins and notes, saying, in effect, “*Au revoir, French franc; bonjour, Euro.*” The Euro was launched smoothly and has now taken its place among the world’s major currencies.

The monetary structure under the European Monetary Union resembles that of the United States. Control over European monetary policy is exercised by the *European Central Bank (ECB)*, which conducts monetary policy for countries in the accord. The ECB undertakes open-market operations and thereby determines interest rates for the Euro.

One of the major questions for monetary policy involves the objectives of the central bank. The ECB is directed under its charter to pursue “price stability” as its primary objective, although it can pursue other communitywide goals as long as these do not compromise price stability. The ECB defines price stability as an increase in Euroland consumer prices of below 2 percent per year over the medium term.

Costs and Benefits of Monetary Union

What are the costs and benefits of European monetary union? Advocates of monetary union see important *benefits*. Under a common currency, exchange-rate volatility within Europe will be reduced to zero, so trade and finance will no longer have to contend with the uncertainties about prices induced by changing exchange rates. The primary result will be a reduction in transactions costs among countries. To the extent that national financial markets

are segmented, moving to a common currency may allow a more efficient allocation of capital across countries. Some believe that firm macroeconomic discipline will be preserved by having an independent European central bank committed to strict inflation targets. Perhaps the most important benefit may be political integration and stability of Western Europe—a region that has been at peace for half a century after being at war with itself for most of its recorded history.

Some economists are skeptical about the wisdom of monetary union in Europe and point to significant *costs* of such a union. The dominant concern is that the individual countries will lose the use of both monetary policy and exchange rates as tools for macroeconomic adjustment. This question concerns the optimal currency area, a concept first proposed by Columbia’s Robert Mundell, who won the 1999 Nobel Prize for his contributions in this field. An **optimal currency area** is one whose regions have high labor mobility or have common and synchronous aggregate supply or demand shocks. In an optimal currency area, significant changes in exchange rates are not necessary to ensure rapid macroeconomic adjustment.

Most economists believe that the United States is an optimal currency area. When the United States is faced with a shock that affects the different regions asymmetrically, labor migration tends to restore balance. For example, workers left the hard-hit northern states and migrated to the oil-rich southwestern states after the oil shocks of the 1970s.

Is Europe an optimal currency area? Some economists think it is not because of the rigidity of its wage structures and the low degree of labor mobility among the different countries. When a shock has occurred—for example, after the 1990 reunification of Germany—inflexible wages and prices led to rising inflation in the regions with a demand increase and rising unemployment in depressed regions. Monetary union might therefore condemn unfortunate regions to persistent low growth and high unemployment.

What is the initial verdict on the European Monetary Union? The creation of the Euro has removed one of the major sources of instability in the European economy—*intra-European exchange-rate movements*. In addition, it has led to a convergence of interest rates and inflation rates among European countries. On the other hand, Europe has

continued to experience high unemployment rates since the Euro's introduction. The financial crisis of 2007–2009 was the first major test of the European Monetary System, and economists will study how well this new multinational institution weathers the storm.

The European Monetary Union is one of history's great economic experiments. Never before has such a large and powerful group of countries turned its economic fortunes over to a multinational body like the European Central Bank. Never before has a central bank been charged with the macroeconomic fortunes of a large group of nations with 325 million people producing \$16 trillion of goods and services. While optimists point to the microeconomic benefits of a larger market and lower transactions costs, pessimists worry that monetary union threatens stagnation and unemployment because of the lack of price and wage flexibility and insufficient labor mobility among countries. The financial crisis of 2007–2009 is the first major test of this new monetary system.

FINAL ASSESSMENT

This survey of international economics must acknowledge a mixed picture, with both successes and failures. It is true that market economies occasionally suffer from inflation and recession. Moreover, in the most recent downturn in 2007–2009, unemployment rose sharply and many financial giants teetered on the edge of bankruptcy. Nonetheless, if we step back, an impartial jury of historians would surely rate the last half-century as one of unparalleled success for the countries of North America and Western Europe:

- *Robust economic performance.* The period has seen the most rapid and sustained economic growth in recorded history. It is the only period since the Industrial Revolution in which these countries have avoided deep depression and the cancer of hyperinflation.
- *The emerging monetary system.* The international monetary system continues to be a source of turmoil, with frequent crises as countries encounter balance-of-payments or currency difficulties. Nonetheless, we can see an emerging system in which the major economic regions—the United States, Europe, and Japan—conduct independent monetary policies with flexible exchange rates, while smaller countries either float or have “hard” fixed exchange rates tied to one of the major blocks. A major challenge for the future will be to integrate the Asian giants China and India into the international trade and financial systems.
- *The reemergence of free markets.* You often hear that imitation is the sincerest form of flattery. In economics, imitation occurs when a nation adopts the economic structure of another in the hope that it will produce growth and stability. In the last two decades, country after country threw off the shackles of communism and stifling central planning. This occurred not only because economics textbooks explained the miracle of the free market but primarily because people could see with their own eyes how the market-oriented countries of the West prospered while the centrally planned command economies collapsed. *For the first time, an empire collapsed because it could not produce sufficient butter along with its guns.*



SUMMARY

A. Foreign Trade and Economic Activity

1. An open economy is one that engages in international exchange of goods, services, and investments. Exports are goods and services sold to buyers outside the country, while imports are those purchased from foreigners. The difference between exports and imports of goods and services is called net exports.

2. When foreign trade is introduced, domestic demand can differ from national output. Domestic demand comprises consumption, investment, and government purchases ($C + I + G$). To obtain GDP, exports (Ex) must be added and imports (Im) subtracted, so

$$GDP = C + I + G + X$$

where $X = \text{net exports} = Ex - Im$. Imports are determined by domestic income and output along with the prices of domestic goods relative to those of foreign goods; exports are the mirror image, determined by foreign income and output along with relative prices. The dollar increase of imports for each dollar increase in GDP is called the marginal propensity to import (MPm).

3. Foreign trade has an effect on GDP similar to that of investment or government purchases. As net exports rise, there is an increase in aggregate demand for domestic output. Net exports hence have a multiplier effect on output. But the expenditure multiplier in an open economy will be smaller than that in a closed economy because of leakages from spending into imports. The multiplier is

$$\text{Open-economy multiplier} = \frac{1}{MPS + MPm}$$

Clearly, other things equal, the open-economy multiplier is smaller than the closed-economy multiplier, where $MPm = 0$.

4. The operation of monetary policy has new implications in an open economy. An important example involves the operation of monetary policy in a small open economy that has a high degree of capital mobility. Such a country must align its interest rates with those in the countries to whom it pegs its exchange rate. This means that countries operating on a fixed exchange rate essentially lose monetary policy as an independent instrument of macroeconomic policy. Fiscal policy, by contrast, becomes a powerful instrument because fiscal stimulus is not offset by changes in interest rates.
5. An open economy operating with flexible exchange rates can use monetary policy for macroeconomic stabilization which operates independently of other countries. In this case, the international link adds another powerful channel to the domestic monetary transmission mechanism. A monetary tightening leads to higher interest rates, attracting foreign financial capital and leading to a rise (or appreciation) of the exchange rate. The exchange-rate appreciation tends to depress net exports, so this impact reinforces the contractionary impact of higher interest rates on domestic investment.

B. Interdependence in the Global Economy

6. In the longer run, operating in the global marketplace provides new constraints and opportunities for countries to improve their economic growth. Perhaps the most important element concerns saving and investment, which are highly mobile and respond to incentives and the investment climate in different countries.
7. The foreign sector provides another source of funds for investment and another outlet for saving. Higher

domestic saving—whether through private saving or government fiscal surpluses—will increase the sum of domestic investment and net exports. Recall the identity

$$X = S + (T - G) - I$$

or

$$\begin{aligned}\text{Net exports} &= \text{private saving} \\ &\quad + \text{government saving} \\ &\quad - \text{domestic investment}\end{aligned}$$

In the long run, a country's trade position primarily reflects its national saving and investment rates. Reducing a trade deficit requires changing domestic saving and investment. One important mechanism for bringing trade flows in line with domestic saving and investment is the exchange rate.

8. Besides promoting high saving and investment, countries increase their growth through a wide array of policies and institutions. Important considerations are a stable macroeconomic climate, strong property rights for both tangible investments and intellectual property, a convertible currency with few restrictions on financial flows, and political and economic stability.

C. International Economic Issues

9. Popular analysis looks at large trade deficits and sees “deindustrialization.” But this analysis overlooks the important distinction between productivity and competitiveness. Competitiveness refers to how well a nation’s goods can compete in the global marketplace and is determined primarily by relative prices. Productivity denotes the level of output per unit of input. Real incomes and living standards depend primarily upon productivity, whereas the trade and current-account positions depend upon competitiveness. There is no close linkage between competitiveness and productivity.
10. Fixed exchange rates are a source of instability in a world of highly mobile financial capital. Recall the fundamental trilemma of fixed exchange rates: A country cannot simultaneously have a fixed but adjustable exchange rate, free capital and financial movements, and an independent domestic monetary policy.
11. In 1999, European countries chose to move to a common currency and a unitary central bank. A common currency is appropriate when a region forms an optimal currency area. Advocates of European monetary union point to the improved predictability, lower transactions costs, and potential for better capital allocation. Skeptics worry that a common currency—like any irrevocably fixed exchange-rate system—will require flexible wages and prices to promote adjustment to macroeconomic shocks.

CONCEPTS FOR REVIEW

$C + I + G + X$ curve for open economy
 $\text{net exports} = X = Ex - Im$
domestic demand vs. spending on GDP
marginal propensity to import (MPm)

expenditure multiplier:
in closed economy = $1/MPS$
in open economy =
 $1/(MPS + MPm)$
impact of trade flows and exchange rates on GDP

saving-investment identity in open economies: $X = S + (T - G) - I$
equilibration in saving-investment market in closed and open economies
growth policies in the open economy competitiveness vs. productivity

FURTHER READING AND INTERNET WEBSITES

Further Reading

The quotation from the *Economic Report of the President, 2000* (Government Printing Office, Washington, D.C., 2000), can also be found at fraser.stlouisfed.org/publications/ERP, pp. 231–235.

Websites

Data on trade and finance for different countries can be found in the section on websites for Chapter 26.

Robert Mundell won the Nobel Prize in 1999 for his contribution to international macroeconomics. Visit www.nobel.se/laureates to read about his contribution.

The website of the European Central Bank, at www.ecb.int/ecb/html/index.en.html, explains some of the issues involved in the management of the Euro. Also see the sites listed for Chapter 26.

QUESTIONS FOR DISCUSSION

1. Assume that an expansionary monetary policy leads to a decline or depreciation of the U.S. dollar relative to the currencies of America's trading partners in the short run with unemployed resources. Explain the mechanism by which this will produce an economic expansion in the United States. Explain how the trade impact reinforces the impact on domestic investment.
2. Explain the short-run impact upon net exports and GDP of the following in the multiplier model, using Table 28-1 where possible:
 - a. An increase in investment (I) of \$100 billion
 - b. A decrease in government purchases (G) of \$50 billion
 - c. An increase in foreign output which increased exports by \$10 billion
 - d. A depreciation of the exchange rate that raised exports by \$30 billion and lowered imports by \$20 billion at every level of GDP
3. What would the expenditure multiplier be in an economy without government spending or taxes where the MPC is 0.8 and the MPm is 0? Where the MPm is 0.1? Where the MPm is 0.9? Explain why the multiplier might even be less than 1.
4. Consider Table 28-3.
 - a. Explain each of the entries in the table.
 - b. Add another column with the heading "Change in interest rates" to Table 28-3. Then, on the basis of the graph in Figure 28-7, fill in the table for a closed economy.
5. An eminent macroeconomist recently wrote: "Moving toward a monetary union by adopting a common currency is not really about the currency. The most important factor is that countries in the union must agree on a single monetary policy for the entire region." Explain this statement. Why might adopting a single monetary policy cause troubles?
6. Consider the city of New Heaven, which is a very open economy. The city exports reliquaries and has no investment or taxes. The city's residents consume 50 percent of their disposable incomes, and 90 percent

of all purchases are imports from the rest of the country. The mayor proposes levying a tax of \$100 million to spend on a public-works program. Mayor Cains argues that output and incomes in the city will rise nicely because of something called “the multiplier.” Estimate the impact of the public-works program on the incomes and output of New Heaven. Do you agree with the mayor’s assessment?

7. Review the bulleted list of the three interactions of saving, investment, and trade on page 577. Make a graph like that of Figure 28-8 to illustrate each of the impacts. Make sure that you can explain the reverse cases mentioned in the paragraph that follows the bulleted list.
8. Politicians often decry the large trade deficit of the United States. Economists reply that to reduce the trade deficit would require a tax increase or a cut in government expenditures. Explain the economists’ view using the analysis of the saving-investment balance in Figure 28-8. Also, explain the quotation from the *Economic Report 2000* on page 565.
9. Look back at Figure 26-2 and make sure you understand it. Now, consider an emerging-market country like Brazil or Argentina.
 - a. Draw a diagram like Figure 28-9(b) for the country in good times, when the risk premium on its borrowing is low. Call this Figure A.
 - b. Next, consider a shock that raises the risk premium by a large amount. Draw a new figure with the high premium and the new equilibrium. Call this Figure B.
 - c. Now compare the equilibria in Figures A and B. Specifically, explain the difference in (i) the equilibrium domestic real interest rate, (ii) domestic investment, (iii) the exchange rate, and (iv) net exports.
10. Consider the example of small open economies like Belgium and the Netherlands that have highly mobile

financial capital and fixed exchange rates but also have high government budget deficits. Suppose that these countries find themselves in a depressed economic condition, with low output and high unemployment. Explain why they cannot use monetary policy to stimulate their economies. Why would fiscal expansion be effective if they could tolerate higher budget deficits?

11. **Advanced problem.** After the reunification of Germany, payments to rebuild the former East Germany led to a major expansion of aggregate demand in Germany. The German central bank responded by raising German real interest rates. These actions took place in the context of the European Monetary System, in which most countries had fixed exchange rates and where the German central bank was dominant in monetary policy.
 - a. Explain why European countries having fixed exchange rates and following the lead of the German central bank would find their interest rates rising along with German interest rates. Explain why other European countries would thereby be plunged into deep recessions.
 - b. Explain why countries would prefer the European Monetary Union to the earlier system.
 - c. Trace through why this German monetary tightening would be expected to lead to a depreciation of the dollar. Explain why the depreciation would stimulate economic activity in the United States.
12. **Advanced problem.** Reread the definition of the fundamental trilemma as well as the discussion by Paul Krugman on page 581. Explain why the three elements cannot go together. Why is there not a fundamental trilemma for the fixed-exchange-rate system between “California dollars” and “Texas dollars”? Explain how the trilemma would apply to China today. Explain the arguments for and against each of the three possible choices in the trilemma described by Krugman.

PART SEVEN

Unemployment, Inflation, and Economic Policy

Unemployment and the Foundations of Aggregate Supply

29



Be nice to people on your way up because you'll meet them on your way down.

Wilson Mizner

Among the persistent features of a market economy are business recessions, in which employment and output fall and unemployment rises. For most of the period since World War II, the United States avoided prolonged and deep recessions. However, even during the mild business contractions, joblessness increased and incomes fell sharply.

Occasionally, and often without much warning, countries suffer severe recessions or even decade-long depressions, and high unemployment persists for several years or even a decade. Such a situation was seen in the U.S. during the 1930s, when the unemployment rate was above 10 percent of the labor force for ten years.

The world's richest economies entered a recession in 2007, and it turned sharply worse in 2008–2009. Faced with a housing bubble, failing banks, a loss of confidence in the economy, weak investment, and a liquidity trap, the unemployment rate rose sharply in the 2007–2009 period. Although a better understanding of macroeconomics has allowed most countries to take countercyclical measures, prospects for a strong recovery of output and employment were slim.

This chapter presents an analysis of the macroeconomics of unemployment. It begins by analyzing the foundations of aggregate supply. This analysis

shows how rising unemployment is the result of slow growth of aggregate demand relative to potential output. We then examine the major policy issues surrounding unemployment.

A. THE FOUNDATIONS OF AGGREGATE SUPPLY

Earlier chapters focused on aggregate demand and economic growth. This section describes the factors determining aggregate supply. In the short run, the nature of the inflationary process and the effectiveness of government countercyclical policies depend on aggregate demand. In the long run of a decade or more, economic growth and rising living standards are closely linked with increases in aggregate supply.

This distinction between short-run and long-run aggregate supply is crucial to modern macroeconomics. In the short run, it is the interaction of aggregate supply and demand that determines business-cycle fluctuations, inflation, unemployment, recessions, and booms. But in the long run, it is the growth of potential output working through aggregate supply which explains the trend in output and living standards.

It will be useful to summarize the key points at the outset:

- **Aggregate supply** describes the behavior of the production side of the economy. The **aggregate supply curve**, or AS curve, is the schedule showing the level of total national output that will be produced at each possible price level, other things held constant.
- In analyzing aggregate supply, we will make the central distinction between the long run and the short run. The short run, corresponding to the behavior over periods of a few months to a few years, involves the **short-run aggregate supply schedule**. In the short run, prices and wages have elements of inflexibility. As a result, higher prices are associated with higher production of goods and services. This is shown as an *upward-sloping AS curve*.
- The long run refers to periods associated with economic growth, after most of the elements of business cycles have damped out; it refers to a period of several years or decades. In the long run, prices and wages are perfectly flexible. Output is determined by potential output and is independent of the price level. We depict the **long-run aggregate supply schedule** as *vertical*.

This section is devoted to explaining these central points.

DETERMINANTS OF AGGREGATE SUPPLY

Aggregate supply depends fundamentally upon two distinct sets of forces: potential output and input costs. Let us examine each of these influences.

Potential Output

The key concept for understanding aggregate supply is *potential output* or *potential GDP*. **Potential output** is the maximum sustainable output that can be produced without triggering rising inflationary pressures.

Over the long run, aggregate supply depends primarily upon potential output. Hence, long-run AS is determined by the same factors which influence long-run economic growth: the quantity and quality of labor, the supply of capital and natural resources, and the level of technology.

Macroeconomists generally use the following definition of potential output:

Potential GDP is the highest sustainable level of national output. It is the level of output that would be produced if we remove business-cycle influences. As an operational measure, we measure potential GDP as the output that would be produced at a benchmark level of the unemployment rate called the *nonaccelerating inflation rate of unemployment* (or the NAIRU).

Potential output is a growing target. As the economy grows, potential output increases as well, and the aggregate supply curve shifts to the right. Table 29-1 shows the key determinants of aggregate supply, broken down into factors affecting potential output and production costs. From our analysis of economic growth, we know that the prime factors determining the growth in potential output are the growth in inputs and technological progress.



Potential Output Is Not Maximum Output

We must emphasize a subtle point about potential output: Potential output is the maximum sustainable output but not the absolute maximum output that an economy can produce. The economy can operate with output levels above potential output for a short time. Factories and workers can work overtime for a while, but production above potential is not indefinitely sustainable. If the economy produces more than its potential output for long, price inflation tends to rise as unemployment falls, factories are worked intensively, and workers and businesses try to extract higher wages and profits.

A useful analogy is someone running a marathon. Think of potential output as the maximum speed that a marathoner can run without becoming “overheated” and dropping out from exhaustion. Clearly, the runner can run faster than the sustainable pace for a while, just as the U.S. economy grew faster than its potential growth rate during the 1990s. But over the entire course, the economy, like the marathoner, can produce only at a maximum sustainable “speed,” and this sustainable output speed is what we call potential output.

Input Costs

It is not surprising that increased potential output would lead to increased aggregate supply. The role

Variable	Impact on aggregate supply
Potential output	
Inputs	Supplies of capital, labor, and natural resources are the important inputs. Potential output comes when employment of labor and other inputs is at the maximum sustainable level. Growth of inputs increases potential output and aggregate supply.
Technology and efficiency	Innovation, technological improvement, and increased efficiency increase the level of potential output and raise aggregate supply.
Production costs	
Wages	Lower wages lead to lower production costs; lower costs mean that quantity supplied will be higher at every price level for a given potential output.
Import prices	A decline in foreign prices or an appreciation in the exchange rate reduces import prices. This leads to lower production costs and raises aggregate supply.
Other input costs	Lower oil prices lower production costs and thereby raise aggregate supply.

TABLE 29-1. Aggregate Supply Depends upon Potential Output and Production Costs

Aggregate supply relates total output supplied to the price level. The AS curve depends upon fundamental factors such as potential output and production costs. The factors listed in the table would increase aggregate supply, shifting the AS curve down or to the right.

of costs in AS is less obvious. We will see, however, that aggregate supply *in the short run* is affected by the costs of production.

The intuition behind this point is the following: Businesses have certain costs that are inflexible in the short run. For example, consider an airline that has a long-term lease and a multiyear labor contract. If the demand for air travel increases, the airline will find it profitable to add flights and to raise its ticket prices. In other words, both prices and output increase with an increase in demand in the short run.

We can also see that changes in production costs will affect aggregate supply in the short run. For example, consider what happened in the early 2000s when oil prices rose sharply, increasing the price of jet fuel. Airlines were unable to adjust their operations and ticket prices sufficiently to offset the higher costs. They were making record losses. They therefore cut some of their operations, abandoned routes, cut back on food service, and mothballed a substantial number of airplanes. This example shows how input costs can affect supply behavior.

Table 29-1 shows some of the cost factors affecting aggregate supply. These examples are ones in which lower costs will increase AS, meaning that the AS curve shifts down.

AS Shifts. We can illustrate the effects of changes in costs and potential output graphically in Figure 29-1. The left-hand panel shows that an increase in potential output with no change in production costs would shift the aggregate supply curve outward from AS to AS'. If production costs were to increase with no change in potential output, the curve would shift straight up from AS to AS'', as shown in Figure 29-1(b).

The real-world shifting of AS is displayed in Figure 29-2. The curves are realistic empirical estimates for two different years, the recession year of 1982 and the peak year of 2000. The vertical lines indicate the levels of potential output in the two years. According to studies, real potential output grew about 72 percent over this period.

The figure shows how the AS curve shifted outward and upward over the period. The *outward* shift was caused by the increase in potential output that came from growth in the labor force and the capital stock as well as from improvements in technology. The *upward* shift was caused by increases in the cost of production, as wages, oil prices, and other production costs rose. Putting together the cost increases and the potential-output growth gives the aggregate supply shift shown in Figure 29-2.

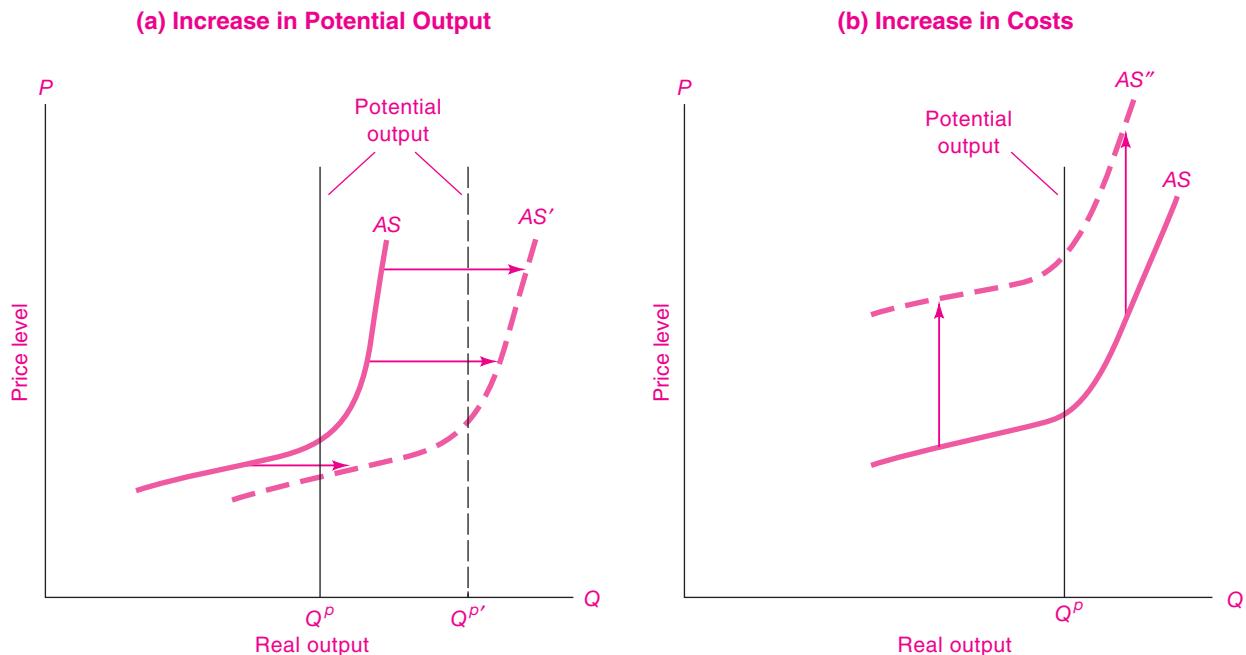


FIGURE 29-1. How Do Growth in Potential Output and Cost Increases Affect Aggregate Supply?

In (a), growth in potential output with unchanged production costs shifts the AS curve rightward from AS to AS' . When production costs increase, say, because of higher wages or oil costs, but with unchanged potential output, the AS curve shifts vertically upward, as from AS to AS'' in (b).

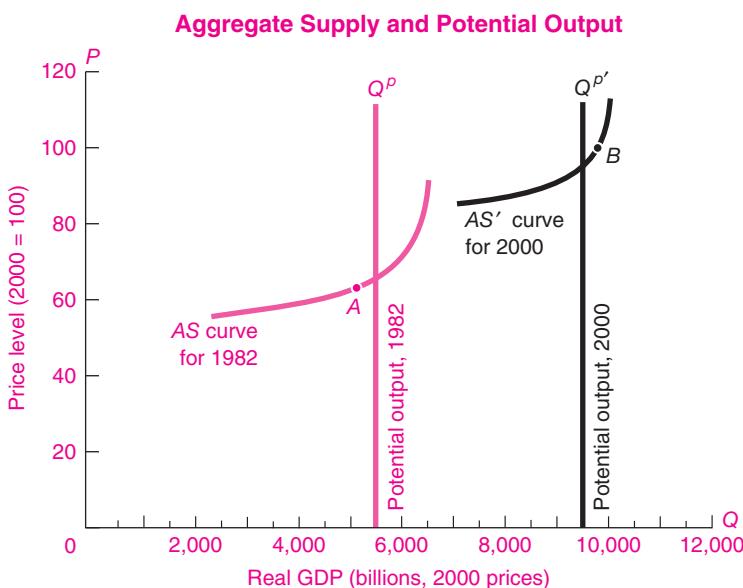


FIGURE 29-2. In Reality, Aggregate Supply Shifts Combine Cost Increases and Increased Potential Output

Between 1982 and 2000, potential output grew due to increases in capital and labor inputs along with technological improvements, shifting out the AS curve. At the same time, increases in production costs shifted up the AS curve. The net effect was to shift the AS curve upward and to the right.

AGGREGATE SUPPLY IN THE SHORT RUN AND LONG RUN

How do shifts in aggregate demand affect output and employment? The answer to this question differs between the short run (which applies to business cycles) and the long run (which applies to comparisons of countries over long periods of time or to comparisons among countries). The two approaches are illustrated in Figure 29-3.

The upward-sloping, short-run aggregate supply curve is associated with the analysis called **Keynesian macroeconomics**. In this situation, changes in aggregate demand have a significant effect on output. In other words, if aggregate demand falls because of a monetary tightening or a falloff in consumer spending, this will lead to falling output and prices. In terms of our curves, this means that the *AS* curve is upward-sloping, so a decline in *AD* will lead to a decline in both prices and output.

The long-run approach, sometimes called **classical macroeconomics**, holds that changes in *AD* affect prices but have no effect on real output. In the long

run, prices and wages adjust fully to changes in aggregate demand. The classical or long-run *AS* curve is vertical; changes in aggregate demand therefore have no effect on output.

We can summarize the reasons for the difference as follows: The short-run *AS* curve in Figure 29-3(a) indicates that firms are willing to increase their output levels in response to changes in aggregate demand. Clearly, there must be unemployed resources in the economy. But the expansion of output cannot go on forever. As output rises, labor shortages appear and factories operate close to capacity. Wages and prices begin to rise more rapidly. A larger fraction of the response to aggregate demand increase comes in the form of price increases and a smaller fraction comes in output increases.

Figure 29-3(b) shows what happens in the long run—after wages and prices have had time to react fully. When all adjustments have taken place, the long-run *AS* curve becomes vertical or classical. In the long run, the level of output supplied is independent of aggregate demand.

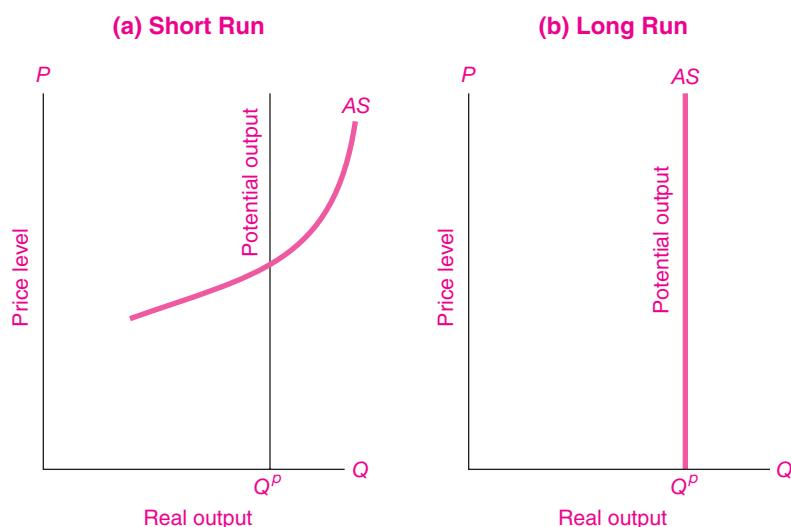


FIGURE 29-3. AS Is Upward-Sloping in the Short Run but Turns Vertical in the Long Run

The short-run *AS* curve in (a) slopes upward because many costs are inflexible in the short run. But sticky prices and wages become unstuck as time passes, so the long-run *AS* curve in (b) is vertical and output is determined by potential output. Can you see why a Keynesian economist in (a) might desire to stabilize the economy through policies that change aggregate demand while a classical economist in (b) would concentrate primarily on increasing potential output?

Sticky Wages and Prices and the Upward-Sloping AS Curve

Economists generally agree that the *AS* curve slopes up in the short run—which is to say that both output and prices respond to demand shifts. It has proved very difficult to develop a complete theory to explain this relationship, and controversies about aggregate supply are among the most heated in all of economics. We will describe one of the important and durable theories here—one involving sticky wages and prices—but don’t be surprised if you hear other ones as well.

The puzzle is why firms raise both prices and output in the short run as aggregate demand increases, whereas increases in demand lead primarily to price changes in the long run. The key to this puzzle lies in the behavior of wages and prices in a modern market economy. Some elements of business costs are *inflexible* or *sticky* in the short run. As a result of this inflexibility, businesses can profit from higher levels of aggregate demand by producing more output.

For example, suppose that a wartime emergency leads to an increase in military spending. Firms know that in the short run many of their production costs are fixed in dollar terms—workers are paid \$15 per hour, rentals are \$1500 per month, and so forth. In response to the higher demand, firms will generally raise their output prices and increase production. This positive association between prices and output is seen in the upward-sloping *AS* curve in Figure 29-3(a).

We have spoken repeatedly of “sticky” or “inflexible” costs. What are some examples? The most significant is wages. Take unionized workers as an example. They are usually paid according to a long-term union contract which specifies a dollar wage rate. For the life of the labor agreement, the wage rate faced by the firm will be largely fixed in dollar terms. It is quite rare for wages to be raised more than once a year even for nonunion workers. It is even more uncommon for money wages or salaries actually to be cut, except when a company is visibly facing the threat of bankruptcy.

Other prices and costs are similarly sticky in the short run. When a firm rents a building, the lease will often last for a year or more and the rental is generally set in dollar terms. In addition, firms often sign contracts with their suppliers specifying the prices to be paid for materials or components.

Putting all these cases together, you can see how a certain short-run stickiness of wages and prices exists in a modern market economy.

What happens in the long run? Eventually, the inflexible or sticky elements of cost—wage contracts, rental agreements, regulated prices, and so forth—become unstuck and negotiable. Firms cannot take advantage of fixed-money wage rates in their labor agreements forever; labor will soon recognize that prices have risen and insist on compensating increases in wages. Ultimately, all costs will adjust to the higher output prices. If the general price level rises by x percent because of the higher demand, then money wages, rents, regulated prices, and other costs will in the end respond by moving up around x percent as well.

Once costs have adjusted upward as much as prices, firms will be unable to profit from the higher level of aggregate demand. In the long run, after all elements of cost have fully adjusted, firms will face the same ratio of price to costs as they did before the change in demand. There will be no incentive for firms to increase their output. The long-run *AS* curve therefore tends to be vertical, which means that output supplied is independent of the level of prices and costs.

*Aggregate supply differs depending upon the period. In the short run, inflexible elements in wages and prices lead firms to respond to higher demand by raising both production and prices. In the longer run, as costs respond fully, all of the response to increased demand takes the form of higher prices. Whereas the short-run *AS* curve is upward-sloping, the long-run *AS* curve is vertical because, given sufficient time, all prices and costs adjust fully.*

B. UNEMPLOYMENT

During the recession that began in 2007, the number of unemployed people in the United States rose by more than 4 million. Of the 11 million unemployed people at the end of 2008, half were “job losers,” people who lost their jobs involuntarily. In earlier periods, such as the Great Depression or the early 1980s, the unemployment rate rose much more, reaching an all-time high of 25 percent in 1933.

The presence of involuntary unemployment in a market economy raises important questions: How can millions of people be unemployed when there is so much useful work to be done? Is there some flaw in the market mechanism that forces so many who want to work to remain idle? Alternatively, is high unemployment primarily due to flawed government programs (such as unemployment insurance) that reduce the incentive to work, or is it due to inherent properties of a market economy? The balance of this chapter provides a survey of the meaning of unemployment and some answers to these important questions.

MEASURING UNEMPLOYMENT

Changes in the unemployment rate make monthly headlines. Look back to Figure 19-3 on page 373 to refresh your memory about the long-term trend. What lies behind the numbers? Statistics on unemployment and the labor force are among the most carefully designed and comprehensive economic data the nation collects. The data are gathered monthly in a procedure known as *random sampling* of the population. Each month about 60,000 households are interviewed about their recent work history.

The survey divides the population of those 16 years and older into four groups:

- **Employed.** These are people who perform any paid work, as well as those who have jobs but are absent from work because of illness, strikes, or vacations.
- **Unemployed.** Persons are classified as unemployed if they do not have a job, have actively looked for work in the prior 4 weeks, and are currently available for work. An important point to note is that unemployment requires more than being without a job—it requires taking steps to find a job.
- **Not in the labor force.** This includes the 34 percent of the adult population that is keeping house, retired, too ill to work, or simply not looking for work.
- **Labor force.** This includes all those who are either employed or unemployed.

Figure 29-4 shows how the population in the United States is divided among the categories of employed, unemployed, and not in the labor force.

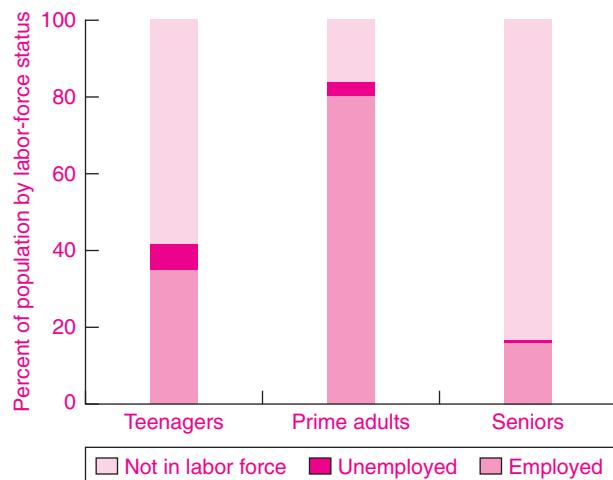


FIGURE 29-4. Labor-Force Status of the Population, 2007

How do Americans spend their time? This figure shows how teenagers (ages 16–19), prime-age adults (ages 25–54), and seniors (65 and older) divided their time among employment, unemployment, and not in the labor force. Many young workers are out of the labor force and in school, while most older workers are retired.

Source: Bureau of Labor Statistics.

(The status of students is examined in question 6 at the end of this chapter.)

The definition of labor-force status used by the government is the following:

People with jobs are employed; people without jobs but looking for work are unemployed; people without jobs who are not looking for work are outside the labor force. The **unemployment rate** is the number of unemployed divided by the total labor force.

IMPACT OF UNEMPLOYMENT

High unemployment is both an economic and a social problem. Unemployment is an economic problem because it represents waste of a valuable resource. Unemployment is a major social problem because it causes enormous suffering as unemployed workers struggle with reduced incomes. During periods of high unemployment, economic distress spills over to affect people's emotions and family lives.

Economic Impact

When the unemployment rate goes up, the economy is in effect throwing away the goods and services that the unemployed workers could have produced.

How much waste results from high unemployment? What is the opportunity cost of recessions? Table 29-2 provides a calculation of how far output fell short of potential GDP during three periods of high unemployment over the last half-century. The largest economic loss occurred during the Great Depression, but the oil and inflation crises of the 1970s and 1980s also generated more than a trillion dollars of lost output.

The economic losses during periods of high unemployment are the greatest documented wastes in a modern economy. They are many times larger than the estimated inefficiencies from microeconomic waste due to monopoly or from the waste induced by tariffs and quotas.

Social Impact

The economic cost of unemployment is certainly large, but no dollar figure can adequately convey the human and psychological toll of long periods of persistent involuntary unemployment. The personal tragedy of unemployment has been proved again

and again. We can read of the futility of a job search in San Francisco during the Great Depression:

I'd get up at five in the morning and head for the waterfront. Outside the Spreckles Sugar Refinery, outside the gates, there would be a thousand men. You know dang well there's only three or four jobs. The guy would come out with two little Pinkerton cops: "I need two guys for the bull gang. Two guys to go into the hole." A thousand men would fight like a pack of Alaskan dogs to get through. Only four of us would get through.

Or we can listen to the recollection of an unemployed construction worker:

I called the roofing outfits and they didn't need me because they already had men that had been working for them five or six years. There wasn't that many openings. You had to have a college education for most of them. And I was looking for anything, from car wash to anything else.

So what do you do all day? You go home and you sit. And you begin to get frustrated sitting home. Everybody in the household starts getting on edge. They start arguing with each other over stupid things 'cause they're all cramped in that space all the time. The whole family kind of got crushed by it.

	Lost Output		
	Average unemployment rate (%)	GDP loss (\$, billion, 2008 prices)	As percentage of GDP during the period
Great Depression (1930–1939)	18.2	2,796	30.0
Oil and inflation crises (1975–1984)	7.7	1,694	2.7
Slump after dot.com bust (2001–2003)	5.5	509	1.4

TABLE 29-2. Economic Costs from Periods of High Unemployment

The two major periods of high unemployment since 1929 occurred during the Great Depression and during the oil shocks and high inflation from 1975 to 1984. The lost output is calculated as the cumulative difference between potential GDP and actual GDP. Note that during the Great Depression losses relative to GDP were 10 times greater than losses in the oil-inflation slump. The slowdown in the early 2000s was mild by comparison to earlier downturns.

Source: Authors' estimates on the basis of official GDP and unemployment data.

Unemployment is not limited to the unskilled, as many well-paid managers, professionals, and white-collar workers learned in the corporate downsizings of the last two decades. Listen to the story of one middle-aged corporate manager who lost his job in 1988 and was still without permanent work in 1992:

I have lost the fight to stay ahead in today's economy.... I was determined to find work, but as the months and years wore on, depression set in. You can only be rejected so many times; then you start questioning your self-worth.

OKUN'S LAW

The most traumatic consequence of a recession is the accompanying rise in unemployment. As output falls, firms need fewer labor inputs, so new workers are not hired and current workers are laid off. We see that the unemployment rate usually moves inversely with output over the business cycle. This co-movement is known as Okun's Law.

Okun's Law states that for every 2 percent that GDP falls relative to potential GDP, the unemployment rate rises about 1 percentage point.

This means that if GDP begins at 100 percent of its potential and falls to 98 percent of potential, the unemployment rate rises by 1 percentage point, say, from 6 to 7 percent. Figure 29-5 shows how output and unemployment have moved together over time.

We can illustrate Okun's Law by examining output and unemployment trends in the 1990s. At the trough of the recession of 1991, the unemployment rate rose to 7 percent. At that point, actual GDP was estimated to be 3 percent below potential output. Then, over the next 8 years, output grew 5 percent faster than potential output, so in 1999 actual GDP was estimated to be 2 percent above potential output. According to Okun's Law, the unemployment rate should have fallen by $2\frac{1}{2}$ percentage points ($5/2$) to $4\frac{1}{2}$ percent ($7 - 2\frac{1}{2}$). In fact, the unemployment rate for 1999 was $4\frac{1}{4}$ percent—a remarkably accurate prediction. This shows how Okun's Law can be used to relate changes in the unemployment rate to the growth in output.

One important consequence of Okun's Law is that actual GDP must grow as rapidly as potential GDP just to keep the unemployment rate from rising. In a sense, GDP has to keep running just to keep

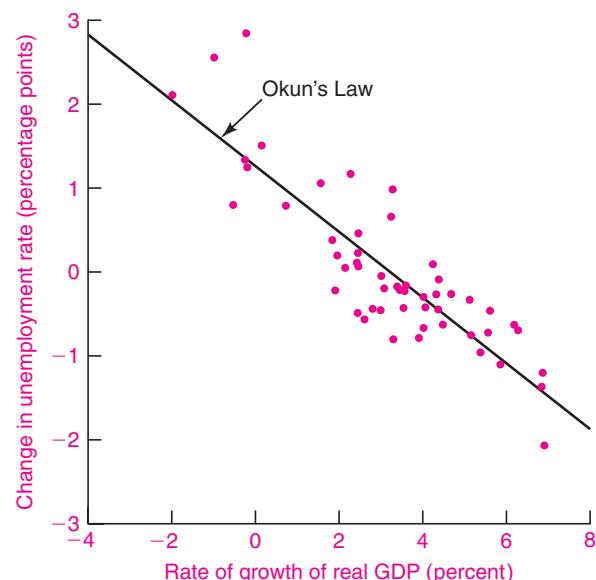


FIGURE 29-5. Okun's Law Illustrated, 1955–2007

According to Okun's Law, whenever output grows 2 percent faster than potential GDP, the unemployment rate declines 1 percentage point. This graph shows that unemployment changes are well predicted by the rate of GDP growth. What output growth would lead to no change in unemployment according to the line?

Source: U.S. Departments of Commerce and Labor.

unemployment in the same place. Moreover, if you want to bring the unemployment rate down, actual GDP must be growing faster than potential GDP.

Okun's Law provides the vital link between the output market and the labor market. It describes the association between short-run movements in real GDP and changes in unemployment.

ECONOMIC INTERPRETATION OF UNEMPLOYMENT

On the face of it, the cause of unemployment seems clear: too many workers chasing too few jobs. Yet this simple phenomenon has presented a tremendous puzzle for economists for many years. Experience shows that prices rise or fall to clear competitive markets. At the market-clearing price, buyers willingly buy what sellers willingly sell. But something is

gumming up the workings of the labor market when many hospitals are searching for nurses but cannot find them while thousands of coal miners want to work at the going wage but cannot find a job. Similar symptoms of labor market failures are found in all market economies.

Let's turn now to the economic analysis of unemployment. As with other economic phenomena, we would like to understand the reasons for unemployment. Can we understand why unemployment varies sharply over the business cycle, as well as why some groups have higher unemployment rates than other groups? We will see that a combination of imperfections in the labor market, as well as personal search dynamics, lies behind the observed behavior.

Equilibrium Unemployment

We begin by analyzing unemployment in a supply-and-demand framework. To begin with, we will consider equilibrium unemployment. **Equilibrium unemployment** arises when people become unemployed voluntarily as they move from job to job or into and out of the labor force. This is also sometimes called *frictional unemployment* because people cannot move instantaneously between jobs. Here are some examples: Someone working at the local hamburger stand might decide that the pay is too low, or the hours are too inconvenient, and quit to look for a better job. Others might decide to take time off between school and their first job. A new mother might take 3 months of unpaid maternity leave. These workers have chosen unemployment rather than work in balancing their relative preferences of income, job characteristics, leisure, and family responsibilities.

This kind of unemployment is equilibrium because firms and workers are on their supply and demand schedules. The market is clearing properly in the sense that all workers who desire jobs at the going wages and working conditions have them and all firms that wish to hire workers at the going compensation can find them. Some economists label this *voluntary unemployment* to denote that people are unemployed because they prefer that state over other labor market states.

Equilibrium unemployment is shown in Figure 29-6(a). The workers have a labor supply schedule shown as SS. The left-hand panel shows the usual picture of competitive supply and demand, with a market equilibrium at point E and a wage of W^* . At

the competitive, market-clearing equilibrium, firms willingly hire all qualified workers who desire to work at the market wage. The number of employed is represented by the line from A to E.

However, even though the market is in equilibrium, some people would like to work but only at a higher wage rate. These unemployed workers, represented by the segment EF, are unemployed in the sense that they choose not to work at the market wage rate. But this is equilibrium unemployment in the sense that they are not working because of their choice between work and nonwork given the market wages.

The existence of equilibrium unemployment leads to an often misunderstood point: *Unemployment may be an efficient outcome in a situation where heterogeneous workers are searching for work or testing different kinds of jobs.* The voluntarily unemployed workers might prefer leisure or other activities to jobs at the going wage rate. Or they may be frictionally unemployed, perhaps searching for their first job. Or they might be low-productivity workers who prefer retirement or unemployment insurance to low-paid work. There are countless reasons why people might voluntarily choose not to work at the going wage rate, and yet these people might be counted as unemployed in the official statistics.

Disequilibrium Unemployment

Go back to reread the paragraphs above on the experiences of the three workers. The situation outside the Spreckles Sugar Refinery hardly sounds like equilibrium conditions. The unemployed workers surely do not seem like people carefully balancing the value of work against the value of leisure. Nor do they resemble people choosing unemployment as they search for a better job. Rather, these workers are in a situation of disequilibrium unemployment. This occurs when the labor market or the macroeconomy is not functioning properly and some qualified people who are willing to work at the going wage cannot find jobs. Two examples of disequilibrium are structural and cyclical unemployment.

Structural unemployment signifies a mismatch between the supply of and the demand for workers. Mismatches can occur because the demand for one kind of labor is rising while the demand for another kind is falling and markets do not quickly adjust. We often see structural imbalances across occupations or

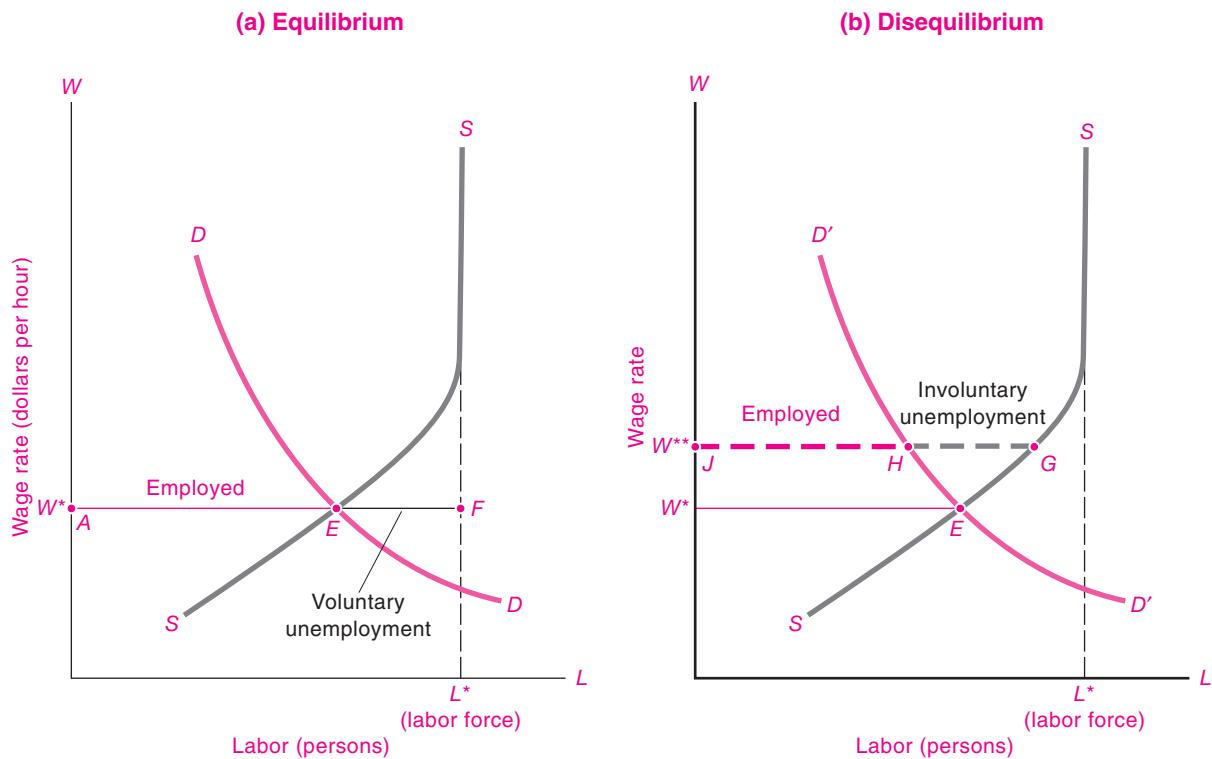


FIGURE 29-6. Equilibrium vs. Disequilibrium Unemployment

We can depict different kinds of unemployment by using the microeconomic supply-and-demand framework.

Panel (a) shows a standard market-clearing equilibrium with flexible wages. Here, wages decline to W^* to clear the labor market and balance supply and demand. All unemployment is voluntary.

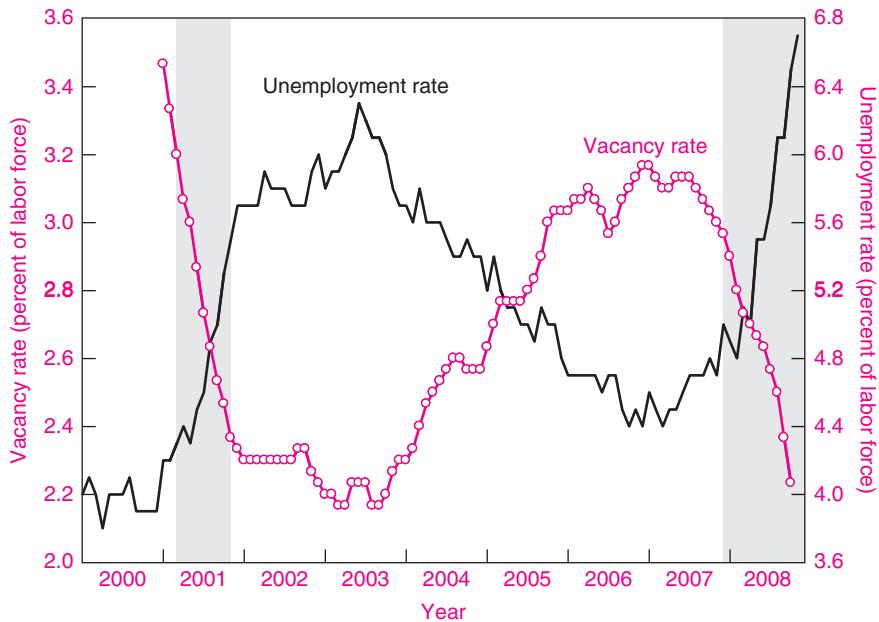
Panel (b) shows disequilibrium unemployment, with sticky wages that do not adjust to clear the labor market. At the too high wage at W^{**} , JH workers are employed, but HG workers are involuntarily unemployed.

regions as certain sectors grow while others decline. For example, an acute shortage of nurses arose recently as the number of skilled nurses grew slowly while the demand for nursing care grew rapidly because of an aging population. Not until nurses' salaries rose rapidly and the supply adjusted did the structural shortage of nurses decline. By contrast, the demand for coal miners has been depressed for decades because of the lack of geographic mobility of labor and capital; unemployment rates in coal-mining communities remain high today.

Cyclical unemployment exists when the overall demand for labor declines in business-cycle downturns, as described in the Keynesian business-cycle

theory. For example, in the major recession of 2007–2009, the demand for labor declined and unemployment rose in virtually every industry and region. Similarly, in the long expansion of the 2000s, the unemployment rate fell in virtually every state in the United States. The labor market consequences of business cycles differ from case to case, from mild declines in employment growth to job losses totaling a sizable fraction of the population.

The key to understanding disequilibrium unemployment is to see that labor markets are not at their supply-and-demand equilibrium, as is shown in Figure 29-6(b). For this example, we assume that wages are sticky in the short run at the initial level of W^{**} .



Shaded areas are NBER recessions.

FIGURE 29-7. Vacancy and Unemployment Rates

The vacancy and unemployment rates move inversely over the business cycle. This is an important prediction of the Keynesian sticky-wage theory of unemployment.

Source: Bureau of Labor Statistics.

Hence, when there is a decline in the demand for labor, and labor demand declines to the $D'D'$ curve in (b), the market wage at W^{**} is above the market-clearing wage at W^* .

At the too high wage rate, there are more qualified workers looking for work than there are vacancies looking for workers. The number of workers desiring to work at wage W^{**} is at point G on the supply curve, but firms want to hire only H workers, as shown by the demand curve. Because the wage exceeds the market-clearing level, there is a surplus of workers. The unemployed workers represented by the dashed line segment HG constitute *disequilibrium unemployment*. Alternatively, we may call them “involuntarily unemployed,” signifying that they are qualified workers who want to work at the prevailing wage but cannot find jobs.

The opposite case occurs when the wage is below the market-clearing rate. Here, in a labor-shortage economy, employers cannot find enough workers to fill

the existing vacancies. Firms put help-wanted signs in their windows, advertise in newspapers or on Monster.com, and even recruit people from other towns.

Figure 29-7 shows the vacancy rate along with the unemployment rate for the last decade. The two curves move inversely, as predicted by the sticky-wage theory shown in Figure 29-6.

The Analogy of College Admissions. The example of college admissions illustrates the kind of adjustment that takes place when shortages or gluts occur because prices do not adjust. Many colleges have enjoyed soaring applications in recent years. How did they react? Did they raise their tuition enough to choke off the excess demand? No. Instead, they raised their admission standards, requiring better grades in high school and higher average SAT scores. Upgrading the requirements rather than changing wages and prices is exactly what happens in the short run when firms experience an excess supply of labor.

Microeconomic Foundations of Inflexible Wages

Economists have developed many approaches to understanding the microeconomic foundations of unemployment. This issue remains one of the deepest unresolved mysteries of modern macroeconomics. Our survey emphasizes the importance of inflexibility of wages and prices. But this raises the further question: Why are wages and prices inflexible? Why do wages not move up or down to clear markets?

These are controversial questions. Few economists today would argue that wages move quickly to erase labor shortages and surpluses. Yet no one completely understands the reasons for the sluggish behavior of wages and salaries. We can therefore provide no more than a tentative assessment of the sources of wage inflexibility.

Auction vs. Administered Markets. A helpful distinction is that between auction markets and administered markets. An *auction market* is a highly organized and competitive market at which the price floats up or down to balance supply and demand. At the Chicago Board of Trade, for example, the price of “number 2 hard red wheat delivered in Kansas City” or “dressed ‘A’ broiler chickens delivered in New York” changes every minute to reflect market conditions.

Auction markets are the exception. Most goods and all labor are sold in administered markets. Nobody grades labor into “grade B Web page developer” or “class AAA assistant professor of economics.” No market specialist ensures that every job and worker is quickly matched at a market-clearing wage.

Rather, most firms *administer* their wages and salaries, setting pay scales and hiring people at an entry-level wage or salary. These wage scales are generally fixed for a year or so, and when they are adjusted, the pay goes up for all categories. For example, every pay grade in a hospital might get a 4 percent pay increase for this year. Sometimes, the firm might decide to move one category up or down more than the average. Under standard procedures, firms will make only partial adjustments when there are shortages or gluts in a particular area.

For unionized labor markets, the wage patterns are even more rigid. Wage scales are typically set for a 3-year contract period; during that period, there are no adjustments in wages if shortages or gluts appear in particular jobs.

Menu Costs of Adjusting Wages and Prices. What is the economic reason for inflexible wages and salaries? Many economists believe that the inflexibility arises because of the costs of administering compensation (these are called “menu costs”). To take the example of union wages, negotiating a contract is a long process that requires much worker and management time and produces no output. Because collective bargaining is so costly, such agreements are generally negotiated only once every 3 years.

Setting compensation for nonunion workers is less costly, but it nevertheless requires scarce management time and has important effects on worker morale. Every time wages or salaries are set, every time fringe benefits are changed, earlier compensation agreements are changed as well. Some workers will feel the changes are unfair, others will complain about unjust procedures, and grievances may be triggered.

Personnel managers therefore prefer a system in which wages are adjusted infrequently and most workers in a firm get the same pay increase, regardless of the market conditions for different skills or categories. This system may appear inefficient because it does not allow for a perfect adjustment of wages to reflect market supply and demand. But it does economize on scarce managerial time and helps promote a sense of fair play and equity in the firm. In the end, it may be cheaper to recruit workers more vigorously or to change the required qualifications than to upset the entire wage structure of a firm simply to hire a few new workers.

We can summarize the microeconomic foundations as follows:

Most wages in market economies are administered by firms or contracts. Wages and salaries are adjusted infrequently because of the costs of negotiation and wage setting. When labor supply or demand changes, because of sticky wages, the reaction is primarily in quantities of labor employed rather than wages.

LABOR MARKET ISSUES

Having analyzed the causes of unemployment, we turn next to major labor market issues for today. Which groups are most likely to be unemployed? How long are they unemployed? What explains differences in unemployment across countries?

Labor market group	Unemployment Rate of Different Groups (% of labor force)		Distribution of Total Unemployment across Different Groups (% of total unemployed)	
	Trough (1982)	Peak (March 2000)	Trough (1982)	Peak (March 2000)
By age:				
16–19	23.2	13.3	18.5	20.2
20 years and older	8.6	3.3	81.5	80.0
By race:				
White	8.6	3.6	77.2	77.6
Black and other	17.3	7.3	22.8	22.4
By sex (adults only):				
Male	8.8	3.8	58.5	50.5
Female	8.3	4.3	41.5	49.5
All workers	9.7	4.1	100.0	100.0

TABLE 29-3. Unemployment by Demographic Group

This table shows how unemployment varies across different demographic groups in peak and trough years. The first set of figures shows the unemployment rate for each group in 1982 and during the peak period of 2000. The last two columns show the percent of the total pool of unemployed that is in each group.

Source: U.S. Department of Labor, *Employment and Earnings*.

Who Are the Unemployed?

We can diagnose labor market conditions by comparing years in which output is above its potential (of which 1999–2000 was a recent period) with those of deep recessions (such as was seen in 1982). Differences between these years show how business cycles affect the amount, sources, duration, and distribution of unemployment.

Table 29-3 shows unemployment statistics for peak and trough years. The first two columns of numbers are the unemployment rates by age, race, and sex. These data show that the unemployment rate of every group tends to rise during recession. The last two columns show how the total pool of unemployment is distributed among different groups; observe that the distribution of unemployment across groups changes relatively little throughout the business cycle.

Note also that nonwhite workers tend to experience unemployment rates more than twice those of whites in both trough and peak periods. Until

the 1980s, women tended to have higher unemployment rates than men, but in the last two decades unemployment rates differed little by gender. Teenagers, with high frictional unemployment, have generally had unemployment rates much higher than adults.

Duration of Unemployment

Another key question concerns duration. How much of the unemployment experience is long-term and of major social concern, and how much is short-term as people move quickly between jobs?

Figure 29-8 shows the duration of unemployment in 2000–2007. A surprising feature of American labor markets is that a very large fraction of unemployment is of short duration. In 2003, one-third of unemployed workers were jobless for less than 5 weeks, and long-term unemployment was relatively rare.

In Europe, with lower mobility and greater legal obstacles to economic change, long-term unemployment in the mid-1990s reached 50 percent of the

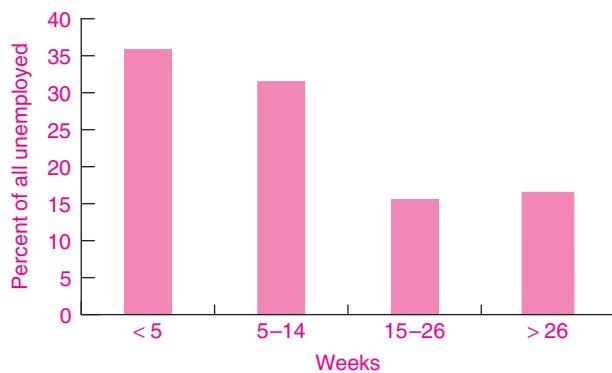


FIGURE 29-8. Duration of Unemployment in the United States, 2000–2007

Most unemployment is short-term in the United States. This suggests a frictional interpretation, where people move quickly between jobs.

Source: Bureau of Labor Statistics.

unemployed. Long-term unemployment poses a serious social problem because the resources that families have available—their savings, unemployment insurance, and goodwill toward one another—begin to run out after a few months.

Sources of Joblessness

Why are people unemployed? Figure 29-9 shows how people responded when asked the source of their unemployment, looking at the recession year of 1982 and the full-employment year of 2000.

There is always some frictional unemployment that results from changes in people's residence or from the life cycle—moving, entering the labor force for the first time, and so forth. The major changes in the unemployment rate over the business cycle arise from the increase in job losers. This source swells enormously in a recession for two reasons: First, the number of people who lose their jobs increases, and then it takes longer to find a new job.

Unemployment by Age

How does unemployment vary over the life cycle? Teenagers generally have the highest unemployment rate of any demographic group, and nonwhite teenagers in recent years have experienced unemployment rates between 30 and 50 percent. Is this unemployment frictional, structural, or cyclical?

Recent evidence indicates that, particularly for whites, teenage unemployment has a large frictional component. Teenagers move in and out of the labor force very frequently. They get jobs quickly and change jobs often. The average duration of teenage unemployment is only half that of adult unemployment; by contrast, the average length of a typical job is 12 times greater for adults than teenagers. In most years, half the unemployed teenagers are “new entrants” who have never had a paying job before. All these factors suggest that teenage unemployment is largely frictional; that is, it represents the job search and turnover necessary for young people to discover their personal skills and to learn what working is all about.

But teenagers do eventually learn the skills and work habits of experienced workers. The acquisition of experience and training, along with a greater desire and need for full-time work, is the reason middle-aged workers have much lower unemployment rates than teenagers.

Teenage Unemployment of Minority Groups. While most evidence suggests that unemployment is largely frictional for white teenagers, the labor market for young African-American workers has behaved quite differently. For the first decade after World War II, the labor-force participation rates and unemployment rates of black and white teenagers were virtually identical. After that time, however, unemployment rates for black teenagers rose sharply relative to those of other groups while their labor-force participation rates have fallen. By 2008, only 20 percent of black teenagers (16 to 19 years of age) were employed, compared to 35 percent of white teenagers.

What accounts for this extraordinary divergence in the experience of minority teenagers from that of other groups? One explanation might be that labor market forces (such as the composition or location of jobs) have worked against black workers in general. This explanation does not tell the whole story. While adult black workers have always suffered higher unemployment rates than adult white workers—because of lower education attainment, fewer contacts with people who can provide jobs, less on-the-job training, and racial discrimination—the ratio of black to white adult unemployment rates has not increased since World War II.

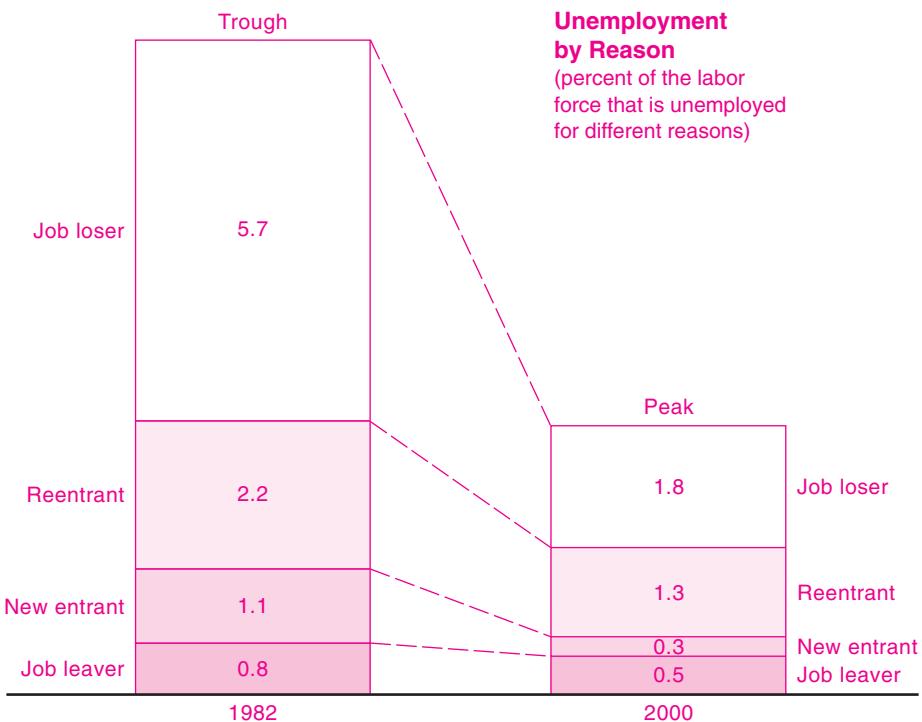


FIGURE 29-9. Distribution of Unemployment by Reason, 1982 and 2000

Why do people become unemployed? Very few were unemployed in the full-employment year of 2000 because they left their jobs, and almost 2 percent were new entrants into the labor force (say, because they just graduated from college) or reentrants (people who earlier left the labor force and are back looking for a job). The major change in unemployment from peak to trough, however, is found in the number of job losers. From 1982 to 2000 the fraction of workers who became unemployed because they lost their jobs fell from 5.7 to 1.8 percent.

Source: Bureau of Labor Statistics, at www.bls.gov/data.

Numerous studies of the sources of the rising black teenage unemployment rate have turned up no clear explanations for the trend. One possible source is discrimination, but a rise in the black-white unemployment differential would require an increase in racial discrimination—even in the face of increased legal protection for minority workers. Another theory holds that a high minimum wage along with rising costs of fringe benefits tends to drive low-productivity black teenagers into unemployment.

Does high teenage unemployment lead to long-lasting labor market damage, with permanently lower levels of skills and wage rates? This question is a topic of intensive ongoing research, and the tentative answer is yes, particularly for minority teenagers. It

appears that when youths are unable to develop on-the-job skills and work attitudes, they earn lower wages and experience higher unemployment when they are older. This finding suggests that public policy has an important stake in devising programs to reduce teenage unemployment among minority groups.



Unemployment Trends in America and Europe

Unemployment rates in the United States and Europe show different trends in recent years.

European unemployment was low until the supply shocks of the 1970s and has been relatively high since that time. American unemployment rates were generally lower than those in

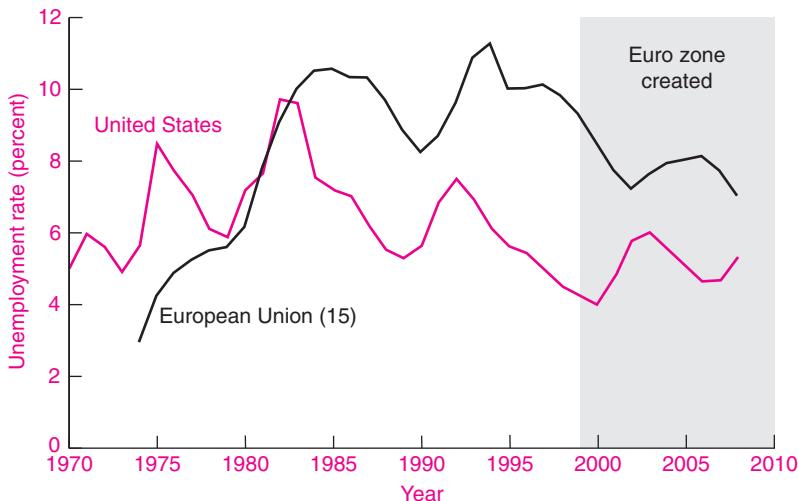


FIGURE 29-10. Unemployment in the United States and Europe

While unemployment has remained low in the United States, European unemployment has risen sharply over the last two decades. Many believe that the rising unemployment was due to labor market rigidities, while others think a fragmented monetary policy was to blame. With the introduction of the Euro and the integrated European Central Bank in 1999, European unemployment has declined gradually.

Source: U.S. Department of Labor, the OECD, and Eurostat. Data are for the EU 15 countries.

Europe over the last quarter-century. Figure 29-10 shows the unemployment-rate history for the two regions.

How can we explain the divergent labor markets of these two regions? Part of the reason probably lies in differences in macroeconomic policies. The United States has for almost a century had a single central bank, the Federal Reserve, which keeps careful watch over the American economy. When unemployment begins to rise, the Fed lowers interest rates to stimulate aggregate demand, increase output, and stem the unemployment increase.

Central banking in Europe was fragmented until very recently. Until 1999, Europe was a confederation of countries whose monetary policies were dominated by the German central bank, the Bundesbank. The Bundesbank was fiercely independent and aimed primarily at maintaining price stability in Germany. When unemployment rose in the rest of Europe and inflation rose in Germany—as happened after the reunification of Germany in 1990—the Bundesbank increased interest rates. This tended to depress output and raise unemployment in countries whose monetary policies were tied to Germany's. You can see this syndrome in the rise in unemployment in Europe after 1990.

A second feature of European unemployment relates to rising structural unemployment. Europe was the birthplace of the welfare state; countries like Germany, France, and Sweden legislated generous welfare benefits, unemployment insurance, minimum wages, and job protection for workers. These policies tend to increase real wages because workers possess greater bargaining power and have more attractive alternative uses for their time. Persons who are collecting welfare or unemployment benefits might be voluntarily unemployed, but they are generally counted as unemployed in the actual statistics. The United States has been less generous in its unemployment and welfare benefits.

What is the remedy for the high level of unemployment in Europe? Some economists emphasize reducing labor market barriers and welfare benefits. Other economists believe that the new European Central Bank may maintain a better balance of aggregate supply and demand in that region. (Recall our discussion of the European Monetary Union in Chapter 28.) It does appear that European unemployment has declined since the introduction of the Euro in 1999, although it is still above that in the United States.



SUMMARY

A. The Foundations of Aggregate Supply

1. Aggregate supply describes the relationship between the output that businesses willingly produce and the overall price level, other things being constant. The factors underlying aggregate supply are (a) potential output, determined by the inputs of labor, capital, and natural resources available to an economy, along with the technology or efficiency with which these inputs are used, and (b) input costs, such as wages and oil prices. Changes in these underlying factors will shift the *AS* curve.
2. A central distinction in *AS* analysis is between the long run and the short run. The short run, corresponding to the behavior in business cycles of a few months to a few years, involves the short-run aggregate supply schedule. In the short run, prices and wages have elements of inflexibility. As a result, higher prices are associated with increases in the production of goods and services. This is shown as an upward-sloping *AS* curve. The short-run *AS* and *AD* analyses are used in Keynesian analysis of the business cycle.
3. The long run refers to periods associated with economic growth, after most of the elements of business cycles have damped out. In the long run, prices and wages are perfectly flexible; output is determined by potential output and is independent of the price level. The long-run aggregate supply schedule is *vertical*. The long-run *AS* and *AD* analyses are used in the classical analysis of economic growth.

B. Unemployment

4. The government gathers monthly statistics on unemployment, employment, and the labor force in a sample survey of the population. People with jobs are categorized as employed; people without jobs who are looking for work are said to be unemployed; people without jobs who are not looking for work are considered outside the labor force.
5. There is a clear connection between movements in output and the unemployment rate over the business cycle. According to Okun's Law, for every 2 percent that actual GDP declines relative to potential GDP, the unemployment rate rises 1 percentage point. This rule is useful in translating cyclical movements of GDP into their effects on unemployment.
6. Economists distinguish between equilibrium and disequilibrium unemployment. Equilibrium unemploy-

ment arises when people become unemployed voluntarily as they move from job to job or into and out of the labor force. This is also called frictional unemployment.

7. Disequilibrium unemployment occurs when the labor market or the macroeconomy is not functioning properly and some qualified people who are willing to work at the going wage cannot find jobs. Two examples of disequilibrium are structural and cyclical unemployment. Structural unemployment arises for workers who are in regions or industries that are in a persistent slump because of labor market imbalances or high real wages. Cyclical unemployment is a situation where workers are laid off when the overall economy suffers a downturn.
8. Understanding the causes of unemployment has proved to be one of the major challenges of modern macroeconomics. The discussion here emphasizes that involuntary unemployment arises because the slow adjustment of wages produces surpluses (unemployment) and shortages (vacancies) in individual labor markets. If inflexible wages are above market-clearing levels, some workers are employed but other equally qualified workers cannot find jobs.
9. Wages are inflexible because of the costs involved in administering the compensation system. Frequent changes of compensation for market conditions would command too large a share of management time, would upset workers' perceptions of fairness, and would undermine worker morale and productivity.
10. A careful look at the unemployment statistics reveals several regularities:
 - a. Recessions hit all segments of the labor force, from the unskilled to the most skilled and educated.
 - b. A very substantial part of U.S. unemployment is short-term. The average duration of unemployment rises sharply in deep and prolonged recessions.
 - c. In most years, a substantial amount of unemployment is due to simple turnover, or frictional causes, as people enter the labor force for the first time or reenter it. Only during recessions is the pool of unemployed composed primarily of job losers.
 - d. The difference in unemployment rates in Europe and the United States reflects both structural policies and the effectiveness of monetary management.

CONCEPTS FOR REVIEW

Foundations of Aggregate Supply

aggregate supply, AS curve
factors underlying and shifting
 aggregate supply
aggregate supply: role of potential
 output and production costs
short-run vs. long-run AS

Unemployment

population status:
 unemployed
 employed
 labor force
 not in labor force
unemployment rate

Okun's Law

equilibrium vs. disequilibrium
 unemployment
inflexible wages, unemployment,
 vacancies

FURTHER READING AND INTERNET WEBSITES

Further Reading

The quotations in the text are from Studs Terkel, *Hard Times: An Oral History of the Great Depression in America* (Pantheon, New York, 1970) for the Great Depression; Harry Maurer, *Not Working: An Oral History of the Unemployed* (Holt, New York, 1979) for the construction worker; and *Business Week*, March 23, 1992, for the corporate manager.

Websites

Analysis of employment and unemployment for the United States comes from the Bureau of Labor Statistics,

at www.bls.gov. Statistics on unemployment in Europe and other OECD countries can be found at www.oecd.org. The BLS site also has an online version of *The Monthly Labor Review* at www.bls.gov/opub/mlr/mlrhome.htm, which is an excellent source for studies about employment, labor issues, and compensation. It contains articles on everything from "The Sandwich Generation" (www.bls.gov/opub/mlr/2006/09/contents.htm) to an analysis of the effect of going to war on labor market performance (www.bls.gov/opub/mlr/2007/12/contents.htm).

QUESTIONS FOR DISCUSSION

1. Explain carefully what is meant by the aggregate supply curve. Distinguish between movements along the curve and shifts of the curve. What might increase output by moving along the AS curve? What could increase output by shifting the AS curve?
2. Construct a table parallel to Table 29-1, illustrating events that would lead to a decrease in aggregate supply. (Be imaginative rather than simply using the same examples.)
3. What, if anything, would be the effect of each of the following on the AS curve in both the short run and the long run, other things being constant?
 - a. Potential output increases by 25 percent.
 - b. Oil prices double because of rising demand from China and India with a fixed supply of oil.
 - c. Consumers become pessimistic and increase their saving rate.
4. Assume that the unemployment rate is 7 percent and GDP is \$4000 billion. What is a rough estimate of potential GDP if the NAIRU is 5 percent? Assume that potential GDP is growing at 3 percent annually. What will potential GDP be in 2 years? How fast will GDP have to grow to reach potential GDP in 2 years?
5. What is the labor-force status of each of the following?
 - a. A teenager who sends out résumés in searching for a first job
 - b. An autoworker who has been laid off and would like to work but has given up hope of finding work or being recalled
 - c. A retired person who moved to Florida and answers advertisements for part-time positions
 - d. A parent who works part-time, wants a full-time job, but doesn't have time to look
 - e. A teacher who has a job but is too ill to work

6. In explaining its procedures, the Department of Labor gives the following examples:
- “Joan Howard told the interviewer that she has filed applications with three companies for summer jobs. However, it is only April and she doesn’t wish to start work until at least June 15, because she is attending school. Although she has taken specific steps to find a job, Joan is classified as not in the labor force because she is not currently available for work.”
 - “James Kelly and Elyse Martin attend Jefferson High School. James works after school at the North Star Café, and Elyse is seeking a part-time job at the same establishment (also after school). James’ job takes precedence over his non-labor force activity of going to school, as does Elyse’s search for work; therefore, James is counted as employed and Elyse is counted as unemployed.”
- Explain each of these examples. Take a survey of your classmates. Using the examples above, have people classify themselves in terms of their labor-force status as employed, unemployed, or not in the labor force.
7. Assume that Congress is considering a law that would set the minimum wage above the market-clearing wage for teenagers but below that for adult workers. Using supply-and-demand diagrams, show the impact of the minimum wage on the employment, unemployment, and incomes of both sets of workers. Is any unemployment voluntary or involuntary? What would you recommend to Congress if you were called to testify about the wisdom of this measure?
8. Do you think that the economic costs and personal stress of a teenager unemployed for 1 month of the summer might be less or more than those of a head-of-household unemployed for 1 year? Do you think that this suggests that public policy should have a different stance with respect to these two groups?

Inflation

30



Lenin is said to have declared that the best way to destroy the capitalist system was to debauch the currency. By a continuing process of inflation, governments can confiscate, secretly and unobserved, an important part of the wealth of their citizens.

J. M. Keynes

For most of the last quarter-century, the United States succeeded in maintaining low and stable inflation. This experience was primarily due to the success of monetary and fiscal policies in keeping output in a narrow corridor between inflationary excesses and sharp downturns, but favorable experience with commodity prices as well as moderation of wage increases helped reinforce the policies.

One new factor in the inflation equation was the growing “globalization” of production. As the United States became more integrated in world markets, domestic firms found that their prices were constrained by the prices of their international competitors.

Even when sales of clothing and electronic goods were booming, domestic companies could not raise their prices too much for fear of losing market share to foreign producers.

The 2000s were a turbulent period for prices. In the first part of the decade, inflation awoke from its long slumber. Particularly under the impetus of rising oil and food prices, prices rose rapidly. Then a steep recession starting in 2007 caused commodity prices to drop sharply, and countries were faced with the peril of deflation.

What are the macroeconomic dynamics of inflation? Why does deflation pose such a challenge for policy makers? The present chapter will examine the meaning and determinants of inflation and describe the important public-policy issues that arise in this area.

A. DEFINITION AND IMPACT OF INFLATION

WHAT IS INFLATION?

We described the major price indexes and defined inflation in Chapter 20, but it will be useful to reiterate the basic definitions here:

Inflation occurs when the general level of prices is rising. Today, we calculate inflation by using price indexes—weighted averages of the prices of thousands of individual products. The consumer price index (CPI) measures the cost of a market basket of consumer goods and services relative to the cost of that bundle during a particular base year. The GDP deflator is the price of all of the different components of GDP.

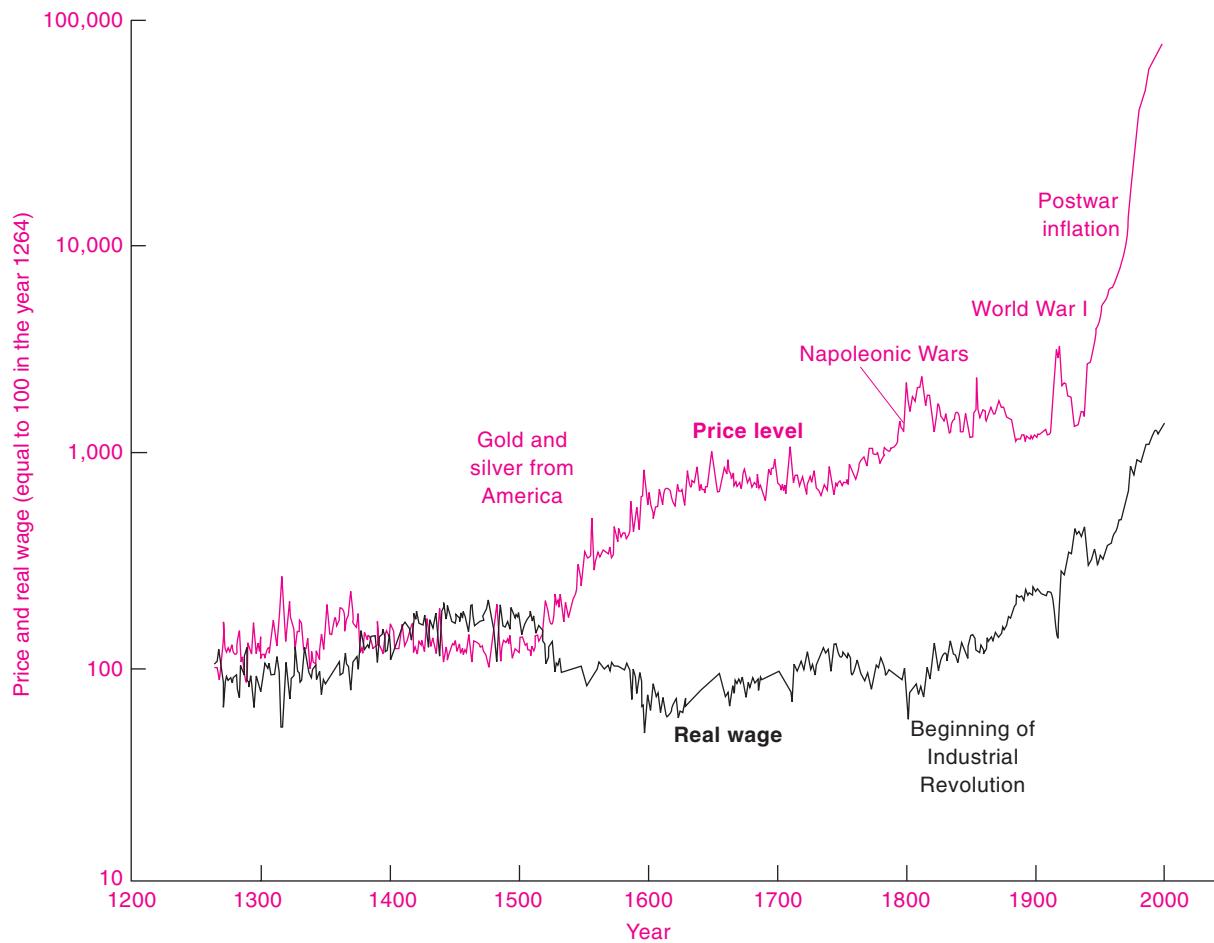


FIGURE 30-1. English Price Level and Real Wage, 1264–2007 (1270 = 100)

The graph shows England's history of prices and real wages since the Middle Ages. In early years, price increases were associated with increases in the money supply, such as from discoveries of New World treasure and the printing of money during the Napoleonic Wars. Note the meandering of the real wage prior to the Industrial Revolution. Since then, real wages have risen sharply and steadily.

Source: E. H. Phelps Brown and S. V. Hopkins, *Economica*, 1956, updated by the authors.

The rate of inflation is the percentage change in the price level:

$$\text{Rate of inflation in year } t = 100 \times \frac{P_t - P_{t-1}}{P_{t-1}}$$

If you are unclear on the definitions, refresh your memory by reviewing Chapter 20.

The History of Inflation

Inflation is as old as market economies. Figure 30-1 depicts the history of prices in England since the thirteenth century. Over the long haul, prices have generally risen, as the green line reveals. But examine also the blue line, which plots the path of *real wages* (the wage rate divided by consumer prices).

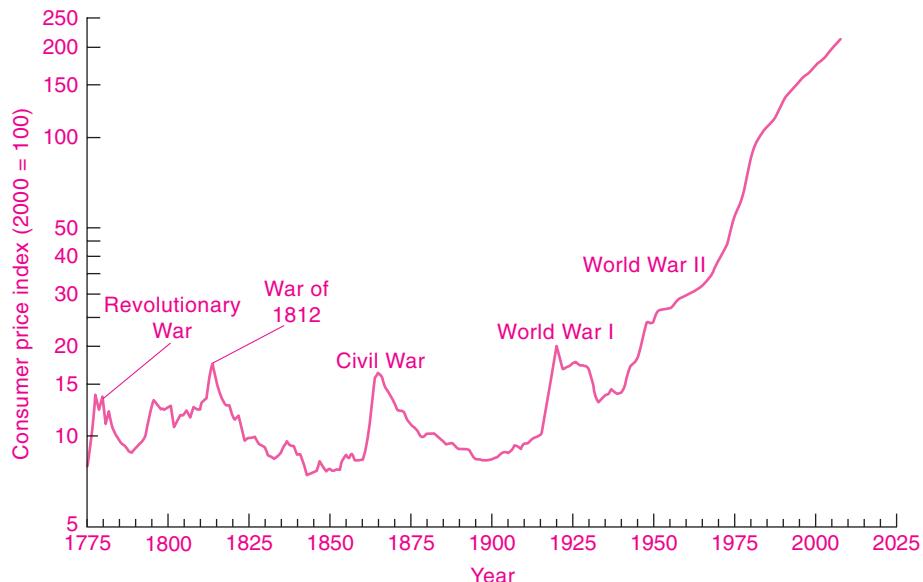


FIGURE 30-2. Consumer Prices in the United States, 1776–2008

Until World War II, prices fluctuated trendlessly—rising rapidly with each war and then drifting down afterward. But since then, the trend has been upward, both here and abroad.

Source: U.S. Department of Labor, Bureau of Labor Statistics for data since 1919.

Real wages meandered along until the Industrial Revolution. Comparing the two lines shows that inflation is not necessarily accompanied by a decline in real income. You can see, too, that real wages have climbed steadily since around 1800, rising more than tenfold.

Figure 30-2 focuses on the behavior of consumer prices in the United States since the Revolutionary War. Until World War II, the United States was generally on a combination of gold and silver standards, and the pattern of price changes was regular: Prices would soar during wartime and then fall back during the postwar slump. But the pattern changed dramatically after World War II. Prices and wages now travel on a one-way street that goes only upward. They rise rapidly in periods of economic expansion and slow down in periods of slack.

Figure 30-3 shows CPI inflation over the last half-century. You can see that inflation in recent years has moved in a narrow range, fluctuating primarily because of volatile food and energy prices.

Three Strains of Inflation

Like diseases, inflations exhibit different levels of severity. It is useful to classify them into three categories: low inflation, galloping inflation, and hyperinflation.

Low Inflation. Low inflation is characterized by prices that rise slowly and predictably. We might define this as single-digit annual inflation rates. When prices are relatively stable, *people trust money* because it retains its value from month to month and year to year. People are willing to write long-term contracts in money terms because they are confident that the relative prices of goods they buy and sell will not get too far out of line. Most countries have experienced low inflation over the last decade.

Galloping Inflation. Inflation in the double-digit or triple-digit range of 20, 100, or 200 percent per year is called **galloping inflation** or “very high inflation.” Galloping inflation is relatively common, particularly in countries suffering from weak governments, war, or revolution. Many Latin American countries, such



FIGURE 30-3. Inflation Has Remained Low and Stable in Recent Years

Historically, inflation in the United States was variable, and it reached unacceptably high rates in the early 1980s. In the last decade, skillful monetary management by the Federal Reserve along with favorable supply shocks has kept inflation low and in a narrow range.

Source: Bureau of Labor Statistics, www.bls.gov. This graph shows inflation of the consumer price index. The graph shows the rate of inflation over the prior 12 months.

as Argentina, Chile, and Brazil, had inflation rates of 50 to 700 percent per year in the 1970s and 1980s.

Once galloping inflation becomes entrenched, serious economic distortions arise. Generally, most contracts get indexed to a price index or to a foreign currency like the dollar. In these conditions, money loses its value very quickly, so people hold only the bare-minimum amount of money needed for daily transactions. Financial markets wither away, as capital flees abroad. People hoard goods, buy houses, and never, ever lend money at low nominal interest rates.

Hyperinflation. While economies seem to survive under galloping inflation, a third and deadly strain takes hold when the cancer of **hyperinflation** strikes. Nothing good can be said about an economy in which prices are rising a million or even a trillion percent per year.

Hyperinflations are particularly interesting to students of inflation because they highlight its disastrous impacts. Consider this description of hyperinflation in the Confederacy during the Civil War:

We used to go to the stores with money in our pockets and come back with food in our baskets. Now we go with money in baskets and return with food in our pockets. Everything is scarce except money! Prices are chaotic and production disorganized. A meal that used to cost the same amount as an opera ticket now costs twenty times as much. Everybody tends to hoard “things” and to try to get rid of the “bad” paper money, which drives the “good” metal money out of circulation. A partial return to barter inconvenience is the result.

The most thoroughly documented case of hyperinflation took place in the Weimar Republic of Germany in the 1920s. Figure 30-4 shows how the government unleashed the monetary printing presses,

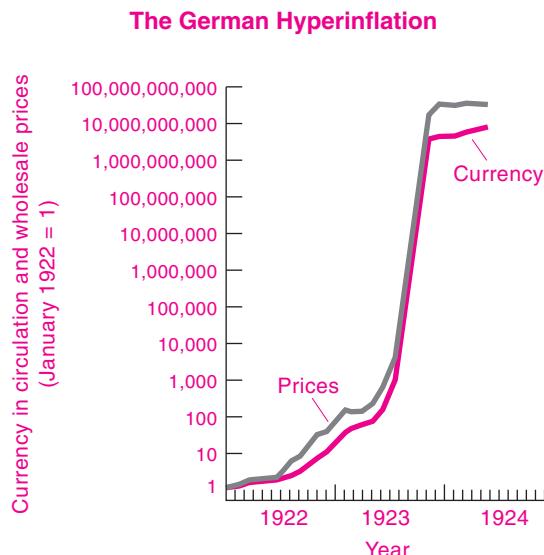


FIGURE 30-4. Money and Hyperinflation in Germany, 1922–1924

In the early 1920s, Germany could not raise enough taxes, so it used the monetary printing press to pay the government's bills. The stock of currency rose astronomically from January 1922 to December 1923, and prices spiraled upward as people frantically tried to spend their money before it lost all value.

driving both money and prices to astronomical levels. From January 1922 to November 1923, the price index rose from 1 to 10,000,000,000. If a person had owned 300 million marks worth of German bonds in early 1922, this amount would not have bought a piece of candy 2 years later.

Studies have found several common features in hyperinflations. First, the real money stock (measured by the money stock divided by the price level) falls drastically. By the end of the German hyperinflation, real money demand was only one-thirtieth of its level 2 years earlier. People were seen running from store to store, dumping their money like hot potatoes before they get burned by money's loss of value. Second, relative prices become highly unstable. Under normal conditions, a person's real wages move only a percent or less from month to month. During 1923, German real wages changed on average one-third (up or down) each month. This huge variation in relative prices and real wages—and the inequities

and distortions caused by these fluctuations—took an enormous toll on workers and businesses, highlighting one of the major costs of inflation.

The impact of inflation was eloquently expressed by J. M. Keynes:

As inflation proceeds and the real value of the currency fluctuates wildly from month to month, all permanent relations between debtors and creditors, which form the ultimate foundation of capitalism, become so utterly disordered as to be almost meaningless; and the process of wealth-getting degenerates into a game and a lottery.

Anticipated vs. Unanticipated Inflation

An important distinction in the analysis of inflation is whether the price increases are anticipated or unanticipated. Suppose that all prices are rising at 3 percent each year and everyone expects this trend to continue. Would there be any reason to get excited about inflation? Would it make any difference if both the actual and the expected inflation rates were 1 or 3 or 5 percent each year? Economists generally believe that anticipated inflation at low rates has little effect on economic efficiency or on the distribution of income and wealth. People would simply be adapting their behavior to a changing monetary yardstick.

But the reality is that inflation is usually unanticipated. For example, the Russian people had become accustomed to stable prices for many decades. When prices were freed from controls of central planning in 1992, no one, not even the professional economists, guessed that prices would rise by 400,000 percent over the next 5 years. People who naïvely put their money into ruble savings accounts saw their net worth evaporate. Those who were more sophisticated manipulated the system, and some even became fabulously wealthy “oligarchs.”

In more stable countries like the United States, the impact of unanticipated inflation is less dramatic, but the same general point applies. An unexpected jump in prices will impoverish some and enrich others. How costly is this redistribution? Perhaps “cost” does not describe the problem. The effects may be more social than economic. An epidemic of burglaries may not lower GDP, but it causes great distress. Similarly, randomly redistributing wealth by inflation is like forcing people to play a lottery they would prefer to avoid.



The Quagmire of Deflation

If inflation is so bad, should societies instead strive for *deflation*—a situation where prices are actually falling rather than rising?

Historical experience and macroeconomic analysis suggest that deflation combined with low interest rates can produce serious macroeconomic difficulties.

A gentle deflation by itself is not particularly harmful. Rather, deflations generally trigger economic problems because they may lead to a situation where monetary policy becomes impotent.

Normally, if prices begin to fall because of a recession, the central bank can stimulate the economy by increasing bank reserves and lowering interest rates. But if prices are falling rapidly, then real interest rates may be relatively high. For example, if the nominal interest rate is $\frac{1}{4}$ percent and prices are falling at $3\frac{3}{4}$ percent per year, then the real interest rate is 4 percent per year. At such a high real interest rate, investment may be choked off, with recessionary consequences.

The central bank may decide to lower interest rates. *But the lower limit on nominal interest rates is zero. Why so?* Because when interest rates are zero, then bonds are essentially money, and people will hardly want to hold a bond paying negative interest when money has a zero interest rate. Now, when the central bank has lowered interest rates to zero, in our example, real interest rates would still be $3\frac{3}{4}$ percent per year, which might still be too high to stimulate the economy. The central bank is trapped in a quagmire—a quagmire called the *liquidity trap*—in which it can lower short-term interest rates no further. The central bank has run out of ammunition.

Deflation was frequently observed in the nineteenth and early twentieth centuries but largely disappeared by the late twentieth century. However, at the end of the 1990s, Japan entered a period of sustained deflation. This was in part caused by a tremendous fall in asset prices, particularly land and stocks, but also by a long recession. Short-term interest rates were essentially zero after 2000. For example, the yield on 1-year bank deposits was 0.032 percent per year in mid-2003. The Bank of Japan was helpless in the face of deflation and zero interest rates.

The United States entered liquidity-trap territory in late 2008. Short-term, risk-free dollar securities (such as 90-day Treasury bills) fell to under 1/10th of 1 percent in late 2008 and early 2009. At that point, many economists believed, the Fed had “run out of ammunition”—that is, there was no further room to lower short-run interest rates.

Are there any remedies for deflation and the liquidity trap? One solution is to use fiscal policy, as was emphasized

by the new Obama administration in emphasizing a large fiscal stimulus plan in early 2009. A fiscal stimulus will increase aggregate demand, and it will do so without any crowding out from higher interest rates.

Monetary policy could also expand its range of instruments, as discussed in Chapter 24. For example, the Fed could attempt to lower long-run interest rates or to lower the risk premium on risky assets, but these steps have proven difficult to achieve. Many economists believe that the best defense against a liquidity trap is a good offense. Policy makers should ensure that the economy stays safely away from deflation and the liquidity trap by maintaining full employment, ensuring a gradually rising price level, and avoiding the asset-price booms and busts that have been experienced over the last decade.

THE ECONOMIC IMPACTS OF INFLATION

Central bankers are united in their determination to contain inflation. During periods of high inflation, opinion polls often find that inflation is economic enemy number one. What is so dangerous and costly about inflation? We noted above that during periods of inflation all prices and wages do not move at the same rate; that is, changes in *relative prices* occur. As a result of the diverging relative prices, two definite effects of inflation are:

- A *redistribution* of income and wealth among different groups
- *Distortions* in the relative prices and outputs of different goods, or sometimes in output and employment for the economy as a whole

Impacts on Income and Wealth Distribution

Inflation affects the distribution of income and wealth primarily because of differences in the assets and liabilities that people hold. When people owe money, a sharp rise in prices is a windfall gain for them. Suppose you borrow \$100,000 to buy a house and your annual fixed-interest-rate mortgage payments are \$10,000. Suddenly, a great inflation doubles all wages and incomes. Your *nominal* mortgage payment is still \$10,000 per year, but its real cost is halved. You will need to work only half as long as before to make your mortgage payment. The great inflation has increased

your wealth by cutting in half the real value of your mortgage debt.

If you are a lender and have assets in fixed-interest-rate mortgages or long-term bonds, the shoe is on the other foot. An unexpected rise in prices will leave you the poorer because the dollars repaid to you are worth much less than the dollars you lent.

If an inflation persists for a long time, people come to anticipate it and markets begin to adapt. An allowance for inflation will gradually be built into the market interest rate. Say the economy starts out with interest rates of 3 percent and stable prices. Once people expect prices to rise at 9 percent per year, bonds and mortgages will tend to pay 12 percent rather than 3 percent. The 12 percent nominal interest rate reflects a 3 percent real interest rate plus a 9 percent inflation premium. There are no further major redistributions of income and wealth once interest rates have adapted to the new inflation rate. The adjustment of interest rates to chronic inflation has been observed in all countries with a long history of rising prices.

Because of institutional changes, some old myths no longer apply. It used to be thought that common stocks were a good inflation hedge, but stocks generally move inversely with inflation today. A common saying was that inflation hurts widows and orphans; today, they are insulated from inflation because social security benefits are indexed to consumer prices. Also, unanticipated inflation benefits debtors and hurts lenders less than before because many kinds of debt (like “floating-rate” mortgages) have interest rates that move up and down with market interest rates.

The major redistributive impact of inflation comes through its effect on the real value of people’s wealth. In general, unanticipated inflation redistributes wealth from creditors to debtors, helping borrowers and hurting lenders. An unanticipated deflation has the opposite effect. But inflation mostly churns incomes and assets, randomly redistributing wealth among the population with little significant impact on any single group.

Impacts on Economic Efficiency

In addition to redistributing incomes, inflation affects the real economy in two specific areas: It can harm economic efficiency, and it can affect total output. We begin with the efficiency impacts.

Inflation impairs economic efficiency because it *distorts prices and price signals*. In a low-inflation

economy, if the market price of a good rises, both buyers and sellers know that there has been an actual change in the supply and/or demand conditions for that good, and they can react appropriately. For example, if the neighborhood supermarkets all boost their beef prices by 50 percent, perceptive consumers know that it’s time to start eating more chicken. Similarly, if the prices of new computers fall by 90 percent, you may decide it’s time to turn in your old model.

By contrast, in a high-inflation economy it’s much harder to distinguish between changes in relative prices and changes in the overall price level. If inflation is running at 20 or 30 percent per month, price changes are so frequent that changes in relative prices get missed in the confusion.

Inflation also *distorts the use of money*. Currency is money that bears a zero nominal interest rate. If the inflation rate rises from 0 to 10 percent per year, the real interest rate on currency falls from 0 to -10% percent per year. There is no way to correct this distortion.

As a result of the negative real interest rate on money, people devote real resources to reducing their money holdings during inflationary times. They go to the bank more often—using up “shoe leather” and valuable time. Corporations set up elaborate cash-management schemes. Real resources are thereby consumed simply to adapt to a changing monetary yardstick rather than to make productive investments.

Economists point to the *distortionary effect of inflation on taxes*. Part of the tax code is written in dollar terms. When prices rise, the real value of the taxes paid rises even though real incomes have not changed. For example, suppose you were taxed at a rate of 30 percent on your income. Further suppose that the nominal interest rate was 6 percent and the inflation rate was 3 percent. You would, in reality, be paying a 60 percent tax rate on the real interest earnings of 3 percent. Many similar distortions are present in the tax code today.

But these are not the only costs; some economists point to *menu costs* of inflation. The idea is that when prices are changed, firms must spend real resources adjusting their prices. For instance, restaurants reprint their menus, mail-order firms reprint their catalogs, taxi companies remeter their cabs, cities adjust parking meters, and stores change the price tags of goods. Sometimes, the costs are intangible, such as those involved in gathering people to make new pricing decisions.

Macroeconomic Impacts

What are the macroeconomic effects of inflation? This question is addressed in the next section, so we merely highlight the major points here. Until the 1970s, high inflation in the United States usually went hand in hand with economic expansions; inflation tended to increase when investment was brisk and jobs were plentiful. Periods of deflation or declining inflation—the 1890s, the 1930s, some of the 1950s—were times of high unemployment of labor and capital.

But a more careful examination of the historical record reveals an interesting fact: The positive association between output and inflation appears to be only a temporary relationship. Over the longer run, there seems to be an inverse-U-shaped relationship between inflation and output growth. Table 30-1 shows the results of a multicountry study of the association between inflation and growth. It indicates that economic growth is strongest in countries with low inflation, while countries with high inflation or deflation tend to grow more slowly. (But beware the *ex post* fallacy here, as explored in question 7 at the end of this chapter.)

What Is the Optimal Rate of Inflation?

Most nations seek rapid economic growth, full employment, and price stability. But just what is

meant by “price stability”? Exactly zero inflation? Over what period? Or is it perhaps low inflation?

One school of thought holds that policy should aim for absolutely stable prices or zero inflation. If we are confident that the price level in 20 years will be very close to the price level today, we can make better long-term investment and saving decisions.

Many macroeconomists believe that, while a zero-inflation target might be sensible in an ideal economy, we do not live in a frictionless system. One friction arises from the resistance of workers to declines in money wages. When inflation is literally zero, efficient labor markets would require that the money wages in some sectors are reduced while wages in other sectors are increased. Yet workers and firms are extremely reluctant to cut money wages. Some economists believe that, in the context of downward rigidity of nominal wages, a zero rate of inflation would lead to higher unemployment on average.

An additional and more serious concern about zero inflation is that economies might find themselves in the liquidity trap discussed above. If a country in a zero-inflation situation were to encounter a major contractionary shock, it might need negative real interest rates to climb out of the recession with monetary policy. While fiscal policy would still be effective, most macroeconomists believe that a better solution is to aim for a positive inflation rate so that the threat of liquidity traps is minimized.

We can summarize our discussion in the following way:

Most economists agree that a predictable and gently rising price level provides the best climate for healthy economic growth. A careful analysis of the evidence suggests that low inflation has little impact on productivity or real output. By contrast, galloping inflation or hyperinflation can harm productivity and redistribute income and wealth in an arbitrary fashion. A gradual rise in prices will help avoid the deadly liquidity trap.

Inflation rate (% per year)	Growth of per capita GDP (% per year)
-20–0	0.7
0–10	2.4
10–20	1.8
20–40	0.4
100–200	-1.7
1,000+	-6.5

TABLE 30-1. Inflation and Economic Growth

The pooled experience of 127 countries shows that the most rapid growth is associated with low inflation rates. Deflation and moderate inflation accompany slow growth, while hyperinflations are associated with sharp downturns.

Source: Michael Bruno and William Easterly, “Inflation Crises and Long-Run Growth,” *Journal of Monetary Economics*, 1998.

B. MODERN INFLATION THEORY

What are the economic forces that cause inflation? What is the relationship between unemployment and inflation in the short run and in the long run? How

can nations reduce an unacceptably high inflation rate? What is the role of inflation targeting in central-bank policies?

Questions, questions, questions. Yet answers to these are critical to the economic health of modern mixed economies. In the balance of this chapter we explore modern inflation theory and analyze the costs of lowering inflation.

PRICES IN THE AS-AD FRAMEWORK

There is no single source of inflation. Like illnesses, inflations occur for many reasons. Some inflations come from the demand side; others, from the supply side. But one key fact about modern inflations is that they develop an internal momentum and are costly to stop once underway.

Expected Inflation

In modern economies like that of the United States, inflation has great momentum and tends to persist at the same rate. Expected inflation is like a lazy old dog. If the dog is not “shocked” by the push of a foot or the pull of a cat, it will stay put. Once disturbed, the dog may chase the cat, but then it eventually lies down in a new spot where it stays until the next shock.

Over the last three decades, prices in the United States rose on average around 3 percent annually, and most people came to expect this rate of inflation. This expected rate was built into the economy’s institutions: wage agreements between labor and management were designed around a 3 percent inflation rate; government monetary and fiscal plans assumed a 3 percent rate as well. During this period, the *expected rate of inflation* was 3 percent per year.

Another closely related concept is the *core rate of inflation*, which is a term often used in monetary policy. This is the inflation rate without volatile elements such as food and energy prices.

While inflation can persist at the same rate for a while, history shows that shocks to the economy tend to push inflation up or down. The economy is constantly subject to changes in aggregate demand, sharp oil- and commodity-price changes, poor harvests, movements in the foreign exchange rate, productivity changes, and countless other economic events that push inflation away from its expected rate.

Inflation has a high degree of inertia in a modern economy. People form an **expected rate of inflation, and that rate is built into labor contracts and other agreements. The expected rate of inflation tends to persist until a shock causes it to move up or down.**

Demand-Pull Inflation

One of the major shocks to inflation is a change in aggregate demand. In earlier chapters we saw that changes in investment, government spending, or net exports can change aggregate demand and propel output beyond its potential. We also saw how a nation’s central bank can affect economic activity. Whatever the reason, **demand-pull inflation** occurs when aggregate demand rises more rapidly than the economy’s productive potential, pulling prices up to equilibrate aggregate supply and demand. In effect, demand dollars are competing for the limited supply of commodities and bid up their prices. As unemployment falls and workers become scarce, wages are bid up and the inflationary process accelerates.

A particularly damaging form of demand-pull inflation occurs when governments engage in deficit spending and rely on the monetary printing press to finance their deficits. The large deficits and the rapid money growth increase aggregate demand, which in turn increases the price level. Thus, when the German government financed its spending in 1922–1923 by printing billions and billions of paper marks, which came into the marketplace in search of bread and fuel, it was no wonder that the German price level rose a billionfold. This was demand-pull inflation with a vengeance. This scene was replayed in the early 1990s when the Russian government financed its budget deficit by printing monetary rubles. The result was an inflation rate that averaged 25 percent *per month*, or 1355 percent per year. (Make sure you understand how 25 percent per month becomes 1355 percent per year.)

Figure 30-5 illustrates the process of demand-pull inflation in terms of aggregate supply and demand. Starting from an initial equilibrium at point *E*, suppose there is an expansion of spending that pushes the *AD* curve up and to the right. The economy’s equilibrium moves from *E* to *E'*. At this higher level of demand, prices have risen from *P* to *P'*. Demand-pull inflation has taken place.

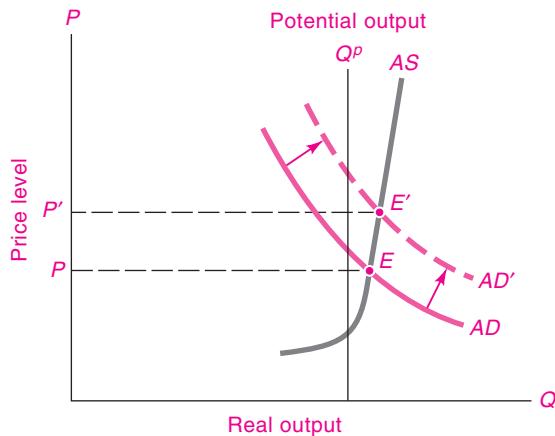


FIGURE 30-5. Demand-Pull Inflation Occurs When Too Much Spending Chases Too Few Goods

When aggregate demand increases, the rising spending is competing for limited goods. Prices rise from P to P' in demand-pull inflation.

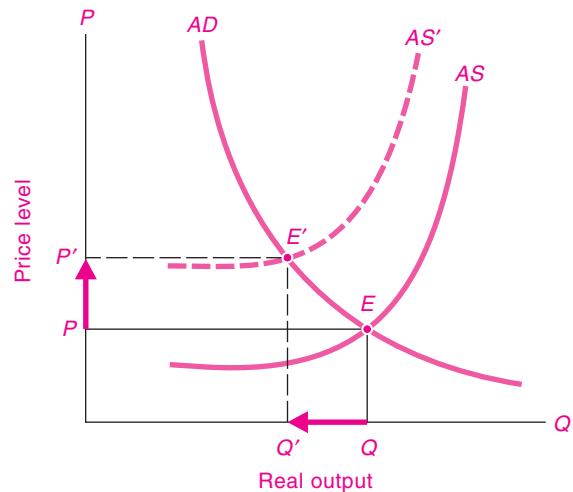


FIGURE 30-6. Increases in Production Costs Can Cause Stagflation, with Falling Output and Rising Prices

In periods marked by rapid increases in production costs, such as with the oil-price shocks, countries can experience the dilemma of rising inflation along with falling output, the combination of which is called stagflation. Policies to affect aggregate demand can cure one problem or the other but not both simultaneously.

Cost-Push Inflation and “Stagflation”

The classical economists understood the rudiments of demand-pull inflation and used that theory to explain historical price movements. But a new phenomenon has emerged over the last half-century. We see today that inflation sometimes increases because of increases in costs rather than because of increases in demand. This phenomenon is known as *cost-push* or *supply-shock* inflation. Often, it leads to an economic slowdown and to a syndrome called “stagflation,” or *stagnation with inflation*.

Figure 30-6 shows the workings of supply-shock inflation. In 1973, 1978, 1999, and again in the late 2000s, countries were minding their macroeconomic business when severe shortages occurred in oil markets. Oil prices rose sharply, business costs of production increased, and a sharp burst of cost-push inflation followed. These situations can be seen as an upward shift in the AS curve. Equilibrium output falls while prices and inflation rise.

Stagflation poses a major dilemma for policymakers. They can use monetary and fiscal policies to change aggregate demand. However, AD shifts cannot simultaneously increase output *and* lower prices and inflation. An outward shift of the AD curve in Figure 30-6 through monetary expansion would offset the decline in output but raise prices further. Or an

attempt to curb inflation by tightening monetary policy would only lower output even further. Economists explain this situation by saying that policymakers have two targets or goals (low inflation and low unemployment) but only one instrument (aggregate demand).

Such a dilemma is often faced by monetary policy makers. When inflation and unemployment are rising at the same time, what stance should the Federal Reserve or the European Central Bank take? Should it tighten money to reduce inflation? Or focus primarily on reducing unemployment? Or make some compromise between the two? Economics can provide no definitive answer to this dilemma. The response will depend upon society’s values as well as the mandates imposed by the national legislatures (such as inflation targeting for the ECB versus a dual mandate for the Fed).

Inflation resulting from rising costs during periods of high unemployment and slack resource utilization is called **supply-shock inflation**. It can lead to the policy dilemma of stagflation when output declines at the same time as inflation is rising.

Expectations and Inflation

Why, you might ask, does inflation have such strong momentum? The answer is that most prices and wages are set with an eye to future economic conditions. When prices and wages are rising rapidly and are expected to continue doing so, businesses and workers tend to build the rapid rate of inflation into their price and wage decisions. High or low inflation expectations tend to be self-fulfilling prophecies.

We can use a hypothetical example to illustrate the role of expectations in the inflation process. Say that in 2009, Brass Mills Inc., a nonunionized light-manufacturing firm, was contemplating its annual wage and salary decisions for 2010. Its sales were growing as well. Brass Mills' chief economist reported that no major inflationary or deflationary shocks were foreseen, and the major forecasting services were expecting national wage growth of 4 percent in 2010. Brass Mills had conducted a survey of local companies and found that most employers were planning on increases in compensation of 3 to 5 percent during the next year. All the signals, then, pointed to wage increases of around 4 percent from 2009 to 2010.

In examining its own internal labor market, Brass Mills determined that its wages were in line with the local labor market. Because the managers did not

want to fall behind local wages, Brass Mills decided that it would try to match local wage increases. It therefore set wage increases at the expected market increase, an average 4 percent wage increase for 2010.

The process of setting wages and salaries with an eye to expected future economic conditions can be extended to virtually all employers. This kind of reasoning also applies to many product prices—such as college tuitions, automobile prices, and long-distance telephone rates—that cannot be easily changed after they have been set. Because of the length of time involved in modifying inflation expectations and in adjusting most wages and many prices, expected inflation will change only if there are major shocks or changes in economic policy.

Figure 30-7 illustrates the process of expected inflation. Suppose that potential output is constant and that there are no supply or demand shocks. If everyone expects average costs and prices to rise at 3 percent each year, the AS curve will shift upward at 3 percent per year. If there are no demand shocks, the AD curve will also shift up at that rate. The intersection of the AD and AS curves will come at a price that is 3 percent higher each year. Hence, the macroeconomic equilibrium moves from E to E' to E'' . Prices are rising 3 percent from one year to the next; expected inflation has set in at 3 percent.

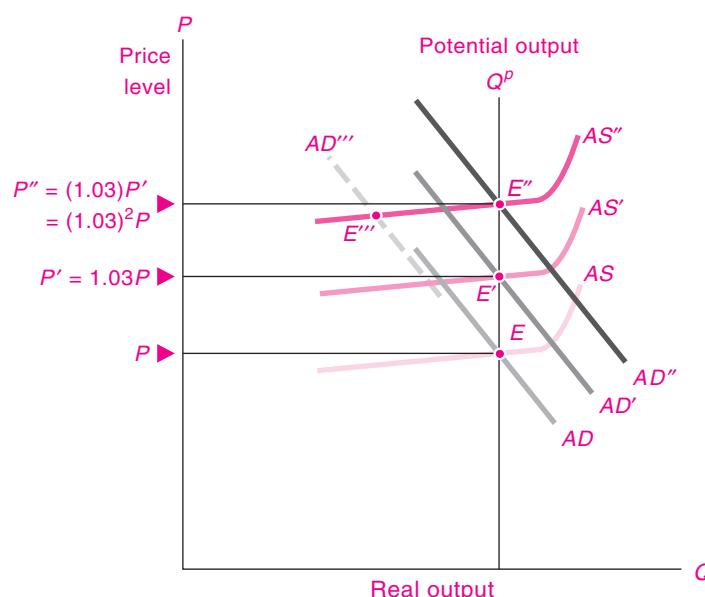


FIGURE 30-7. An Upward Spiral of Prices and Wages Occurs When Aggregate Supply and Demand Shift Up Together

Suppose that production costs and AD rise by 3 percent each year. AS and AD curves would shift up 3 percent each year. As the equilibrium moves from E to E' to E'' , prices march up steadily because of expected inflation.

Steady inflation occurs when the *AS* and *AD* curves are moving steadily upward at the same rate.

Price Levels vs. Inflation

Using Figure 30-7, we can make the useful distinction between movements in the price level and movements in inflation. In general, an increase in aggregate demand will raise prices, other things being equal. Similarly, an upward shift in the *AS* curve resulting from an increase in wages and other costs will raise prices, other things being equal.

But of course other things always change; in particular, *AD* and *AS* curves never sit still. Figure 30-7 shows, for example, the *AS* and *AD* curves marching up together.

What if there were an unexpected shift in the *AS* or *AD* curve during the third period? How would prices and inflation be affected? Suppose, for example, that the third period's *AD''* curve shifted to the left to *AD'''* because of a monetary contraction. This might cause a recession, with a new equilibrium at *E'''* on the *AS'''* curve. At this point, output would have fallen below potential; prices and the inflation rate would be lower than at *E''*, but the economy would still be experiencing inflation because the price level at *E'''* is still above the previous period's equilibrium *E'* with price *P'*.

This example is a reminder that supply or demand shocks may reduce the price level below the level it would otherwise have attained. Nonetheless, because of inflation's momentum, the economy may continue to experience inflation.

THE PHILLIPS CURVE

The major macroeconomic tool used to understand inflation is the **Phillips curve**. This curve shows the relationship between the unemployment rate and inflation. The basic idea is that when output is high and unemployment is low, wages and prices tend to rise more rapidly. This occurs because workers and unions can press more strongly for wage increases when jobs are plentiful and firms can more easily raise prices when sales are brisk. The converse also holds—high unemployment tends to slow inflation.

Short-Run Phillips Curve

Macroeconomists distinguish between the short-run Phillips curve and the long-run Phillips curve. A typical

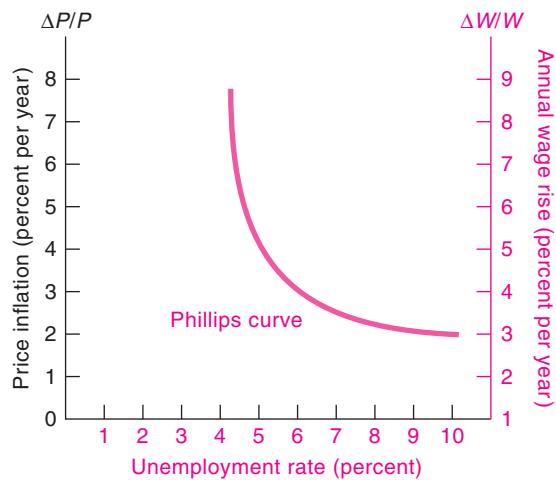


FIGURE 30-8. The Short-Run Phillips Curve Depicts the Tradeoff between Inflation and Unemployment

A short-run Phillips curve shows the inverse relationship between inflation and unemployment. The green wage-change scale on the right-hand vertical axis is higher than the blue left-hand inflation scale by the assumed 1 percent rate of growth of average labor productivity.

short-run Phillips curve is shown in Figure 30-8. On the diagram's horizontal axis is the unemployment rate. On the blue left-hand vertical scale is the annual rate of price inflation. The green right-hand vertical scale shows the rate of money-wage inflation. As you move leftward on the Phillips curve by reducing unemployment, the rate of price and wage increase indicated by the curve becomes higher.

An important piece of inflation arithmetic underlies this curve. Say that labor productivity (output per worker) rises at a steady rate of 1 percent each year. Further, assume that firms set prices on the basis of average labor costs, so prices always change just as much as average labor costs per unit of output. If wages are rising at 4 percent, and productivity is rising at 1 percent, then average labor costs will rise at 3 percent. Consequently, prices will also rise at 3 percent.

Using this inflation arithmetic, we can see the relation between wage and price increases in Figure 30-8. The two scales in the figure differ only by the assumed rate of productivity growth (so the price change of 4 percent per year would correspond to a wage change of 5 percent per year

if productivity grew by 1 percent per year and if prices always rose as fast as average labor costs).



The Logic of Wage-Price Arithmetic

This relationship between prices, wages, and productivity can be formalized as follows: The fact that prices are based on average labor costs per unit of output implies that P is always proportional to WL/Q , where P is the price level, W is the wage rate, L is labor-hours, and Q is output. Assume that average labor productivity (Q/L) is growing smoothly at 1 percent per year. Hence, if wages are growing at 4 percent annually, prices will grow at 3 percent annually (= 4 percent growth in wages – 1 percent growth in productivity). More generally,

$$\text{Rate of inflation} = \frac{\text{rate of wage growth}}{\text{rate of productivity growth}}$$

This shows the relationship between price inflation and wage inflation.

We can illustrate how closely this relationship holds with actual numbers for a high-inflation period and for a low-inflation period. The following table shows the major long-run determinants of inflation to be wage growth and productivity change. From the first to the second period, inflation rose because wage growth increased slightly while productivity fell sharply. In the third period, inflation was low because wage growth was restrained while productivity growth rebounded.

	Rate of CPI inflation (%)	Rate of wage growth (%)	Rate of productivity growth (%)
1958–1973	2.9	5.4	3.1
1973–1995	5.6	5.9	1.5
1995–2007	2.6	4.3	2.6

Source: Bureau of Labor Statistics data on the business sector, at www.bls.gov.

The Nonaccelerating Inflation Rate of Unemployment

Economists who looked carefully at inflationary periods noticed that the simple two-variable Phillips curve drawn in Figure 30-8 was unstable. On the basis of theoretical work of Edmund Phelps and Milton

Friedman, along with statistical tests of the actual history, macroeconomists developed the modern theory of inflation, which distinguishes between the long run and the short run. The downward-sloping Phillips curve of Figure 30-8 holds only in the short run. In the long run, the Phillips curve is *vertical*, not downward-sloping. This approach implies that in the long-run there is a minimum unemployment rate that is consistent with steady inflation. This is the *nonaccelerating inflation rate of unemployment* or *NAIRU* (pronounced “nay-reew”).¹

The **nonaccelerating inflation rate of unemployment** (or *NAIRU*) is that unemployment rate consistent with a constant inflation rate. At the *NAIRU*, upward and downward forces on price and wage inflation are in balance, so there is no tendency for inflation to change. The *NAIRU* is the lowest unemployment rate that can be sustained without upward pressure on inflation.

The idea behind the *NAIRU* is that the state of the economy can be divided into three situations:

- **Excess demand.** When markets are extremely tight, with low unemployment and high utilization of capacity, then prices and wages will be subject to demand-pull inflation.
- **Excess supply.** In recessionary situations, with high unemployment and idled factories, firms tend to sell at discounts and workers push less aggressively for wage increases. Wage and price inflation tend to moderate.
- **Neutral pressures.** Sometimes the economy is operating “in neutral.” The upward wage pressures from job vacancies just match the downward wage pressures from unemployment. There are no supply shocks from oil or other exogenous sources. Here, the economy is at the *NAIRU*, and inflation neither rises nor falls.

From Short Run to Long Run

How does the economy move from the short run to the long run? The basic idea is that when price changes are unanticipated, the short-run Phillips curve tends to shift up or down. This point is

¹ Other terms will sometimes be encountered. The original name for the *NAIRU* was the “natural rate of unemployment.” This term is unsatisfactory because there is nothing natural about the *NAIRU*.

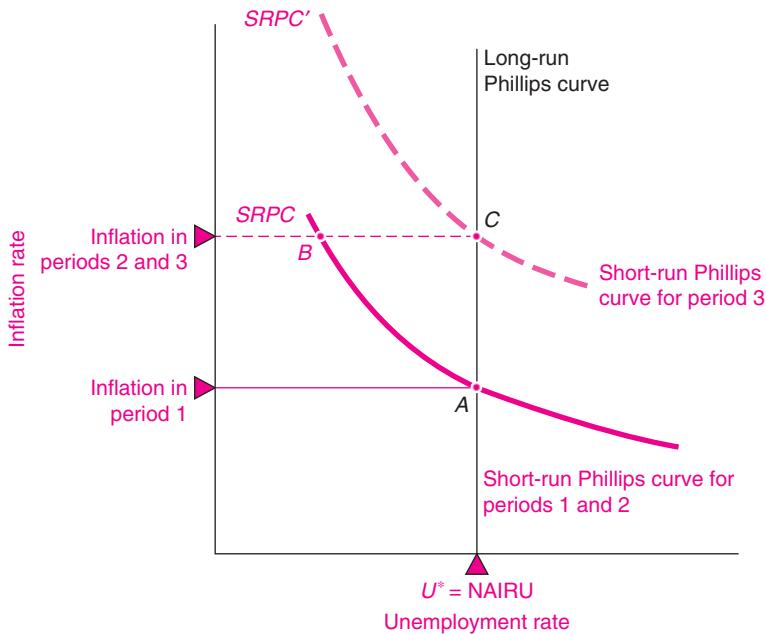


FIGURE 30-9. The Shifting Phillips Curve

This figure shows how economic expansion leads to an inflationary surprise and an upward shift in the short-run Phillips curve. The steps in the shift are explained by the bullets in the text. Note that if you connect points A, B, and C, the shifting curve produces a clockwise loop.

illustrated by a series of steps in a “boom cycle” here and in Figure 30-9:

- *Period 1.* In the first period, unemployment is at the NAIRU. There are no demand or supply surprises, and the economy is at point A on the lower short-run Phillips curve (*SRPC*) in Figure 30-9.
- *Period 2.* Next, suppose there is an economic expansion which lowers the unemployment rate. As unemployment declines, firms recruit workers more vigorously, giving larger wage increases than formerly. As output approaches capacity, price markups rise. Wages and prices begin to accelerate. In terms of our Phillips curve, the economy moves up and to the left to point B on its short-run Phillips curve (along *SRPC* in Figure 30-9). As shown in the figure, inflation expectations have not yet changed, so the economy stays on the original Phillips curve, on *SRPC*. The lower unemployment rate raises inflation during the second period.

- *Period 3.* Because inflation has risen, firms and workers are surprised, and they revise upward their inflationary expectations. They begin to incorporate the higher expected inflation into their wage and price decisions. The result is a *shift in the short-run Phillips curve*. We can see the new curve as *SRPC'* in Figure 30-9. The new short-run Phillips curve lies above the original Phillips curve, reflecting the higher expected rate of inflation. We have drawn the curve so that the new expected inflation rate for period 3 equals the actual inflation rate in period 2. If a slowdown in economic activity brings the unemployment rate back to the NAIRU in period 3, the economy moves to point C. Even though the unemployment rate is the same as it was in period 1, actual inflation will be higher, reflecting the upward shift in the short-run Phillips curve.

Note the surprising outcome. Because the expected inflation rate has increased, the rate of

inflation is higher in period 3 than during period 1 even though the unemployment rate is the same. The economy in period 3 will have the same *real* GDP and unemployment rate as it did in period 1, even though the *nominal* magnitudes (prices and nominal GDP) are now growing more rapidly than they did before the expansion raised the expected rate of inflation.

We can also track a “recession cycle” that occurs when unemployment rises and the actual inflation rate falls below its expected rate. The expected rate of inflation declines in recessions, and the economy enjoys a lower inflation rate when it returns to the NAIRU. This painful cycle of austerity occurred during the Carter-Volcker-Reagan wars against inflation during 1979–1984.

The Vertical Long-Run Phillips Curve

When the unemployment rate departs from the NAIRU, the inflation rate will tend to change. What happens if the gap between the actual unemployment rate and the NAIRU persists? For example, say that the NAIRU is 5 percent while the actual unemployment rate is 3 percent. Because of the gap, inflation will tend to rise from year to year. Inflation might be 3 percent in the first year, 4 percent in the second year, 5 percent in the third year—and might continue to move upward thereafter. When would this upward spiral stop? It stops only when unemployment moves back to the NAIRU. Put differently, as long as unemployment is below the NAIRU, wage inflation will tend to increase.

The opposite behavior will be seen at high unemployment. In that case, inflation will tend to fall as long as unemployment is above the NAIRU.

Only when unemployment is *at* the NAIRU will inflation stabilize; only then will the shifts of supply and demand in different labor markets be in balance; only then will inflation—at whatever is its inertial rate—tend neither to increase nor to decrease.

The modern theory of inflation has important implications for economic policy. It implies that there is a minimum level of unemployment that an economy can enjoy in the long run. If the economy is pushed to very high levels of output and employment, this will ignite an upward spiral of wage and price inflation. This theory also provides a formula for curbing inflation. When the inflation rate is too high, a country can tighten money, trigger a

recession, raise the unemployment rate above the NAIRU, and thereby reduce inflation.

The NAIRU defines the neutral zone between excessive tightness/rising inflation and high unemployment/falling inflation. In the short run, inflation can be reduced by raising unemployment above the NAIRU, but in the long run, the NAIRU is the lowest sustainable rate of unemployment.

Quantitative Estimates

Although the NAIRU is a crucial macroeconomic concept, precise numerical estimates of the NAIRU have proved elusive. Many macroeconomists have used advanced techniques to estimate the NAIRU. For this text, we have adopted the estimates prepared by the Congressional Budget Office (CBO). According to the CBO, the NAIRU rose gradually from the 1950s, peaked at 6.3 percent of the labor force around 1980, and declined to 4.8 percent by 2008. CBO estimates, along with the actual unemployment rate through the end of 2008, are shown in Figure 30-10.

Doubts about the NAIRU

The concept of the nonaccelerating inflation rate of unemployment, along with its output twin of potential GDP, is crucial for understanding inflation and the connection between the short run and the long run in macroeconomics. But the mainstream view remains controversial.

Critics wonder whether the NAIRU is a stable and reliable concept. The inflation experience of the United States has led economists to question whether there is in fact a stable NAIRU for the country. Another question is whether an extended period of high unemployment will lead to a deterioration of job skills, to loss of on-the-job training and experience, and thereby to a higher NAIRU. Might not slow growth of real GDP reduce investment and leave the country with a diminished capital stock? Might not that capacity shortage produce rising inflation even with unemployment rates above the NAIRU?

Experience in Europe over the last two decades confirms some of these worries (recall our discussion of the European unemployment puzzle at the end of the previous chapter). In the early 1960s, labor markets in Germany, France, and Britain appeared to be in equilibrium with unemployment rates between 1 and 2 percent. By the late 1990s, after a decade of stagnation and slow job growth, labor market

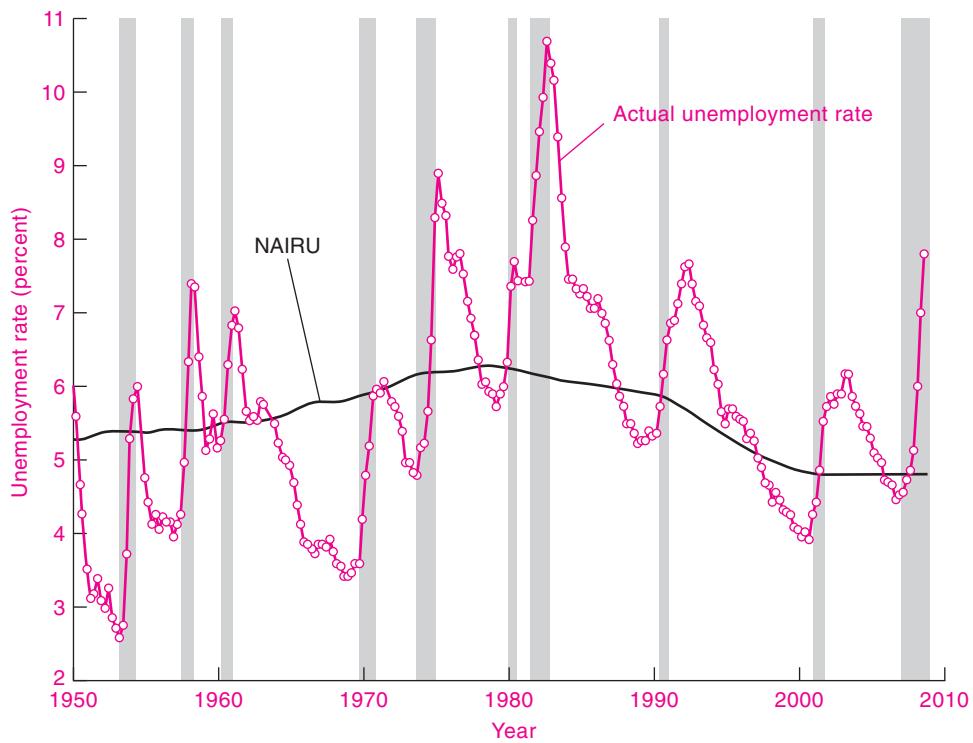


FIGURE 30-10. Actual Unemployment Rate and NAIRU for the United States

The NAIRU is the unemployment rate at which upward and downward forces acting on inflation are in balance.

Source: Actual unemployment rate from Bureau of Labor Statistics; NAIRU from estimates of the Congressional Budget Office.

equilibrium seemed to be in balance with unemployment rates in the 6 to 12 percent range. On the basis of recent European experience, many macroeconomists are looking for ways to explain the instability of the NAIRU and its dependence upon actual unemployment as well as labor market institutions.

Review

The major points to understand are the following:

- In the short run, an increase in aggregate demand which lowers the unemployment rate below the NAIRU will tend to increase the inflation rate. Recessions and high unemployment tend to lower inflation. In the short run, there is a tradeoff between inflation and unemployment.
- When inflation is higher or lower than what people expect, inflation expectations adjust. The

changed inflation expectations will generally shift the short-run Phillips curve up or down.

- The long-run Phillips curve is vertical at the non-accelerating inflation rate of unemployment (NAIRU). Unemployment above (below) the NAIRU will tend to lower (increase) the rate of inflation.

C. DILEMMAS OF ANTI-INFLATION POLICY

The economy evolves in response to political forces and technological change. Our economic theories, designed to explain issues like inflation and unemployment, must also adapt. In this final section on

inflation theory, we discuss the pressing issues that arise in combating inflation.

How Long Is the Long Run?

The NAIRU theory holds that the Phillips curve is vertical in the long run. Just how long is the long run for this purpose? The length of time that it takes the economy to adjust fully to a shock is not known with precision. Recent studies suggest that full adjustment takes at least 5 years or perhaps even a decade. The reason for the long delay is that it takes years for expectations to adjust, for labor and other long-term contracts to be renegotiated, and for all these effects to percolate through the economy.

How Much Does It Cost to Reduce Inflation?

Our analysis suggests that a nation can reduce the expected rate of inflation by temporarily reducing output and raising unemployment. But policymakers may want to know just how much it costs to squeeze inflation out of the economy. How costly is *disinflation*, which denotes the policy of lowering the rate of inflation?

Studies of this subject find that the cost of reducing inflation varies depending upon the country, the initial inflation rate, and the policy used. Analyses for the United States give a reasonably consistent answer: Lowering the expected inflation rate by 1 percentage point costs the nation about 4 percent of 1 year's GDP. In terms of the current level of GDP, this amounts to an output loss of about \$600 billion (in 2008 prices) to reduce the inflation rate by 1 percentage point.

To understand the cost of disinflation, consider the Phillips curve. If the Phillips curve is relatively flat, reducing inflation will require much unemployment and loss in output; if the Phillips curve is steep, a small rise in unemployment will bring down inflation quickly and relatively painlessly. Statistical analyses indicate that when the unemployment rate rises 1 percentage point above the NAIRU for 1 year and then returns to the NAIRU, the inflation rate will decline about $\frac{1}{2}$ percentage point. Therefore, to reduce inflation by 1 full percentage point, unemployment must be held 2 percentage points above the NAIRU for 1 year.

The loss associated with disinflationary policies is called the **sacrifice ratio**. More precisely, the sacrifice ratio is the cumulative loss in output, measured as a



FIGURE 30-11. The Costs of Disinflation, 1979–1987

This graph shows a disinflation cycle. High interest rates led to slow economic growth and high unemployment in the early 1980s. The result was unemployment above the NAIRU and output below potential. Core inflation declined by about 5 percentage points, while cumulative output loss was about 20 percent of GDP, which leads to a sacrifice ratio of 4 percent.

percent of 1 year's GDP, associated with a 1-percentage-point permanent reduction in inflation.

We can illustrate the sacrifice ratio using the period of disinflation after 1979. The scatter plot of inflation and unemployment during this period is shown in Figure 30-11. This is an *austerity cycle* or *disinflation cycle*, which is the opposite of the boom cycle illustrated in Figure 30-9. During these years, the Federal Reserve took strong steps to reduce inflation. Tight money drove the unemployment rate up above 10 percent for 2 years, and output was below its potential for 7 years. We have shown the average NAIRU as the vertical line, which would also be the long-run Phillips curve for this period.

Tight money did reduce core inflation from around 8 to 3 percent per year during this period. The cumulative loss of output associated with this disinflation is estimated to be about 20 percent of GDP. This provides an estimate of the sacrifice ratio for this period of 4 percent [$= (20 \text{ percent of GDP}) / (5 \text{ percentage points of disinflation})$]. In the American economy today, this implies that lowering the core inflation rate by 1 percentage point would cost about \$600 billion, or around \$6000 per American household.

The Phillips-curve theory illustrates how policy can reduce inflation by raising unemployment above the NAIRU for a period of time. Estimates of the cost of disinflation are typically around 4 percent of 1 year's GDP for 1 point of disinflation. This calculation shows why containing inflation is a costly policy and one not undertaken lightly.

Credibility and Inflation

One of the most important questions in anti-inflation policy concerns the role of credibility of policy. Many economists argue that the Phillips-curve approach is too pessimistic. The dissenters hold that credible and publicly announced policies—for example, adopting fixed monetary rules or targeting nominal GDP—would allow anti-inflation policies to reduce inflation with lower output and unemployment costs.

The idea relies on the fact that inflation is a process that depends on people's expectations of future inflation. A credible monetary policy—such as one that relentlessly targets a fixed, low inflation rate—might lead people to expect that inflation would be lower in the future and that this belief might in some measure be a self-fulfilling prophecy. Those emphasizing credibility backed their theories by citing fundamental policy changes, such as occurred with monetary and fiscal reforms that ended Austrian and Bolivian hyperinflations at relatively low cost in terms of unemployment or lost GDP.

Many economists were skeptical about claims that credibility would significantly lower the output costs of disinflation. While such policies might work in countries torn by hyperinflation, war, or revolution, Draconian anti-inflation policies would be less credible in the United States. Congress and the president often lose heart in the fight against inflation when unemployment rises sharply and farmers or construction workers storm the Capitol and circle the White House.

The U.S. experience during the 1980s, shown in Figure 30-11, provides a good laboratory to test the credibility critique. During this period, monetary policy was tightened in a clear and forceful manner. Yet the price tag was still high, as the sacrifice calculations indicate. Using tough, preannounced policies to enhance credibility does not appear to have lowered the cost of disinflation in the United States.

Because the United States has such a high degree of stability of its political and economic institutions, its experience may be unusual. Economists have examined anti-inflation policies in other countries and have determined that anti-inflation policies can sometimes be *expansionary*. A recent study by Stanley Fischer, Ratna Sahay, and Carlos A. Végh concluded as follows:

Periods of high inflation are associated with bad macroeconomic performance. In particular, high inflation is bad for growth. The evidence is based on a sample of 18 countries which have experienced very high inflation episodes. During such periods, real GDP per capita fell on average by 1.6 percent per annum (compared to positive growth of 1.4 percent in low inflation years).... Exchange rate-based stabilizations appear to lead to an initial expansion in real GDP and real private consumption.

Policies to Lower Unemployment

Given the costs of high unemployment, we might ask: Is the NAIRU the optimal level of unemployment? If not, what can we do to lower it toward a more desirable level? Some economists believe that the NAIRU (sometimes also called the "natural rate of unemployment") represents the economy's efficient unemployment level. They hold that it is the outcome of an efficient pattern of employment, job vacancies, and job search. In their view, holding the unemployment rate below the NAIRU would be like driving your car without a spare tire.

Other economists strongly disagree, reasoning that the NAIRU is likely to be above the optimal unemployment rate. In their view, economic welfare would be increased if the NAIRU could be lowered. This group argues that there are many spillovers or externalities in the labor market. For example, workers who have been laid off suffer from a variety of social and economic hardships. Yet employers do not pay the costs of unemployment; most of the costs (unemployment insurance, medical costs, family distress, etc.) spill over as external costs and are absorbed by the worker or by the government. Moreover, there may be congestion externalities when an additional unemployed worker makes it harder for other workers to find jobs. To the extent that unemployment has external costs, the NAIRU is likely to be higher than the optimal unemployment

rate; consequently, lowering the unemployment rate would raise the nation's net economic welfare.

A large social dividend would reward the society that discovers how to lower the NAIRU. What measures might lower the NAIRU?

- *Improve labor market services.* Some unemployment occurs because job vacancies are not matched up with unemployed workers. Through better information, the amount of frictional and structural unemployment can be reduced. A recent innovation is Internet matching, run by states or private companies, which can help people find jobs and firms find qualified workers more quickly.
- *Bolster training programs.* If you look at the Internet or at help-wanted ads in the newspaper, you will see that most of the job vacancies call for skilled workers. Conversely, most of the unemployed are unskilled or semiskilled workers, or workers who are in a depressed industry. Many economists believe that government or private training programs can help unemployed workers retool for better jobs in growing sectors. If successful, such programs provide the double bonus of allowing people to lead productive lives and

of reducing the burden on government transfer programs.

- *Reduce disincentives to work.* In protecting people from the hardships of unemployment and poverty, the government has at the same time removed the sting of unemployment and reduced incentives to seek work. Some economists call for reforming the unemployment-insurance system and reforming health care, disability, and social security programs to improve work incentives. Others note that the lack of a national health insurance system may increase "job lock" and reduce the mobility of workers.

* * *

Having surveyed the history and theory of unemployment and inflation, we conclude with the following cautious summary:

Critics believe that the high unemployment that often prevails in North America and Europe is a central flaw in modern capitalism. Indeed, unemployment must sometimes be kept above its socially optimal level to ensure price stability, and the tension between price stability and low unemployment is one of the cruellest dilemmas of modern society.



A. Definition and Impact of Inflation

1. Recall that inflation occurs when the general level of prices is rising. The rate of inflation is the percentage change in a price index from one period to the next. The major price indexes are the consumer price index (CPI) and the GDP deflator.
2. Like diseases, inflations come in different strains. We generally see low inflation in the United States (a few percentage points annually). Sometimes, galloping inflation produces price rises of 50 or 100 or 200 percent each year. Hyperinflation takes over when the printing presses spew out currency and prices start rising many times each month. Historically, hyperinflations have almost always been associated with war and revolution.
3. Inflation affects the economy by redistributing income and wealth and by impairing efficiency. Unanticipated inflation usually favors debtors, profit seekers, and

risk-taking speculators. It hurts creditors, fixed-income classes, and timid investors. Inflation leads to distortions in relative prices, tax rates, and real interest rates. People take more trips to the bank, taxes may creep up, and measured income may become distorted.

B. Modern Inflation Theory

4. At any time, an economy has a given expected inflation rate. This is the rate that people have come to anticipate and that is built into labor contracts and other agreements. The expected rate of inflation is a short-run equilibrium and persists until the economy is shocked.
5. In reality, the economy receives incessant price shocks. The major kinds of shocks that propel inflation away from its expected rate are demand-pull and supply-shock. Demand-pull inflation results from too much spending chasing too few goods, causing

the aggregate demand curve to shift up and to the right. Wages and prices are then bid up in markets. Supply-shock inflation is a new phenomenon of modern industrial economies and occurs when the costs of production rise even in periods of high unemployment and idle capacity.

6. The Phillips curve shows the relationship between inflation and unemployment. In the short run, lowering one rate means raising the other. But the short-run Phillips curve tends to shift over time as expected inflation and other factors change. If policymakers attempt to hold unemployment below the NAIRU for long periods, inflation will tend to spiral upward.
7. Modern inflation theory relies on the concept of the nonaccelerating inflation rate of unemployment, or NAIRU, which is the lowest sustainable unemployment rate that the nation can enjoy without risking

an upward spiral of inflation. It represents the level of unemployment of resources at which labor and product markets are in inflationary balance. Under the NAIRU theory, there is no permanent tradeoff between unemployment and inflation, and the long-run Phillips curve is vertical.

C. Dilemmas of Anti-inflation Policy

8. A central concern for policymakers is the cost of reducing inflation. Current estimates indicate that a substantial recession is necessary to slow expected inflation.
9. Economists have put forth many proposals for lowering the NAIRU; notable proposals include improving labor market information, improving education and training programs, and refashioning government programs so that workers have greater incentives to work.

CONCEPTS FOR REVIEW

History and Theories of Inflation

Rate of inflation in year t

$$= 100 \times \frac{P_t - P_{t-1}}{P_{t-1}}$$

strains of inflation:

- low
- galloping
- hyperinflation

impacts of inflation (redistributive, on output and employment)

anticipated and unanticipated inflation

costs of inflation:

“shoe leather”

menu costs

income and tax distortions

loss of information

short-run and long-run Phillips curves
nonaccelerating inflation rate of
unemployment (NAIRU) and the
long-run Phillips curve

Anti-inflation Policy

costs of disinflation

measures to lower the NAIRU
sacrifice ratio

FURTHER READING AND INTERNET WEBSITES

Further Reading

The quotation from Stanley Fischer, Ratna Sahay, and Carlos A. Végh is from their article, “Modern Hyper- and High Inflations,” *Journal of Economic Literature*, September 2002, pp. 837–880.

A discussion of factors influencing the NAIRU can be found in Congressional Budget Office, *The Effect of Changes in Labor Markets on the Natural Rate of Unemployment*, April 2002, available at www.cbo.gov.

Websites

Analysis of the consumer price data for the United States comes from the Bureau of Labor Statistics, at www.bls.gov. This site also contains useful discussions of inflation trends in the *Monthly Labor Review*, online at www.bls.gov/opub/mlr/mlrhome.htm.

QUESTIONS FOR DISCUSSION

1. Consider the following impacts of inflation: tax distortions, income and wealth redistribution, shoe-leather costs, and menu costs. For each, define the cost and provide an example.
2. “During periods of inflation, people use real resources to reduce their holdings of fiat money. Such activities produce a private benefit with no corresponding social gain, which illustrates the social cost of inflation.” Explain this quotation and give an example.
3. Unanticipated deflation also produces serious social costs. For each of the following, describe the deflation and analyze the associated costs:
 - a. During the Great Depression, prices of major crops fell along with the prices of other commodities. What would happen to farmers who had large mortgages?
 - b. Japan experienced a mild deflation in the 1990s. Assume that Japanese students each borrowed 2,000,000 yen (about \$20,000) to pay for their education, hoping that inflation would allow them to pay off their loans in inflated yen. What would happen to these students if wages and prices began to fall at 5 percent per year?
4. The data in Table 30-2 describe inflation and unemployment in the United States from 1979 to 1987. Note that the economy started out near the NAIRU in 1979 and ended near the NAIRU in 1987. Can you explain the decline of inflation over the intervening years? Do so by drawing the short-run and long-run Phillips curves for each of the years from 1979 to 1987.
5. Many economists argue as follows: “Because there is no long-run tradeoff between unemployment and inflation, there is no point in trying to shave the peaks and troughs from the business cycle.” This view suggests that we should not care whether the economy is stable or fluctuating widely as long as the average level of unemployment is the same. Discuss critically.
6. A leading economist has written: “If you think of the social costs of inflation, at least of moderate inflation, it is hard to avoid coming away with the impression that they are minor compared with the costs of unemployment and depressed production.” Write a short essay describing your views on this issue.
7. Consider the data on annual inflation rates and growth of per capita GDP shown in Table 30-1. Can you see that low inflation is associated with the highest growth rates? What are the economic reasons that growth might be lower for deflation and for hyperinflation. Explain why the *ex post* fallacy might apply here (see the discussion in Chapter 1).
8. The following policies and phenomena affected labor markets over the last three decades. Explain the likely effect of each on the NAIRU:
 - a. Unemployment insurance became subject to taxation.
 - b. Funds for training programs for unemployed workers were cut sharply by the federal government.
 - c. The fraction of the workforce in labor unions fell sharply.
 - d. The welfare-reform act of 1996 sharply reduced payments to low-income families and required them to work if they were to receive government payments.

Year	Unemployment rate (%)	Inflation rate, CPI (% per year)
1979	5.8	11.3
1980	7.1	13.5
1981	7.6	10.3
1982	9.7	6.2
1983	9.6	3.2
1984	7.5	4.4
1985	7.2	3.6
1986	7.0	1.9
1987	6.2	3.6

TABLE 30-2. Unemployment and Inflation Data for the United States, 1979–1987



The task of economic stabilization requires keeping the economy from straying too far above or below the path of steady high employment. One way lies inflation, and the other lies recession. Flexible and vigilant fiscal and monetary policy will allow us to hold the narrow middle course.

President John F. Kennedy
(1962)

The U.S. economy has changed enormously over the last 50 years. The shares of farming and manufacturing have declined. People work with computers instead of with tractors. Trade is a growing share of production and consumption. Technology has revolutionized daily life. Advanced telecommunications systems enable businesses to control their operations across the country and around the world, and ever more powerful computers have eliminated many of the tedious tasks that used to employ so many people.

Yet, even with these tectonic shifts in our economic structure, the central goals of macroeconomic policy remain the same: stable employment, good pay, low unemployment, rising productivity and real incomes, and low and stable inflation. The challenge remains to find policies that can achieve these objectives.

This chapter uses the tools of macroeconomics to examine some of today's major policy issues. We begin with an assessment of the consequences of government deficits and debt on economic activity. We then present some of the new approaches to

macroeconomics. Some of these theories are on the frontiers of our science today but will be the staples of classroom economics in a generation. We analyze controversies involving short-run economic stabilization, including current questions on the roles of monetary and fiscal policy. Should the government stop trying to smooth out business cycles? Should policy makers rely on fixed rules rather than discretion? We then conclude with an epilogue on the importance of economic growth.

A. THE ECONOMIC CONSEQUENCES OF THE GOVERNMENT DEBT

As the United States entered the twenty-first century, its fiscal policies were stable and the federal government was running a budget surplus. Then, like a monster rising from the deep, the budget deficit rose up to swallow the nation's fiscal resources and terrify its populace.

The budget deficit increased even during the prosperous years of the mid-2000s as taxes were cut and spending increased on new entitlement programs and seemingly endless wars in Iraq and Afghanistan. Then, the nation's banking system ran mammoth losses and the economy went into a deep recession. Tax revenues fell sharply, and hundreds of billions of dollars were spent to prop up the financial system and stimulate the economy. For 2009, the federal government was running an annual deficit of close to \$2 trillion, which was the largest percent of GDP since World War II.

How did the budget deficit get so high? What are the economic impacts of fiscal deficits? These important questions will be addressed in this section. We will see that the popular concern with deficits has a firm economic foundation. Deficit spending may be necessary to reduce the length and depth of recessions, particularly when the economy is in a liquidity trap. But high deficits during periods of full employment carry serious consequences, including reduced national saving and investment and slower long-run economic growth.

Government Budgets. Governments use budgets to plan and control their fiscal affairs. A **budget** shows, for a given year, the planned expenditures of government programs and the expected revenues from tax systems. The budget typically contains a list of specific programs (education, welfare, defense, etc.), as well as tax sources (individual income tax, social-insurance taxes, etc.).

A **budget surplus** occurs when all taxes and other revenues exceed government expenditures for a year. A **budget deficit** is incurred when expenditures exceed taxes. When revenues and expenditures are equal during a given period—a rare event on the federal level—the government has a **balanced budget**.

When the government incurs a budget deficit, it must borrow from the public to pay its bills. To borrow, the government issues bonds, which are IOUs that promise to pay money in the future. The **government debt** (sometimes called the *public debt*) consists of the total or accumulated borrowings by the government; it is the total dollar value of government bonds.

It is useful to distinguish between the total debt and the net debt. The *net debt*, also called the *debt held by the public*, excludes debt held by the government itself. Net debt is owned by households, banks, businesses, foreigners, and other nonfederal entities.

The *gross debt* equals the net debt plus bonds owned by the government, primarily by the social security trust fund. The social security trust fund is running a large surplus, so the difference between these two concepts is growing rapidly today.



Debt versus Deficit

People often confuse the debt with the deficit. You can remember the difference as follows: Debt is water in the tub, while a deficit is water flowing into the tub. The government debt is the stock of liabilities of the government. The deficit is a flow of new debt incurred when the government spends more than it raises in taxes. For example, when the government ran a deficit of \$640 billion in 2008, it added that amount to the stock of government debt. By contrast, when the government enjoyed a surplus of \$200 billion in 2000, this reduced the government debt by that amount.

FISCAL HISTORY

Like Sisyphus, federal policymakers toil endlessly to push the stone of fiscal balance up the hill only to have it roll down to crush them again. The government passed law after law in the 1980s and 1990s to stop the rising deficit. No sooner was the deficit vanquished than it reappeared and grew rapidly after 2001. Was this typical, or was it a new feature of the American economy?

Deficits were not new to the American economy, but large deficits during peacetime are a unique feature of recent economic history. For the first two centuries after the American Revolution, the federal government of the United States generally balanced its budget. Heavy military spending during wartime was financed by borrowing, so the government debt soared in wartime. In peacetime, the government would pay off some of its debt, and the debt burden would shrink.

Then, starting in 1940, the fiscal affairs of state began to change rapidly. Table 31-1 illuminates the major trends. This table lists the major federal budget categories and their shares in GDP for the period from 1940 to 2008. The key features were the following:

- The share of federal spending and taxes grew sharply from 1940 to 1960 primarily because of the expansion of military and civilian spending. This growth was financed by a significant increase in individual and corporate taxation.

Federal budget component	Percent of GDP				
	1940	1960	1980	2000	2008
Revenues	6.4	17.6	18.5	20.6	17.7
Individual income taxes	0.9	7.7	8.8	10.2	8.1
Corporation income taxes	1.2	4.1	2.3	2.1	2.1
Social insurance and retirement receipts	1.8	2.8	5.7	6.7	6.3
Other	2.7	3.0	1.8	1.6	1.2
Expenditures	9.4	17.5	21.2	18.2	20.9
National defense and international affairs	1.8	9.7	5.3	3.2	4.4
Health	0.1	0.2	2.0	3.6	4.7
Income security	1.5	1.4	3.1	2.6	3.0
Social security	0.0	2.2	4.2	4.2	4.3
Net interest	0.9	1.3	1.9	2.3	1.7
Other	5.2	2.7	4.7	2.4	2.5
Surplus or deficit	-2.9	0.1	-2.6	2.4	-3.2

TABLE 31-1. Federal Budget Trends, 1940–2008

The federal share of the economy grew sharply from 1940 to 1960 as the United States took an active military role in world affairs during the hot and cold wars. After 1960, the federal-spending share stabilized, but the composition of spending moved from military to health care and other social spending. The federal government deficit grew sharply in the 2000s as revenues declined sharply due to individual income-tax cuts.

Source: Data are for fiscal years and come from the Department of the Treasury, Office of Management and Budget, and Department of Commerce. They are summarized in *Economic Indicators*, available at origin.www.gpoaccess.gov/indicators/.

- The period from 1960 to 1980 marked the “New Society” programs for health, income security, and expanded social security. As a result, the expenditure share grew sharply. The share of federal revenues in GDP stabilized over this period.
- Beginning in 1981, both political parties declared that the era of big government was over. Presidents Ronald Reagan and George W. Bush introduced large tax cuts, which in each case led to large government budget deficits. From 1980 to 2008, as shown in Table 31-1, the ratio of total federal spending to GDP was essentially constant. Spending on health care rose sharply as other civilian programs were squeezed.

GOVERNMENT BUDGET POLICY

The government budget serves two major economic functions. First, it is a device by which the government can set national priorities, allocating national output

among private and public consumption and investment and providing incentives to increase or reduce output in particular sectors. From a macroeconomic point of view, it is through fiscal policy that the budget affects the key macroeconomic goals. More precisely, by **fiscal policy** we mean the setting of taxes and public expenditures to help dampen the swings of the business cycle and contribute to the maintenance of a growing, high-employment economy, free from high or volatile inflation.

Some early enthusiasts of the Keynesian approach believed that fiscal policy was like a knob they could turn to control or “fine-tune” the pace of the economy. A bigger budget deficit meant more stimulus for aggregate demand, which could lower unemployment and pull the economy out of recession. A budget surplus could slow down an overheated economy and dampen the threat of inflation.

Few today hold such an idealized view of fiscal policy. With many decades of practice, economies

still experience recessions and inflations. Fiscal policy works better in theory than in practice. Moreover, monetary policy has become the preferred tool for moderating business-cycle swings. Still, when unemployment rises, there is usually strong public pressure for the government to boost spending. In this section, we will review the major ways in which the government can employ fiscal policy, and we will examine the practical shortcomings that have become apparent.

Actual, Structural, and Cyclical Budgets

Modern public finance distinguishes between structural and cyclical deficits. The idea is simple. The *structural* part of the budget is active—determined by discretionary policies such as those covering tax rates, public-works or education spending, or the size of defense purchases. In contrast, the *cyclical* part of the budget is determined passively by the state of the business cycle, that is, by the extent to which national income and output are high or low. The precise definitions follow:

The **actual budget** records the actual dollar expenditures, revenues, and deficits in a given period.

The **structural budget** calculates what government revenues, expenditures, and deficits would be if the economy were operating at potential output.

The **cyclical budget** is the difference between the actual budget and the structural budget. It measures the impact of the business cycle on the budget, taking into account the effect of the cycle on revenues, expenditures, and the deficit.

The distinction between the actual and the structural budgets is important for policymakers who want to distinguish between long-term or trend budget changes and short-term changes that are primarily driven by the business cycle. Structural spending and revenues consist of the discretionary programs enacted by the legislature; cyclical spending and deficits consist of the taxes and spending that react automatically to the state of the economy.

The nation's saving and investment balance is primarily affected by the structural budget. Efforts to change government saving should focus on the structural budget because no durable change comes simply from higher revenues due to an economic boom.

THE ECONOMICS OF THE DEBT AND DEFICITS

No macroeconomic issue is more controversial today than the impact of large government deficits upon the economy. Some argue that large deficits are placing a heavy burden on future generations. Others rejoinder that there is little evidence of an impact of deficits on interest rates or investment. Yet a third group argues that deficits are favorable for the economy in recessionary times.

How can we sort through the conflicting points of view? At one extreme, we must avoid the customary practice of assuming that a public debt is bad because private debtors are punished. On the other hand, we must recognize the genuine problems associated with large government deficits and the advantages that come from a lower government debt.

THE SHORT-RUN IMPACT OF GOVERNMENT DEFICITS

Short Run vs. Long Run

It is useful to separate the impact of fiscal policy into the short run and the long run. The *short run* in macroeconomics considers situations where less than full employment may prevail—that is, where actual output may differ from potential output. This is the world of the Keynesian multiplier model. The *long run* refers to a full-employment situation, where actual output equals potential output. This is the world of our economic-growth analysis.

We have already discussed the role of fiscal policy in the short run, so that needs only a brief review in this section. The impact in the long run is more novel and will be presented in the next section.

Fiscal Policy and the Multiplier Model

We discussed in earlier chapters the way that fiscal policy affects the economy in the short run—that is, in an economy with less than full employment.

Suppose that the government purchases computers for its schools or missiles for its army. Our multiplier model says that in the short run, with no change in interest or exchange rates, GDP will rise by a multiple (perhaps $1\frac{1}{2}$ or 2) times the increase in G . The same argument applies (with a smaller multiplier) to reductions in taxes, T . At the same time, the

government deficit will rise because the deficit equals $T - G$ and thus rises with T cuts or G increases.

This then is the basic result for the short run: With less than full employment, increases in the structural deficit arising from discretionary T cuts or G increases will tend to produce higher output and lower unemployment, and perhaps higher inflation.

We must, however, expand on the simplest multiplier analysis to incorporate the reactions of financial markets and monetary policy. As output rises and inflation threatens, central banks may raise interest rates, discouraging domestic investment. Higher interest rates may also cause a country's foreign exchange rate to appreciate if the country has a flexible exchange rate; the appreciation leads to a decline in net exports. These financial reactions would tend to choke off or "crowd out" investment, with a resulting decrease in the expenditure multiplier of our simplest model.

Fiscal policy tends to expand the economy in the short run—that is, when there are unemployed resources. Higher spending and lower tax rates increase aggregate demand, output, employment, and inflation. However, this expansionary impact is reduced by the subsequent financial reactions of interest rates and foreign exchange rates.

GOVERNMENT DEBT AND ECONOMIC GROWTH

We turn now from the short run to the long run—to the impact of fiscal policy, and particularly a large government debt, on investment and economic growth. The analysis here deals with the costs of servicing a large external debt, the inefficiencies of levying taxes to pay interest on the debt, and the impact of the debt on capital accumulation.

Historical Trends

Before we begin our analysis of government debt, it is useful to review historical trends. Long-run data for the United States appear in the figure on page 716 of this text, which shows the ratio of net federal debt to GDP since 1789. Notice how wars drove up the ratio of debt to GDP, while rapid output growth with generally balanced budgets in peacetime reduced the ratio of debt to GDP.

Figure 31-1 shows the debt-GDP ratio for the United States over the last seven decades. You can see the

dramatic effect of government deficits during World War II, as well as during the 1980s and the 2000s.

Most industrialized countries are today saddled with large public debts. Table 31-2 compares the United States with seven other large countries. Japan's debt-GDP ratio has climbed sharply over the last two decades because of the nation's aggressive fiscal policy and a prolonged recession. Many economists worry that Japan is caught in a vicious cycle of high debt leading to high interest payments, which in turn increase the growth of the debt.

External vs. Internal Debt

The first distinction to be made is between an internal debt and an external debt. *Internal government debt* is owed by a nation to its own residents. Many argue that an internal debt poses no burden because "we owe it all to ourselves." While this statement is oversimplified, it does represent a genuine insight. If each citizen owned \$10,000 of government bonds and were liable for the taxes to service just that debt, it would make no sense to think of debt as a heavy load of rocks that each citizen must carry. People simply owe the debt to themselves.

An external debt is quite a different situation. An *external debt* occurs when foreigners own a fraction of the assets of a country. For example, because of

	Ratio of Gross Government Debt to GDP (%)			
	1980	1990	2000	2007
Japan	37	47	106	161
Italy	53	93	104	96
France	30	40	47	52
United Kingdom	51	35	43	43
Germany	13	20	34	39
United States	26	41	34	36
South Korea	4	13	17	32
Mexico	18	46	23	24

TABLE 31-2. Central-Government Debt in Eight Major Countries

Slow economic growth and rising spending on entitlement programs led to growing public debts in most major countries in the last three decades. Japan's debt-GDP ratio led to a downgrading of the nation's debt rating even though Japan is one of the world's richest countries.

Source: OECD at webnet.oecd.org/wbos/index.aspx.



FIGURE 31-1. Debt-GDP Ratio for the U.S. Federal Government

This figure shows the ratio of net debt, or debt in the hands of the public, to GDP. See the effect of World War II and the two periods of supply-side tax cuts on the ratio.

Source: U.S. Office of Management and Budget, available at www.gpoaccess.gov/eop/tables08.html, Table B-78.

its large current-account deficits, the United States owed the rest of the world \$3 trillion at the end of 2008. What this means is that U.S. residents will eventually have to export that much in goods and services or sell that much of the nation's assets to foreigners. Suppose that the real interest rate on that debt is 5 percent per year. Then, each year, U.S. residents would need to ship abroad \$150 billion (about \$500 per capita) to "service" the external debt.

So an external debt definitely does involve a net subtraction from the resources available for consumption in the debtor nation. This lesson has been learned time and again by developing countries—particularly when their creditors wanted their debts paid back quickly.

Efficiency Losses from Taxation

An internal debt requires payments of interest to bondholders, and taxes must be levied for this purpose. But even if the same people were taxed to pay the same

amounts they receive in interest, there would still be the *distorting effects on incentives* that are inescapably present in the case of any taxes. Taxing Paula's interest income or wages to pay Paula interest would introduce microeconomic distortions. Paula might work less and save less; either of these outcomes must be reckoned as a distortion of efficiency and well-being.

Displacement of Capital

Perhaps the most serious consequence of a large public debt is that it displaces capital from the nation's stock of private wealth. As a result, the pace of economic growth slows and future living standards will decline.

What is the mechanism by which debt affects capital? Recall from our earlier discussion that people accumulate wealth for a variety of purposes, such as retirement, education, and housing. We can separate the assets people hold into two groups: (1) government debt and (2) capital like houses and financial assets like corporate stocks that represent ownership of private capital.

The effect of government debt is that people will accumulate government debt instead of private capital, and the nation's private capital stock will be displaced by public debt.

To illustrate this point, suppose that people desire to hold exactly 1000 units of wealth for retirement and other purposes. As the government debt increases, people's holdings of other assets will be reduced dollar for dollar. This occurs because as the government sells its bonds, other assets must be reduced, since total desired wealth holdings are fixed. But these other assets ultimately represent the stock of private capital; stocks, bonds, and mortgages are the counterparts of factories, equipment, and houses. In this example, if the government debt goes

up 100 units, we would see that people's holdings of capital and other private assets fall by 100 units. This is the case of 100 percent displacement (which is the long-run analog of 100 percent crowding out).

Full displacement is unlikely to hold in practice. The higher debt may increase interest rates and stimulate domestic saving. In addition, the country may borrow abroad rather than reduce its domestic investment (as has been the case for the U.S. in recent years). The exact amount of capital displacement will depend on the conditions of production and on the saving behavior of domestic households and foreigners.

A Geometric Analysis. The process by which the stock of capital is displaced in the long run is illustrated in Figure 31-2. The left panel shows the supply

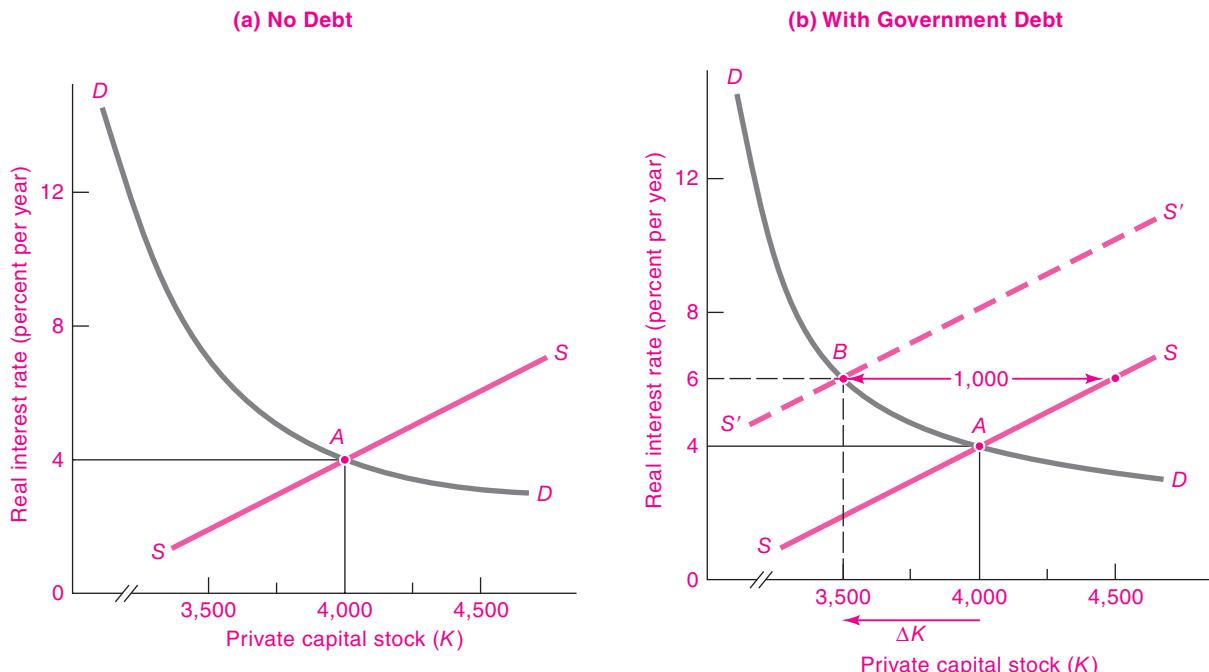


FIGURE 31-2. Government Debt Displaces Private Capital

Firms demand capital, while households supply capital by saving in private and public assets. The demand curve is the downward-sloping business demand for K , while the supply curve is the upward-sloping household supply of wealth.

Before-debt case in (a) shows the equilibrium without government debt: K is 4000 and the real interest rate is 4 percent.

After-debt case in (b) shows the impact of 1000 units of government debt. Debt shifts the net supply of K to the left by the 1000 units of the government debt. The new equilibrium arises northwest along the demand-for- K curve, moving from point A to point B . The interest rate is higher, firms are discouraged from holding K , and the capital stock falls.

and demand for capital as a function of the real interest rate or return on capital. As interest rates rise, firms demand less capital while individuals may want to supply more. The equilibrium shown is for a capital stock of 4000 units with a real interest rate of 4 percent.

Now say that the government debt rises from 0 to 1000—because of war, recession, supply-side fiscal policies, or some other reason. The impact of the increase in debt can be seen in the right-hand diagram of Figure 31-2. This figure shows the 1000-unit increase in debt as a shift in the supply-of-capital (or SS) curve. As depicted, the households' supply-of-capital schedule shifts 1000 units to the left, to $S'S'$.

We represent an increase in government debt as a leftward shift in the households' supply-of-capital schedule. Note that, because the SS curve represents the amount of private capital that people willingly hold at each interest rate, the capital holdings are equal to the total wealth holdings minus the holdings of government debt. Since the amount of government debt (or assets other than capital) rises by 1000, the amount of private capital that people can buy after they own the 1000 units of government debt is 1000 less than total wealth at each interest rate. Therefore, if SS represents the total wealth held by people, $S'S'$ (equal to SS less 1000) represents the total amount of capital held by people. In short, after 1000 units of government debt are sold, the new supply-of-capital schedule is $S'S'$.

As the supply of capital dries up—with national saving going into government bonds rather than into housing or into companies' stocks and bonds—the market equilibrium moves northwest along the demand-for- K curve. Interest rates rise. Firms slow their purchases of new factories, trucks, and computers.

In the illustrative new long-run equilibrium, the capital stock falls from 4000 to 3500. Thus, in this example, 1000 units of government debt have displaced 500 units of private capital. Such a reduction has significant economic effects, of course. With less capital, potential output, wages, and the nation's income are lower than they would otherwise be.

The diagrams in Figure 31-2 are illustrative. Economists do not have a firm estimate of the magnitude of the displacement effect. In a look at historical trends, the best evidence suggests that domestic capital is partially displaced by government debt but that some of the impact comes in higher foreign debt.

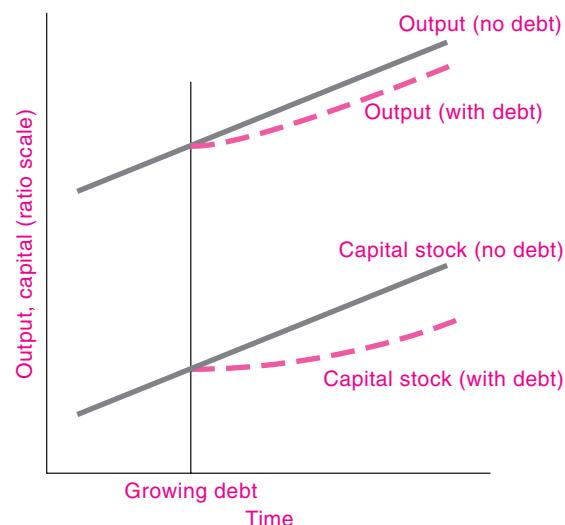


FIGURE 31-3. Impact of Government Debt on Economic Growth

The solid lines show the paths of capital and output if the government balances its books and has no debt. When the government incurs a debt, private capital is reduced. The dashed lines illustrate the impact on capital and output of the higher government debt.

Debt and Growth

If we consider all the effects of government debt on the economy, a large public debt is likely to reduce long-run economic growth. Figure 31-3 illustrates this connection. Say that an economy were to operate over time with no debt. According to the principles of economic growth outlined in Chapter 25, the capital stock and potential output would follow the hypothetical paths indicated by the solid blue lines in Figure 31-3.

Next consider a situation with a growing national debt. As the debt accumulates over time, more and more capital is displaced, as shown by the dashed green line for the capital stock in the bottom of Figure 31-3. As taxes are raised to pay interest on the debt, inefficiencies further lower output. Also, an increase in external debt lowers national income and raises the fraction of national output that has to be set aside for servicing the external debt. All the effects taken together, output and consumption will grow more slowly than they would have had there been no large government debt and deficit, as can be seen by comparing the top lines in Figure 31-3.

What is the impact of a budget surplus and a *declining* government debt? Here, the argument works in the other direction. A lower national debt means that more of national wealth is put into capital rather than government bonds. A higher capital stock increases the growth of output and increases wages and consumption per person.

This is the major point about the long-run impact of a large government debt on economic growth: A large government debt tends to reduce the growth in potential output because it displaces private capital, increases the inefficiency from taxation, and forces a nation to reduce consumption to service its foreign borrowing.



Deficit Confusions Unraveled

Having completed our analysis of the economic impacts of deficits and debt, we can summarize the key points by unraveling some of the major confusions in this area.

The impact of fiscal policy on the economy is one of the most misunderstood facets of macroeconomics. The confusion arises because fiscal policy operates differently depending upon the time period:

- In the short run, higher spending and lower tax rates tend to increase aggregate demand and thereby to raise output and lower unemployment. This is the Keynesian impact of fiscal policy, which operates by raising actual output relative to potential output. We would expect that the expansionary impact of fiscal policy—the increase in capacity utilization—would last at most for a few years. It might be offset by a monetary tightening, especially if the central bank thought the economy was operating near the inflation danger zone.
- In the long run, higher spending and lower tax rates tend to depress the growth rate of the economy. This is the growth impact of fiscal policy. The growth impact concerns the impact of government deficits on the national saving and investment balance in a full-employment economy. If taxes are lower, this will decrease public saving and, because private saving is unlikely to rise as much as public saving falls, total national saving and investment will decline. The investment decline will lead to slower growth in the capital stock and therefore in potential output.

These two impacts of fiscal policy can easily confuse people and are the source of many debates about fiscal

policy. Consider the following debate between Senators Hawk and Dove:

Senator Dove: The economy is tipping into recession.

We cannot afford to sit around while millions of people lose their jobs. Now is the time for a big stimulus package with tax cuts and new spending on infrastructure and pressing public needs. Recessions are not the time for old-fashioned dogmas about deficits.

Senator Hawk: A huge stimulus package today would

be the height of fiscal irresponsibility. With higher government spending, the deficit will grow even larger; interest rates will rise, and businesses will reduce their spending on new plant, equipment, and information technology. With all the critical needs facing the nation, we can ill-afford slower economic growth over the next decade.

Make sure that you understand the implicit theories underlying the positions of the two distinguished senators. They are both right ... and both wrong.

B. ADVANCES IN MODERN MACROECONOMICS

Our philosophy in this textbook is to consider all the important schools of thought. We emphasize the modern mainstream Keynesian approach as the best way to explain the business cycle in market economies. At the same time, the forces behind long-run economic growth are best understood by using the neoclassical growth model.

While our key task has been to present mainstream thinking, experience shows how important it is to keep our minds open to alternative points of view. Time and again in science, the orthodoxies of one era are overturned by new discoveries in the next. Schools, like people, are subject to hardening of the arteries. Students learn the embalmed truth from their teachers and sacred textbooks, and the imperfections in the orthodox doctrines are glossed over as unimportant. For example, John Stuart Mill, one of the greatest economists and philosophers of all time, wrote in his 1848 classic, *Principles of Political Economy*: “Happily, there is nothing in the laws of Value which remains for the present and any future writer to clear up.” Yet the next century and a half

saw two major revolutions in economics—the marginal revolution in microeconomics and the discovery of macroeconomics.

Historians of science observe that the progress of science is discontinuous. New schools of thought rise, spread their influence, and convince skeptics. In this section, we sketch some of the leading new lines of thinking in modern macroeconomics.

CLASSICAL MACROECONOMICS AND SAY'S LAW

Since the dawn of economics two centuries ago, economists have wondered if a market economy has a tendency to move spontaneously toward a long-run, full-employment equilibrium without the need for government intervention. Using modern language, we label as **classical** those approaches that emphasize the self-correcting forces in an economy. The classical approach holds that prices and wages are flexible and that the economy is stable, so the economy moves automatically and quickly to its full-employment equilibrium.

Say's Law of Markets

Before Keynes developed his macroeconomic theories, the major economic thinkers generally adhered to the classical view of the economy, at least in good times. Early economists knew about business cycles, but they viewed them as temporary and self-correcting aberrations.

Classical analysis revolved around **Say's Law of Markets**. This theory, advocated in 1803 by the French economist J. B. Say, states that overproduction is impossible by its very nature. This is sometimes expressed as “supply creates its own demand.” This law rests on a view that there is no essential difference between a monetary economy and a barter economy—in other words, people can afford to buy whatever factories can produce. Say’s Law is illustrated in Figure 31-4. In the classical world, output is determined by aggregate supply, and aggregate demand affects only the price level.

A long line of the most distinguished economists, including David Ricardo (1817), John Stuart Mill (1848), and Alfred Marshall (1890), subscribed to the classical macroeconomic view that overproduction is impossible.

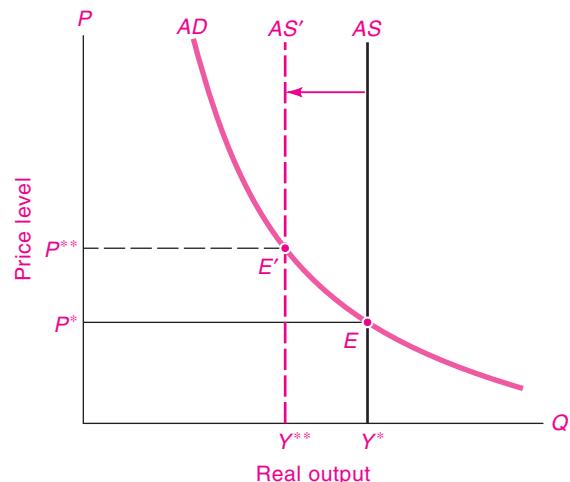


FIGURE 31-4. In the Real Business Cycle, Output Changes Come from Technological Shocks

In the classical as well as the real-business-cycle (RBC) approach, AS reflects classical flexible wages and prices and is therefore vertical. Output fluctuations come as technological shocks percolate through the economy. This figure shows how a decline in productivity can be the cause of a RBC recession. Can you see why policies to increase AD will affect prices but not output?

The classical view is that the economy moves automatically toward its full-employment equilibrium. Changes in the money supply, fiscal policy, investment, or other spending factors have no lasting impact upon output or employment. Prices and wages adjust quickly and flexibly to maintain full employment.

MODERN CLASSICAL MACROECONOMICS

While classical economists were preaching the impossibility of persistent unemployment, eclectic economists of the 1930s could hardly ignore the vast army of unemployed workers begging for work and selling pencils on street corners. Keynes's *The General Theory of Employment, Interest and Money* (1936) offered an alternative macroeconomic theory—a new set of theoretical spectacles for looking at the impacts of shocks and economic policies. The analysis of business cycles and short-run aggregate demand presented in this text reflects the modern synthesis of the Keynesian approach.

While mainstream business-cycle analysis relies primarily on the Keynesian *AS* and *AD* model, a new branch of the classical school challenges the standard approach. This theory, called **new classical macroeconomics**, was developed by Robert Lucas (University of Chicago), Thomas Sargent (Stanford University and New York University), and Robert Barro (Harvard University). This approach is much in the spirit of the classical approach in emphasizing the role of flexible wages and prices, but it also adds a new feature called rational expectations to explain observations such as the Phillips curve.

Rational Expectations

The major innovation of new classical economics has been to introduce the principle of rational expectations into macroeconomics. Some background on expectations will help to explain this new approach. In many areas of economics, particularly those involving investment and financial decisions, expectations are a central factor in decision making. They influence how much businesses will spend on investment goods and whether consumers spend now or save for the future. For example, assume that you are considering how much to spend on your first house. Your decision will be affected by your *expectations* about your future income, family size, and future housing prices.

How do people form their expectations? According to the **rational-expectations hypothesis**, expectations are unbiased and based on all available information.

We pause for a statistical aside: A forecast is unbiased if it contains no systematic forecasting errors. Clearly, a forecast cannot always be perfectly accurate—you cannot foresee how a coin flip will come up on a single toss. However, you should not commit the statistical sin of *bias* by predicting that a fair coin will come up tails 25 percent of the time. You would be making an unbiased forecast if you predicted that the coin would come up tails 50 percent of the time or that each of the numbers on a die would, on average, come up one-sixth of the time.

People have **rational expectations** when, in addition to lacking bias, they use all available information in making their decisions. This implies that people understand how the economy works and what the government is doing. Thus, suppose that the government always boosts spending in election years to

promote its election prospects. Under rational expectations, people will anticipate this kind of behavior and act accordingly. (Recall that this principle is also an important assumption behind the efficient-market hypothesis of financial markets, as described in Chapter 23.)

Real Business Cycles

The major application of modern classical macroeconomics is an exciting field known as **real-business-cycle (RBC) theory**. This theory was developed principally by Finn Kydland and Edward C. Prescott, who won the Nobel Prize for their work in this area. This approach holds that business cycles are primarily due to technological shocks and do not invoke any monetary or demand-side forces.

In the RBC approach, shocks to technology, investment, or the labor supply change the potential output of the economy. In other words, the shocks shift a *vertical AS* curve. These supply shocks are transmitted into actual output by the fluctuations of aggregate supply and are completely independent of *AD*. Similarly, movements in the unemployment rate are the result of movements in the natural rate of unemployment (the NAIRU) due either to microeconomic forces, such as the intensity of sectoral shocks, or to tax and regulatory policies. Standard Keynesian monetary and fiscal policies have no effect on output or employment in RBC models; they affect only *AD* and the price level. Figure 31-4 shows an example of a RBC recession caused by a decline in productivity.

The Ricardian View of Fiscal Policy

One of the most influential criticisms of Keynesian macroeconomics was a new view of the role of fiscal policy. This view, known as the **Ricardian view of fiscal policy** and developed by Harvard University's Robert Barro, argues that changes in tax rates have no impact upon consumption spending.

This idea is a logical extension of the life-cycle model of consumption, introduced in Chapter 21. Under the Ricardian view, individuals are farsighted and form part of a succession of family members, like a dynasty. Parents care not only about their own consumption but also about the well-being of their children; the children, in turn, care about the well-being of their own children; and so on. This structure, called "dynamic preferences," implies that the current generation's horizon stretches into the

indefinite future through the overlapping concerns of each generation about its offspring.

Here is where the surprising result comes: If the government cuts taxes but leaves expenditures unchanged, this necessarily requires increased government borrowing. But, with unchanged expenditures, the government will have to raise taxes at some point in the future to pay the interest on its new borrowing. In the Ricardian view, consumers have rational expectations about future policies, so when a tax cut occurs, they know they must plan for a future tax increase. They will therefore increase their saving by the amount of the tax cut, and their consumption will remain unchanged. Moreover, people take into account the well-being of their children. So, even if the future tax increase comes after their lifetime, they will save enough to increase their bequests to their children so that their children can pay the extra taxes.

The net result in the Ricardian view is that tax changes have no impact upon consumption. Moreover, government debt is not net debt from the point of view of households because they offset these assets in their mental calculations with the present value of taxes that must be paid to service the government debt.

The Ricardian view of debt and deficits has stirred much controversy among macroeconomists. Critics point out that it requires that households be extremely farsighted, planning to give bequests to their children and constantly weighing their own interests against those of their descendants. The chain would be broken if there were no children, no bequests, no concern for children, or poor foresight. The empirical evidence to date provides little support for the Ricardian view, but it is a useful reminder of the logical limitations on fiscal policy.

Efficiency Wages

Another important recent development, fusing elements of both classical and Keynesian economics, is called **efficiency-wage theory**. This approach was developed by Edmund Phelps (Columbia University), Joseph Stiglitz (Columbia University), and Janet Yellen (president of the Federal Reserve Bank of San Francisco). It explains the rigidity of real wages and the existence of involuntary unemployment in terms of firms' attempts to increase productivity by keeping wages above the market-clearing level. According to

this theory, higher wages lead to higher productivity because workers are healthier, because workers will have higher morale and be less likely to surf the Internet at work for fear of losing their jobs, because good workers are less likely to quit and look for new jobs, and because higher wages may attract better workers.

As firms raise their wages to increase worker productivity, job seekers may be willing to stand in line for these high-paying jobs, thereby producing involuntary unemployment. The innovation in this theory is that involuntary unemployment is an equilibrium feature and will not disappear over time.

Supply-Side Economics

In the early 1980s, a group of economists and journalists developed a popular school known as **supply-side economics**, which emphasized incentives and tax cuts as a means of increasing economic growth. Supply-side economics was espoused forcefully by President Reagan in the United States (1981–1989) and by Prime Minister Thatcher in Great Britain (1979–1990).

Supply siders argued that Keynesians, in their excessive concern with the business cycle, had ignored the impact of tax rates and incentives on economic growth. According to supply siders, high taxes lead people to reduce their labor and capital supply. Indeed, supply-side economists like Arthur Laffer suggested that high tax rates might actually lower tax revenues. This *Laffer-curve* proposition holds that high tax rates shrink the tax base because they reduce economic activity. To fix what they view as an inefficient tax system, supply-side economists proposed a radical restructuring of the tax system, through an approach sometimes called “supply-side tax cuts.”

After occupying center stage during the 1980s, the supply-side theories largely waned after Ronald Reagan left office. In studying this period, economists have generally found that many of the supply-side assertions were not supported by economic experience. Supply-side tax cuts produced lower, not higher, revenues.

Many of the supply-side policies were revived in 2001, when President George W. Bush successfully negotiated another round of income-tax cuts. These cuts were rationalized not by the argument that they would raise revenues but, instead, by the theory that they would improve the efficiency of the tax system

and raise the long-run rate of economic growth. Like their precursor in 1981, these tax cuts led to lower, rather than higher, tax revenues (see Table 31-1).

POLICY IMPLICATIONS

Policy Ineffectiveness

The new classical approaches have several important implications for macroeconomic policy. One of the most important contentions is the *ineffectiveness of systematic fiscal and monetary policies in reducing unemployment*. The basic idea here is that a predictable attempt to stimulate the economy would be known in advance and would therefore have no effect on the economy.

For example, suppose that the government has always stimulated the economy whenever elections were approaching. After a couple of episodes of politically motivated fiscal policy, people would rationally come to expect that behavior. They might say to themselves:

Elections are coming. From experience I know that the government always pumps up the economy before elections. I will probably get an election-year tax cut, but that will be followed by a stealth tax increase next year. They can't fool me into consuming more, working harder, and voting for incumbents.

This is the **policy-ineffectiveness theorem** of classical macroeconomics. With rational expectations and flexible prices and wages, anticipated government policy cannot affect real output or unemployment.

The Desirability of Fixed Rules

We described the monetarist case for fixed rules in Chapter 24. New classical macroeconomics puts this argument on firmer footing. This approach holds that an economic policy can be divided into two parts, a predictable part (the "rule") and an unpredictable part ("discretion").

New classical macroeconomists argue that discretion is a snare and a delusion. Policymakers, they contend, cannot forecast the economy any better than can the private sector. Therefore, by the time policymakers act on the news, flexibly moving prices in markets populated by well-informed buyers and sellers have already adapted to the news and reached their efficient supply-and-demand equilibrium. There are no further *discretionary* steps the government can take

to improve the outcome or prevent the unemployment that is caused by temporary misperceptions or real-business-cycle shocks.

Although they cannot make things better, government policies can definitely make things worse. The government can generate unpredictable discretionary policies that give misleading economic signals, confuse people, distort their economic behavior, and cause waste. According to new classical macroeconomists, governments should avoid any discretionary macroeconomic policies rather than risk producing such confusing "noise."

A New Synthesis?

After three decades of digesting the new classical approach to macroeconomics, elements of a synthesis of old and new theories are beginning to appear. Economists today emphasize the importance of expectations. A useful distinction is between the adaptive (or "backward-looking") approach and the rational (or "forward-looking") approach. The adaptive assumption holds that people form their expectations on the basis of past information; the forward-looking or rational approach was described above. The importance of forward-looking expectations is crucial to understanding behavior, particularly in competitive auction markets like those in the financial sector.

Some macroeconomists have begun to fuse the new classical view of expectations with the Keynesian view of product and labor markets. This synthesis is embodied in macroeconomic models that assume (1) labor and goods markets display inflexible wages and prices, (2) the prices in financial auction markets adjust rapidly to economic shocks and expectations, and (3) the expectations in auction markets are formed in a forward-looking way.

One important forecast of such new approaches is that forward-looking models tend to have large "jumps" or discontinuous changes in interest rates, stock prices, foreign exchange rates, and oil prices in reaction to major news. Sharp reactions are often seen after elections or when wars break out. For example, when the United States invaded Iraq in March 2003, oil prices declined by 35 percent and stock prices rose by 10 percent *in a single week*. The new classical prediction of "jumpy" prices replicates one realistic feature of auction markets and thus suggests one area where forward-looking expectations might be important in the real world.

The new classical approach to macroeconomics has brought many fruitful insights. Most important, it reminds us that the economy is populated by intelligent consumers and investors who react to and often anticipate policy. This reaction and counterreaction can actually change the way the economy behaves.

C. STABILIZING THE ECONOMY

The period since World War II has been one of remarkable economic progress for the high-income market democracies. Average incomes and employment grew rapidly, international trade broadened and deepened, and many poor countries, notably India and China, began to close the gap with rich countries.

The economies performed so well that some proclaimed a “Great Moderation,” in which business cycles were disappearing. Some “new” economics textbooks virtually ignored the macroeconomics of business cycles.

This fantasy was dispelled with the financial crisis and deep recession that began in 2007. Words like “recession” and “depression”—which had been banished to the history books—again took on meaning in people’s daily lives.

It is critical to find policies which can help avoid the excesses of the business cycle. We have seen that the path of output and prices is determined by the interaction of aggregate supply and aggregate demand. *However, policies designed to stabilize the business cycle must operate primarily through their impact on aggregate demand.* The government can affect the growth of aggregate demand primarily through the use of its monetary and fiscal levers and thereby counter recessions.

These observations leave open two crucial questions: What is the best mix of monetary and fiscal policies for stabilizing the economy? Should there be tight rules on policy-making, or should policymakers be allowed great discretion in their actions?

THE INTERACTION OF MONETARY AND FISCAL POLICIES

For large economies like the United States or Euroland, the best combination of monetary and fiscal policies will depend upon two factors: the need for demand management and the desired fiscal-monetary mix.

Demand Management

The top consideration in business-cycle management is the overall state of the economy and the need to adjust aggregate demand. When the economy is stagnating, fiscal and monetary policies can be used to stimulate the economy and promote economic recovery. When inflation threatens, monetary and fiscal policies can help slow the economy and dampen inflationary fires. These are examples of *demand management*, which refers to the active use of monetary and fiscal policies to affect the level of aggregate demand.

Suppose, for example, that the economy is entering a severe recession. Output is low relative to its potential. What can the government do to revive the lagging economy? It can increase aggregate demand by raising money growth or by boosting government spending or both. After the economy has responded to the monetary and fiscal stimulus, output growth and employment will increase and unemployment will fall. (What steps could the government take during inflationary periods?)

Let’s review the relative strengths and weaknesses of monetary policy and fiscal policy.

The Role of Fiscal Policy. In the early stages of the Keynesian revolution, macroeconomists emphasized fiscal policy as the most powerful and balanced remedy for demand management. Critics of fiscal policy pointed to shortcomings stemming from timing, politics, and macroeconomic theory.

One concern is the time span between cyclical shock and policy response. It takes time to recognize that a cyclical turning point has been reached—the policy lag. For example, it took one year for the NBER to declare the latest business-cycle peak. (The December 2007 peak was not announced until December 2008.) After a turning point is identified, it takes time for the President to decide what policies are necessary and then still more time for the Congress to act. Finally, even when taxation or spending is changed, there is an effectiveness lag before the economy responds.

Critics also point out that it is easier to cut taxes than to raise them, and easier to raise spending than to cut it. During the 1960s, Congress was enthusiastic about passing the Kennedy-Johnson tax cuts. Two years later, when the Vietnam War expansion ignited inflationary pressures, contractionary policies were called for.

There are two situations when countercyclical fiscal policies appear to be particularly useful. One case is temporary tax cuts in recessions. Temporary tax cuts may be aimed primarily at low- and middle-income households. The reason is that these households have high marginal propensities to consume because they have little excess saving to fall back on in hard times. Statistical studies indicate that these measures have indeed been effective in increasing aggregate demand in the short run without leading to long-run fiscal deficits.

An even more important situation is when the economy is in a liquidity trap and the central bank has no further room to lower short-term interest rates. (Recall our discussion of the liquidity trap in Chapter 24.) This was the case during the 2007–2009 recession. In its effort to revive the economy, the Obama administration worked with Congress in early 2009 to pass the largest fiscal stimulus package in U.S. history. While some people worried about the long-term impact of the fiscal stimulus on the government debt, most macroeconomists believed that fiscal policy was the only feasible way to reduce the depth and the severity of the downturn in this circumstance.

Effectiveness of Monetary Policy. Compared to fiscal policy, monetary policy operates much more indirectly on the economy. Whereas an expansive fiscal policy actually buys goods and services or puts income into the hands of consumers and businesses, monetary policy affects spending by altering interest rates, credit conditions, exchange rates, and asset prices. In the early years of the Keynesian revolution, some macroeconomists were skeptical about the effectiveness of monetary policy—some said, “Monetary policy was like pushing on a string.” Over the last two decades, however, these concerns have been put to rest as the Federal Reserve has shown itself quite capable of slowing down, or speeding up, the economy.

The Federal Reserve is much better placed to conduct stabilization policy than are the fiscal-policy makers. Its staff of professional economists can recognize cyclical movements as well as anyone. And it can move quickly when the need arises. For example, a cascade of failures of financial institutions caused a major financial crisis when the investment-banking firm Bear, Stearns had severe liquidity problems on Friday, March 14, 2008. The Fed needed to come up with a solution before markets opened on Monday

morning. By Sunday, working with the U.S. Treasury Department, the Fed had engineered a takeover of Bear by J.P. Morgan and had opened an entire new credit facility for its primary dealers. It is difficult to conceive of any legislature taking such complex measures in such a short time.

A key ingredient in Fed policy is its independence, and the Fed has proved that it can stand the heat of making politically unpopular decisions when they are necessary to slow inflation. Most important is that—with some qualifications—from the point of view of demand management, monetary policy can do, or undo, anything that fiscal policy can accomplish. The major reservation is that if the economy gets stuck in a liquidity trap, with nominal interest rates at or near zero, then monetary policy loses its ability to stimulate the economy. When the economy is in or near a liquidity trap, fiscal policy must therefore take over the major expansionary role.

We can summarize the current state of fiscal and monetary policy as follows:

Because of their political independence and rapid decision making, central banks are well placed to be on the front line of defense in stabilizing the economy against business-cycle shocks. Discretionary fiscal policy is useful in recessions as a one-time stimulus. When the economy approaches a liquidity trap, fiscal policy must be the primary source of economic stimulus.

The Fiscal-Monetary Mix

The second factor affecting fiscal and monetary policy is the desired **fiscal-monetary mix**, which refers to the relative strength of fiscal and monetary policies and their effect on different sectors of the economy. A *change in the fiscal-monetary mix* is an approach which tightens one policy while easing the other in such a way that aggregate demand and therefore total output remain constant. The basic idea is that fiscal policy and monetary policy are substitutes in demand management. But while alternative combinations of monetary and fiscal policies can be used to stabilize the economy, they have different impacts upon the *composition* of output. By varying the mix of taxes, government spending, and monetary policy, the government can change the fraction of GDP devoted to business investment, consumption, net exports, and government purchases of goods and services.

Sector	Change in output (\$, billion, 2008 prices)
Investment sectors	132
Gross private domestic investment	48
Housing	18
Business fixed investment	30
Net exports	83
Consumption sectors	-106
Government purchases of goods and services	-68
Personal consumption expenditures	-38
Memoranda:	
Change in real GDP	26
Change in federal deficit	-100

TABLE 31-3. Changing the Fiscal-Monetary Mix

What would be the impact of a change in the fiscal-monetary mix for the United States? This simulation assumes that the federal deficit is cut by \$100 billion through higher personal taxes and lower federal nondefense expenditures while the Federal Reserve uses monetary policy to keep unemployment on an unchanged trajectory. The simulation takes the average of the changes from the baseline path over the period 2000–2009.

Source: Simulation using the DRI model of the U.S. economy.

Effect of Changing the Mix of Monetary and Fiscal Policies. To understand the impact of changing the fiscal-monetary mix, let's examine a specific set of policies. Suppose that the federal government reduces the federal budget deficit by \$100 billion and that the Fed lowers interest rates to offset the contractionary impact of such a fiscal policy.

We can estimate the impact using a quantitative economic model. Table 31-3 shows the results of this experiment. Two interesting features emerge: First, the simulation indicates that a change in the fiscal-monetary mix would indeed change the composition of real GDP. While the deficit declines by \$100 billion, business investment goes up by \$30 billion. Investment in housing also increases as interest rates fall. At the same time, personal consumption declines, freeing up resources for investment. This simulation shows how a change in the fiscal-monetary mix might change the composition of output.

The simulation contains one particularly interesting result: Net exports rise far more than either housing or business fixed investment. This occurs because of the strong depreciation of the dollar which results from the lower interest rates. While this

result is clearly sensitive to the reaction of financial markets and exchange rates to the deficit-reduction package, it suggests that some of the popular analyses of the impact of such a package may be misleading. Many analysts have argued that a deficit-reduction package would have a significant impact upon domestic business investment and upon productivity. However, to the extent that lower deficits mainly increase net exports and housing, the nation is likely to experience relatively little increase in productivity growth. According to the estimates, cutting the budget deficit by \$100 billion will raise the growth rate of potential output from 2.3 percent per year to 2.5 percent per year over a 10-year period. Perhaps the small size of the payoff explains why it is so hard to muster the political will to cut the deficit.



Alternative Mixes in Practice

The fiscal-monetary mix has been sharply debated in American economic policy. Here are two major alternatives:

- *Loose fiscal—tight monetary policy.* Assume that the economy begins in an initial situation with low inflation

and output at its potential. A new president decides that it is necessary to increase defense spending sharply without raising taxes. By itself, this would increase the government deficit and increase aggregate demand. In this situation, the Federal Reserve would need to tighten monetary policy to prevent the economy from overheating. The result would be higher real interest rates and an appreciation of the dollar exchange rate. The higher interest rates would squeeze investment, while the appreciated dollar would reduce net exports. The net effect therefore would be that the higher defense spending would crowd out domestic investment and net exports. This policy was the one followed by the United States in the 1980s and again in the 2000s.

- **Tight fiscal—loose monetary policy.** Suppose that a country becomes concerned about a low national saving rate and desires to raise investment so as to increase the capital stock and boost the growth rate of potential output. To implement this approach, the country could raise consumption taxes and squeeze transfer payments so as to reduce disposable income and thereby lower consumption (tight fiscal policy). This would be accompanied by an expansionary monetary policy to lower interest rates and raise investment, lower the exchange rate, and expand net exports. This course would encourage private investment by increasing public saving. This was the economic philosophy of President Clinton which was embodied in the 1993 Budget Act and led to the budget surplus at decade's end.

RULES VS. DISCRETION

We have seen that fiscal and monetary policy can *in principle* stabilize the economy. Many economists believe that countries should *in practice* take steps to shave the peaks and troughs off the business cycle. Other economists are skeptical of our ability to forecast cycles and take the right steps at the right time for the right reasons; this second group concludes that government cannot be trusted to make good economic policy, so its freedom to act should be strictly limited.

For example, fiscal conservatives worry that it's easier for Congress to increase spending and cut taxes than to do the reverse. That means it's easy to increase the budget deficit during recessions but much harder to turn around and shrink the deficit

again during booms, as a countercyclical fiscal policy would require. For that reason, conservatives have made several attempts to limit the ability of Congress to appropriate new funds or increase the deficit.

At the same time, monetary conservatives would like to tie the hands of central banks and force them to target inflation. Such a policy would eliminate the uncertainty about policy and enhance the credibility of the central bank as an inflation fighter.

At the most general level, the debate about "rules versus discretion" boils down to whether the advantages of flexibility in decision making are outweighed by the uncertainties and potential abuse in unconstrained decisions. Those who believe that the economy is inherently unstable and complex and that governments generally make wise decisions are comfortable with giving policymakers wide discretion to react aggressively to stabilize the economy. Those who believe that the government is the major destabilizing force in the economy and that policymakers are prone to selfishness and misjudgments favor tying the hands of the fiscal and monetary authorities.

Budget Constraints on Legislatures?

As deficits began to grow during the 1980s, many people argued that Congress lacks the self-control to curb excessive spending and a burgeoning government debt. One proposal put forth by conservatives was a *constitutional amendment requiring a balanced budget*. Such an amendment was criticized by economists because it would make it difficult to use fiscal policy to fight recessions. To date, none of the proposed constitutional amendments has passed Congress.

Instead, Congress legislated a series of *budgetary rules to limit spending and tax reductions*. The first attempt was the Gramm-Rudman Act in 1985, which required that the deficit be reduced by a specified dollar amount each year and that the budget be balanced by 1991. This approach failed to limit spending and was abandoned.

A second approach was a *pay-as-you-go budget rule*, which was adopted in 1990. This required that Congress find the revenues to pay for any new spending program. In a sense, pay-as-you-go imposes a budget constraint on Congress, requiring that the costs of new programs be explicitly recognized either through higher taxes or through a reduction in other spending.

What was the impact of the budget constraints on Congress? Economic studies indicate that the

budget rules produced significant fiscal discipline, helped reduce the deficit over the 1990s, and eventually produced the surplus after 1998. However, when the deficit changed to surplus and the urgency of deficit-reduction declined, policymakers evaded the earlier budget caps with gimmicks like “emergency spending” for predictable items like the decennial census. Finally, in 2002, the budget caps were allowed to expire. Many economists believe that a pay-as-you-go rule is a useful mechanism to impose budget constraints on legislatures, and there were proposals to reinstate these in 2009.

Monetary Rules for the Fed?

In our discussion of monetarism in Chapter 24, we laid out the case for fixed policy rules. The traditional argument for fixed rules is that the private economy is relatively stable and active policy-making is likely to destabilize rather than stabilize the economy. Moreover, to the extent that a central bank under the thumb of the government may be tempted to expand the economy before elections and to create a political business cycle, fixed rules will tie its hands. In addition, modern macroeconomists point to the value of being able to commit to action in advance. If the central bank can commit to follow a noninflationary rule, people’s expectations will adapt to this rule and inflationary expectations may be damped.

One of the most important new developments in the last decade has been the trend toward inflation targeting in many countries. **Inflation targeting** is the announcement of official target ranges for the inflation rate along with an explicit statement that low and stable inflation is the overriding goal of monetary policy. Inflation targeting in hard or soft varieties has been adopted in recent years by many industrialized countries, including Canada, Britain, Australia, and New Zealand. Moreover, the treaty authorizing the new European Central Bank mandates that price stability be the ECB’s primary objective, although it is not formally required to target inflation. A number of economists and legislators are advocating this approach for the United States as well.

Inflation targeting involves the following:

- The government or central bank announces that monetary policy will strive to keep inflation near a numerically specified target.

- The target usually involves a range, such as 1 to 3 percent per year, rather than literal price stability. Generally, the government targets a core inflation rate, such as the CPI excluding volatile food and energy prices.
- Inflation is the primary or overriding target of policy in the medium run and long run. However, countries always make room for short-run stabilization objectives, particularly with respect to output, unemployment, financial stability, and the foreign exchange rate. These short-run objectives recognize that supply shocks can affect output and unemployment and that it may be desirable to have temporary departures from the inflation target to avoid excessive unemployment or output losses.

Proponents of inflation targeting point to many advantages. If there is no long-run tradeoff between unemployment and inflation, a sensible inflation target is that rate which maximizes the efficiency of the price system. Our analysis of inflation in Chapter 30 suggested that a low and stable rate of inflation would promote efficiency and minimize unnecessary redistribution of income and wealth. In addition, some economists believe that a strong and credible commitment to low and stable inflation will improve the short-run inflation-unemployment tradeoff. Finally, an explicit inflation target would increase the transparency of monetary policy.

Inflation targeting is a compromise between rule-based approaches and purely discretionary policies. The main disadvantage would come if the central bank began to rely too rigidly on the inflation rule and thereby allowed excessive unemployment in periods of severe supply shocks. Skeptics worry that the economy is too complex to be governed by fixed rules. Arguing by analogy, they ask whether one would advocate a fixed speed limit for cars or an automatic pilot for aircraft in all kinds of weather and emergencies.

Critics point to the financial crisis of 2007–2009 as an example of the peril of relying on rigid targets. The Fed lowered interest rates and expanded credit throughout this period, even though supply shocks were raising inflation above the Fed’s “comfort zone.” If the Fed had focused entirely on inflation under an inflation-targeting approach, it would have raised interest rates, tightened credit, and reinforced the recessionary tendencies and economic distress in

this period. Instead, the Fed concentrated on trying to cushion the economy from a deep recession and to prevent wholesale bankruptcies of financial institutions (see the discussion of Bear, Stearns above).

Monetary policy cannot banish all recessions or remove every temporary spike of inflation. However, working with fiscal policy, it can reduce the chance of spiraling contractions or hyperinflation.

The debate over rules versus discretion is one of the oldest debates of political economy. This dilemma reflects the difficult tradeoffs that democratic societies face in making decisions between short-run policies intended to attract political support and long-run policies designed to improve the general welfare. There is no single best approach for all times and places. For monetary policy, the United States has resolved the dilemma by creating an independent central bank, accountable to the legislature but given discretion to act forcefully when economic or financial crises arise.

Country	Per capita GDP, 2006
United States	44,070
Hong Kong	39,200
United Kingdom	33,650
Japan	32,840
Germany	32,680
Slovenia	23,970
South Korea	22,990
Poland	14,250
Mexico	11,990
Botswana	11,730
Argentina	11,670
China	4,660
Nigeria	1,410
Congo	270

TABLE 31-4. Current Incomes Represent Effects of Past Growth

Those countries that have grown most rapidly in the past have reached the highest levels of per capita GDP today.

Source: World Bank.

D. ECONOMIC GROWTH AND HUMAN WELFARE

We have come to the end of our survey of modern macroeconomics. Let us step back and reflect on the central long-run message as stated by economist-journalist Paul Krugman:

Productivity isn't everything, but in the long run it is almost everything. A country's ability to improve its living standards over time depends almost entirely on its ability to raise its output per worker.

Promoting a high and growing standard of living for the nation's residents is one of the fundamental goals of macroeconomic policy. Because the current *level* of real income reflects the history of the *growth* of productivity, we can measure the relative success of past growth by examining the per capita GDPs of different countries. A short list is presented in Table 31-4. This table compares incomes by using *purchasing-power-parity* exchange rates that measure the purchasing power of (or quantity of goods and services that can be bought by) different national currencies. Evidently, the United States has been successful in its past growth performance. Perhaps

the most worrisome issue in recent years is that the growth in living standards has not been universally shared around the world.

In discussions of growth rates, the numbers often seem tiny. A successful policy might increase a country's growth rate by only 1 percentage point per year (recall the estimated impact of the deficit-reduction package in the last section). But over long periods, this makes a big difference. Table 31-5 shows how tiny acorns grow into mighty oaks as small growth-rate differences cumulate and compound over time. A 4 percent-per-year growth difference leads to a 50-fold difference in income levels over a century.

How can public policy boost economic growth? As we emphasized in our chapters on economic growth, the growth of output per worker and of living standards depends upon a country's saving rate and upon its technological advance. Issues involving saving were discussed earlier in this chapter. Technological change includes not only new products and processes but also improvements in management as well as entrepreneurship and the spirit of enterprise—and we close our discussion with this topic.

Growth rate (% per year)	Real Income per Capita (constant prices)		
	2000	2050	2100
0	\$ 24,000	\$ 24,000	\$ 24,000
1	24,000	39,471	64,916
2	24,000	64,598	173,872
4	24,000	170,560	1,212,118

TABLE 31-5. Small Differences in Growth Rates Compound into Large Income Differentials over the Decades

THE SPIRIT OF ENTERPRISE

Although investment is a central factor in economic growth, technological advance is perhaps even more important. If we took the workers in 1900 and doubled or tripled their capital in mules, saddles, picks, and cow paths, their productivity still could not come close to that of today's workers using huge tractors, superhighways, and supercomputers.

Fostering Technological Advance

While it is easy to see how technological advance promotes growth in productivity and living standards, governments cannot simply command people to think harder or be smarter. Centrally planned socialist countries used “sticks” to promote science, technology, and innovation, but their efforts failed because neither the institutions nor the “carrots” were present to encourage both innovation and introduction of new technologies. Governments often promote rapid technological change best when they set a sound economic and legal framework with strong intellectual property rights and then allow great economic freedom within that framework. *Free markets in labor, capital, products, and ideas have proved to be the most fertile soil for innovation and technological change.*

Within the framework of free markets, governments can foster rapid technological change both by encouraging new ideas and by ensuring that technologies are effectively used. Policies can focus on both the supply side and the demand side.

Promoting Demand for Better Technologies. The world is full of superior technologies that have not been adopted; otherwise, how could we explain the

vast differences in productivity shown in Table 31-4? In considering technology policies, therefore, governments must ensure that firms and industries move toward the *technological frontier*, adopting the best-practice technology available in the global marketplace.

The major lesson here is that “necessity is the mother of invention.” In other words, vigorous competition among firms and industries is the ultimate discipline that ensures innovation. Just as athletes perform better when they are trying to outrun their competitors, so are firms spurred to improve their products and processes when the victors are given fame and fortune while the laggards may go bankrupt.

Vigorous competition involves both domestic and foreign competitors. For large countries on the technological frontier, domestic competition is necessary to promote innovation. The movement to deregulation over the last three decades has brought competition to airlines, energy, telecommunications, and finance, and the positive impact on innovation has been dramatic. For small or technologically backward countries, import competition is crucial to adopting advanced technologies and ensuring product market competition.

Promoting Supply of New Technologies. Rapid economic growth requires pushing out the technological frontier by increasing the supply of inventions as well as ensuring that there is adequate demand for existing advanced technologies. There are three ways by which governments can encourage the supply of new technologies.

First, governments can ensure that the basic science, engineering, and technology are appropriately supported. In this respect, the world leader in the

last half-century has been the United States, which combines company support for applied research with top-notch university basic research generously supported by government funding. Particularly outstanding have been the impressive improvements in biomedical technology in the form of new drugs and equipment that benefit consumers directly in daily life. The government's role in supporting for-profit research is accomplished by a strong patent system, predictable and cost-effective regulations, and fiscal incentives such as the current R&D tax credit.

Second, governments can advance technologies at home through encouraging investment by foreign firms. As foreign countries reach and pass the American technological frontier, they can also contribute to American know-how by establishing operations in the United States. The last two decades have brought a number of Japanese automakers to the United States, and Japanese-owned plants have introduced new technologies and managerial practices to the benefit of both the profits of Japanese shareholders and the productivity of American workers.

Third, governments can promote new technologies by pursuing sound macroeconomic policies. These include low and stable taxes on capital income and a low cost of capital to firms. Indeed, the importance of the cost of capital brings us back full circle to the issue of the low saving rate and high real interest rate. American firms are sometimes accused of being myopic and being unwilling to invest for the long run. At least part of this myopia comes from being faced with high real interest rates—high real interest rates *force* rational American firms to look for quick payoffs in their investments. A change in economic policy that lowered real interest rates would change

the “economic spectacles” through which firms look when considering their technological policies. If real interest rates were lower, firms would view long-term, high-risk projects such as investments in technology more favorably, and the increased investment in knowledge would lead to more rapid improvements in technology and productivity.



Valediction on Economic Growth

Following the Keynesian revolution, the leaders of the market democracies believed that they could flourish and grow rapidly.

By using the tools of modern economics, countries could moderate the extremes of unemployment and inflation, poverty and wealth, privilege and deprivation. Indeed, many of these goals were achieved as the market economies experienced a period of output expansion and employment growth never seen before.

At the same time, Marxists carped that capitalism was doomed to crash in a cataclysmic depression; ecologists fretted that market economies would choke on their own fumes; and libertarians worried that government planning was leading us down the road to serfdom. But the pessimists overlooked the spirit of enterprise, which was nurtured by an open society and free markets and which led to a continuous stream of technological improvements.

A valediction from John Maynard Keynes, as timely today as it was in an earlier age, provides a fitting summary of our survey of modern economics:

It is Enterprise which builds and improves the world's possessions. If Enterprise is afoot, wealth accumulates whatever happens to Thrift; and if Enterprise is asleep, wealth decays whatever Thrift may be doing.



SUMMARY

A. The Economic Consequences of the Government Debt

1. Budgets are systems used by governments and organizations to plan and control expenditures and revenues. Budgets are in surplus (or deficit) when the government has revenues greater (or less) than its

expenditures. Macroeconomic policy depends upon fiscal policy, which comprises the overall stance of spending and taxes.

2. Economists separate the actual budget into its structural and cyclical components. The structural budget calculates how much the government would collect

and spend if the economy were operating at potential output. The cyclical budget accounts for the impact of the business cycle on tax revenues, expenditures, and the deficit. To assess fiscal policy, we should pay close attention to the structural deficit; changes in the cyclical deficit are a *result* of changes in the economy, while structural deficits are a *cause* of changes in the economy.

3. The government debt represents the accumulated borrowings from the public. It is the sum of past deficits. A useful measure of the size of the debt is the debt-GDP ratio, which for the United States has tended to rise during wartime and fall during peacetime.
4. In understanding the impact of government deficits and debt, it is crucial to distinguish between the short run and the long run. Review the box on page 638 and make sure you understand why a larger deficit can increase output in the short run while decreasing output in the long run.
5. To the degree that we borrow from abroad for consumption and pledge posterity to pay back the interest and principal on such external debt, our descendants will indeed find themselves sacrificing consumption to service this debt. If we leave future generations an internal debt but no change in capital stock, there are various internal effects. The process of taxing Peter to pay Paula, or taxing Paula to pay Paula, can involve various microeconomic distortions of productivity and efficiency but should not be confused with owing money to another country.
6. Economic growth may slow if the public debt displaces capital. This syndrome occurs when people substitute public debt for capital or private assets, thereby reducing the economy's private capital stock. In the long run, a larger government debt may slow the growth of potential output and consumption because of the costs of servicing an external debt, the inefficiencies that arise from taxing to pay the interest on the debt, and the diminished capital accumulation that comes from capital displacement.

B. Advances in Modern Macroeconomics

7. Classical economists relied upon Say's Law of Markets, which holds that "supply creates its own demand." In modern language, the classical approach means that flexible wages and prices quickly remove any excess supply or demand and thereby reestablish full employment. In a classical system, macroeconomic policy has no role to play in stabilizing the real economy, although it will still affect the path of prices.
8. New classical macroeconomics holds that expectations are rational, prices and wages are flexible,

and unemployment is largely voluntary. The policy ineffectiveness theorem holds that predictable government policies cannot affect real output and unemployment. The theory of the real business cycle points to supply-side technological disturbances and to labor market shifts as the clues to business-cycle fluctuations.

9. What is our appraisal of the contribution of the new classical approach to short-run macroeconomics? The new classical approach properly insists that the economy is populated by forward-looking consumers and investors. These economic actors react to and often anticipate policy and can thereby change economic behavior. This lesson is particularly important in financial markets, where reactions and anticipations often have dramatic effects.

C. Stabilizing the Economy

10. Nations face two considerations in setting monetary and fiscal policies: the appropriate level of aggregate demand and the best monetary-fiscal mix. The mix of fiscal and monetary policies helps determine the composition of GDP. A high-investment strategy would call for a budget surplus along with low real interest rates.
11. Should governments follow fixed rules or discretion? The answer involves both positive economics and normative values. Conservatives often espouse rules, while liberals often advocate active fine-tuning to attain economic goals. More basic is the question of whether active and discretionary policies stabilize or destabilize the economy. Economists often stress the need for *credible* policies, whether credibility is generated by rigid rules or by wise leadership. A recent trend among countries is inflation targeting for monetary policy, which is a flexible rule-based system that sets a medium-term inflation target while allowing short-run flexibility when economic shocks make attaining a rigid inflation target too costly.

D. Economic Growth and Human Welfare

12. Remember the dictum: "Productivity isn't everything, but in the long run it is almost everything." A country's ability to improve its living standards over time depends almost entirely on its ability to improve the technologies and capital used by the workforce.
13. Promoting economic growth entails advancing technology. The major role of government is to ensure free markets, protect strong intellectual property rights, promote vigorous competition, and support basic science and technology.

CONCEPTS FOR REVIEW

The Economics of Debt and Deficits

government budget
budget deficit, surplus, and balance budget:
actual
structural
cyclical
short-run impact of G and T on output
long-run impacts on economic growth:
internal vs. external debt
distortions from taxation
displacement of capital

Advances in Modern Macroeconomics

Say's Law of Markets
rational (forward-looking)
expectations, adaptive (backward-looking) expectations
policy-ineffectiveness theorem
real business cycle, efficiency wages
Ricardian view of fiscal policy

Stabilization

demand management
fiscal-monetary mix

fixed rules vs. discretion
inflation targeting

Long-Run Growth

reaching the technological frontier vs.
moving it outward
Keynes's spirit of enterprise

FURTHER READING AND INTERNET WEBSITES

Further Reading

The Krugman quotation is from Paul Krugman, *The Age of Diminished Expectations* (MIT Press, Cambridge, Mass., 1990), p. 9. Many of the foundations of new classical economics were developed by Robert Lucas and republished in *Studies in Business-Cycle Theory* (MIT Press, Cambridge, Mass., 1990). Modern efficiency-wage theory is presented in Edmund Phelps, *Structural Slumps: The Modern Equilibrium Theory of Unemployment, Interest, and Assets* (Harvard University Press, Cambridge, Mass., 1994).

A nontechnical review of the different schools of macroeconomics is provided by Paul Krugman, *Peddling Prosperity: Economic Sense and Nonsense in the Age of Diminished Expectations* (Norton, New York, 1994).

Websites

Economic issues and data on fiscal policy, budgets, and the debt are regularly provided by the nonpartisan Congressional Budget Office, which is staffed by professional economists. Recent documents are available at www.cbo.gov.

A survey of issues involved in inflation targeting can be found in a 2003 speech by Fed chair Ben Bernanke, "A Perspective on Inflation Targeting," at www.federalreserve.gov/Boarddocs/Speeches/2003/20030325/default.htm. Real-business-cycle theory has its own website at dge.repec.org/index.html.

QUESTIONS FOR DISCUSSION

1. A common confusion is that between the debt and the deficit. Explain each of the following:
 - a. A budget deficit leads to a growing government debt.
 - b. Reducing the deficit does not reduce the government debt.
 - c. Reducing the government debt requires running a budget surplus.
 - d. Even though the government deficit was reduced in the 1993–1998 period, the government debt still rose in these years.
2. Is it possible that government *promises* might have a displacement effect along with government debt? Thus, if the government were to promise large future social security benefits to workers, would workers feel richer? Might they reduce saving as a result? Could

- the capital stock end up smaller? Illustrate using Figure 31-2.
3. Trace the impact upon the government debt, the nation's capital stock, and real output of a government program that borrows abroad and spends the money on the following:
- Capital to drill for oil, which is exported (as did Mexico in the 1970s)
 - Grain to feed its population (as did Nigeria in the 2000s)
4. Construct a graph like that in Figure 31-3 showing:
- The paths of consumption and net exports with and without a large government debt
 - The paths of consumption with a balanced budget and with a government fiscal surplus
5. Review the debate between the senators on page 638. Explain which senator would be correct in the following situations:
- The government increased military spending during the Great Depression.
 - The government reduced tax rates during a period of full employment in the early 1960s.
 - The government refused to raise taxes during the full-employment period of the Vietnam War.
6. Suppose someone advocates that monetary policy should target a specific inflation rate every year—say, 2 percent per year for the CPI. What are the various arguments for and against this proposal? Specifically, consider the difficulties of attaining a strict inflation target after a sharp supply shock shifts the Phillips curve up. Compare a rigid inflation target with a flexible inflation target in which the target would be attained at the end of a 5-year period.
7. Political candidates have proposed the policies listed below to speed economic growth in recent years. For each, explain qualitatively the impact upon the growth of potential output and upon the growth of per capita potential output. If possible, give a quantitative estimate of the increase in the growth of potential output and per capita potential output over the next decade.
- Cut the federal budget deficit (or raise the surplus) by 2 percent of GDP, increasing the ratio of investment to GDP by the same amount.
 - Increase the federal subsidy to R&D by $\frac{1}{2}$ percent of GDP, assuming that this subsidy will increase private R&D by the same amount and that R&D has a social rate of return that is 4 times that of private investment.
 - Decrease defense spending by 1 percent of GDP at full employment.
8. J. M. Keynes wrote, "If the Treasury were to fill old bottles with banknotes, bury them in disused coal mines, and leave it to private enterprise to dig the notes up again, there need be no more unemployment and the real income of the community would probably become a good deal greater than it actually is" (*The General Theory*, p. 129). Explain why Keynes's analysis of the utility of a discretionary public-works program might be correct during a depression. How could well-designed monetary policies have the same impact on employment while producing a larger quantity of useful goods and services?
9. What would Keynesians and new classical macroeconomists predict to be the impacts of each of the following on the course of prices, output, and employment? In each case, hold tax rates and interest rates constant unless specifically mentioned:
- A large tax cut
 - A large cut in interest rates
 - A wave of innovations that increases potential output by 10 percent
 - A burst of exports
10. **Advanced problem** (on rational expectations): Consider the effect of rational expectations on consumption behavior.
- Say that the government proposes a temporary tax cut of \$20 billion, lasting for a year. Consumers with adaptive expectations consequently assume that their disposable incomes would be \$20 billion higher every year. What would be the resulting impact on consumption spending and GDP in the simple multiplier model of Chapter 22?
 - Next suppose that consumers have rational expectations. They rationally forecast that the tax cut is only for 1 year. Being "life-cycle" consumers, they recognize that their average lifetime incomes will increase by only \$2 billion per year, not by \$20 billion per year. What would be the reaction of such consumers? Analyze, then, the impact of rational expectations on the effectiveness of temporary tax cuts.
 - Finally, assume that consumers behave according to the Ricardian view. What would be the impact of the tax cut on saving and consumption? Explain the differences between the models discussed in **a**, **b**, and **c**.

Glossary of Terms¹

A

Ability-to-pay principle (of taxation). The principle that one's tax burden should depend upon the ability to pay as measured by income or wealth. This principle does not specify *how much* more those who are better off should pay.

Absolute advantage (in international trade). The ability of Country A to produce a commodity more efficiently (i.e., with greater output per unit of input) than Country B. Possession of such an absolute advantage does not necessarily mean that A can export this commodity to B successfully. Country B may still have the comparative advantage.

Actual, cyclical, and structural budget. The *actual budget* deficit or surplus is the amount recorded in a given year. This is composed of the *structural budget*, which calculates what government revenues, expenditures, and deficits would be if the economy were operating at potential output, and the *cyclical budget*, which measures the effect of the business cycle on the budget.

Adaptive expectations. See **expectations**.

Adverse selection. A type of market failure in which those people with the highest risk are the most likely to buy insurance. More broadly,

adverse selection encompasses situations in which sellers and buyers have different information about a product, such as in the market for used cars.

Aggregate demand. Total planned or desired spending in the economy during a given period. It is determined by the aggregate price level and influenced by domestic investment, net exports, government spending, the consumption function, and the money supply.

Aggregate demand (AD) curve. The curve showing the relationship between the quantity of goods and services that people are willing to buy and the aggregate price level, other things equal. As with any demand curve, important variables lie behind the aggregate demand curve, e.g., government spending, exports, and the money supply.

Aggregate supply. The total value of goods and services that firms would willingly produce in a given time period. Aggregate supply is a function of available inputs, technology, and the price level.

Aggregate supply (AS) curve. The curve showing the relationship between the output firms would willingly supply and the aggregate price level, other things equal. The AS curve tends to be vertical at potential output in the very long run but may be upward-sloping in the short run.

Allocative efficiency. See **Pareto efficiency**.

Appreciation (of a currency). See **depreciation** (of a currency).

Appropriable. Term applied to resources for which the owner can capture the full economic value. In a well-functioning competitive market, appropriable resources are priced and allocated efficiently. Also refer to **inappropriate**.

Arbitrage. The purchase of a good or asset in one market for immediate resale in another market in order to profit from a price discrepancy. Arbitrage is an important force in eliminating price discrepancies, thereby making markets function more efficiently.

Asset. A physical property or intangible right that has economic value. Important examples are plant, equipment, land, patents, copyrights, and financial instruments such as money or bonds.

Asymmetric information. A situation where one party to a transaction has better information than the other party. This often leads to a market failure or even to no market at all.

Automatic (or built-in) stabilizers. The property of a government tax and spending system that cushions income changes in the private sector. Examples include unemployment compensation and progressive income taxes.

¹ Words in bold type within definitions appear as separate entries in the glossary. For a more detailed discussion of particular terms, the text will provide a useful starting point. More complete discussions are contained in Douglas Greenwald, ed., *The McGraw-Hill Encyclopedia of Economics* (McGraw-Hill, New York, 1994), and David W. Pearce, *The MIT Dictionary of Modern Economics*, 4th ed. (Macmillan, London, 1992). For a comprehensive encyclopedia, see Steven N. Durlauf and Lawrence E. Blume, *The New Palgrave Dictionary of Economics*, 8 vols. (Macmillan, London, 2008). A reasonably accurate online dictionary by *The Economist* is at www.economist.com/research/economics/.

Average cost. Refer to **cost, average**.
Average cost curve, long-run (LRAC, or LAC).

The graph of the minimum average cost of producing a commodity for each level of output, assuming that technology and input prices are given but that the producer is free to choose the optimal size of plants.

Average cost curve, short-run (SRAC, or SAC). The graph of the minimum average cost of producing a commodity for each level of output, using the given state of technology, input prices, and existing plant.

Average fixed cost. Refer to **cost, average fixed**.

Average product. Total product or output divided by the quantity of one of the inputs. Hence, the average product of labor is defined as total product divided by the amount of labor input, and similarly for other inputs.

Average revenue. Total revenue divided by total number of units sold—i.e., revenue per unit. Average revenue is generally equal to price.

Average tax rate. Total taxes divided by total income; also known as *effective tax rate*.

Average variable cost. Refer to **cost, average variable**.

B

Balance of international payments. A statement showing all of a nation's transactions with the rest of the world for a given period. It includes purchases and sales of goods and services, gifts, government transactions, and capital movements.

Balance of trade. The part of a nation's balance of payments that deals with imports or exports of *goods*, including such items as oil, capital goods, and automobiles. When services and other current items are included, this measures the *balance on current account*. In balance-of-payments accounting,

the current account is financed by the *financial account*.

Balance on current account. See **balance of trade**.

Balance sheet. A statement of the financial position of an entity (person, firm, government) as of a given date, listing **assets** in one column and **liabilities** plus **net worth** in the other. Each item is listed at its actual or estimated money value. Totals of the two columns must balance because net worth is defined as assets minus liabilities.

Balanced budget. Refer to **budget, balanced**.

Bank, commercial. A financial intermediary whose prime distinguishing feature is that it accepts checkable deposits. All financial institutions that hold savings and checkable deposits are called depository institutions.

Bank money. Money created by banks, particularly the checking accounts (part of M_1) that are generated by a multiple expansion of bank reserves.

Bank reserves. Refer to **reserves, bank**.

Barriers to entry. Factors that impede entry into a market and thereby reduce the amount of competition or the number of producers in an industry. Important examples are legal barriers, regulation, and product differentiation.

Barter. The direct exchange of one good for another without using anything as money or as a medium of exchange.

Benefit principle (of taxation). The principle that people should be taxed in proportion to the benefits they receive from government programs.

Bond. An interest-bearing certificate issued by a government or corporation, promising to repay a sum of money (the principal) plus interest at a specified date in the future.

Break-even point (in macroeconomics). For an individual, family, or

community, that level of income at which 100 percent is spent on consumption (i.e., the point where there is neither saving nor dis-saving). Positive saving begins at higher income levels.

Broad money (M_2). A measure of the **money supply** that includes transactions money (or M_1) as well as savings accounts in banks and similar assets that are very close substitutes for transactions money.

Budget. An account, usually for a year, of planned expenditures and expected receipts. For a government, the receipts are tax revenues. See also **actual, cyclical, and structural budget**.

Budget, balanced. A budget in which total expenditures just equal total receipts (excluding any receipts from borrowing).

Budget constraint. See **budget line**.

Budget deficit. For a government, the excess of total expenditures over total receipts, with borrowing not included among receipts. This difference (the deficit) is ordinarily financed by borrowing.

Budget line. A line indicating the combination of commodities that a consumer can buy with a given income at a given set of prices. Also sometimes called the *budget constraint*.

Budget surplus. Excess of government revenues over government spending; the opposite of *budget deficit*.

Business cycles. Fluctuations in total national output, income, and employment, usually lasting for a period of 2 to 10 years, marked by widespread and simultaneous expansion or contraction in many sectors of the economy.

C

C + I + G + NX schedule. A schedule showing the planned or desired levels of aggregate demand for each level of GDP, or the graph on which this schedule is depicted.

The schedule includes consumption (C), investment (I), government spending on goods and services (G), and net exports (NX).

Capital (capital goods, capital equipment). (1) In economic theory, one of the triad of productive inputs (land, labor, and capital). Capital consists of durable produced items that are in turn used in production. (2) In accounting and finance, “capital” means the total amount of money subscribed by the shareholder-owners of a corporation, in return for which they receive shares of the company’s stock.

Capital consumption allowance. See depreciation (of an asset).

Capital deepening. In economic-growth theory, an increase in the capital-labor ratio. (Contrast with capital widening.)

Capital gains. The rise in value of a capital asset, such as land or common stocks, the gain being the difference between the sales price and the purchase price of the asset.

Capital markets (also **financial markets**). Markets in which financial resources (money, bonds, stocks) are traded. These, along with **financial intermediaries**, are institutions through which saving in the economy is transferred to investors.

Capital-output ratio. In economic-growth theory, the ratio of the total capital stock to annual GDP.

Capital widening. A rate of growth in real capital stock just equal to the growth of the labor force (or of the population), so the ratio between total capital and total labor remains unchanged. (Contrast with capital deepening.)

Capitalism. An economic system in which most property (land and capital) is privately owned. In such an economy, private markets are the primary vehicles used to allocate resources and generate incomes.

Cardinal utility. See ordinal utility.

Cartel. An organization of independent firms producing similar products that work together to raise prices and restrict output. Cartels are illegal under U.S. antitrust laws.

Central bank. A government-established agency (in the United States, the Federal Reserve System) responsible for controlling the nation’s money supply and credit conditions and for supervising the financial system, especially commercial banks and other depository institutions.

Change in demand vs. change in quantity demanded. A change in the quantity buyers want to purchase, prompted by any reason other than a change in price (e.g., increase in income, change in tastes), is a *change in demand*. In graphical terms, it is a shift of the demand curve. If, in contrast, the decision to buy more or less is prompted by a change in the good’s price, then it is a *change in quantity demanded*. In graphical terms, a change in quantity demanded is a movement along an unchanging demand curve.

Change in supply vs. change in quantity supplied. This distinction for supply is the same as that for demand, so see **change in demand vs. change in quantity demanded**.

Checking accounts (also **checkable deposits** and **bank money**). A deposit in a commercial bank or other financial intermediary upon which checks can be written and which is therefore transactions money (or M_1). Checkable deposits are about half of M_1 .

Chicago School of Economics. A group of economists (among whom Henry Simons, F. A. von Hayek, and Milton Friedman have been the most prominent) who believe that competitive markets free of government intervention will lead to the most efficient operation of the economy.

Classical approach. See **classical economics**.

Classical economics. The predominant school of economic thought prior to the appearance of Keynes’s work; founded by Adam Smith in 1776. Other major figures who followed Smith include David Ricardo, Thomas Malthus, and John Stuart Mill. By and large, this school believed that economic laws (particularly individual self-interest and competition) determine prices and factor rewards and that the price system is the best possible device for resource allocation.

Classical macroeconomics. See **classical theories**.

Classical theories (in **macroeconomics**). Theories emphasizing the self-correcting forces in the economy. In the classical approach, there is generally full employment, and policies to stimulate aggregate demand have no impact upon output.

Clearing market. A market in which prices are sufficiently flexible to equilibrate supply and demand very quickly. In markets that clear, there is no rationing, unemployed resources, or excess demand or supply. In practice, this is thought to apply to many commodity and financial markets but not to labor or many product markets.

Closed economy. See **open economy**.

Collective bargaining. The process of negotiations between a group of workers (usually a union) and their employer. Such bargaining leads to an agreement about wages, fringe benefits, and working conditions.

Collusion. An agreement between different firms to cooperate by raising prices, dividing markets, or otherwise restraining competition.

Collusive oligopoly. A market structure in which a small number of firms (i.e., a few oligopolists) collude and jointly make their

decisions. When they succeed in maximizing their joint profits, the price and quantity in the market closely approach those prevailing under monopoly.

Command economy. A mode of economic organization in which the key economic functions—*what, how, and for whom*—are principally determined by government directive. Sometimes called a *centrally planned economy*.

Commodity money. Money with **intrinsic value**; also, the use of some commodity (cattle, beads, etc.) as money.

Common currency. A situation where several countries form a monetary union with a single currency and a unified central bank; e.g., the European Monetary Union (EMU), which introduced the Euro in 1999.

Common stock. The financial instrument representing ownership and, generally, voting rights in a corporation. A certain share of a company's stock gives the owner title to that fraction of the votes, net earnings, and assets of the corporation.

Communism. A communist economic system (also called *Soviet-style central planning*) is one in which the state owns and controls the means of production, particularly industrial capital. Such economies are also characterized by extensive central planning, with the state setting many prices, output levels, and other important economic variables.

Comparative advantage (in international trade). The law of comparative advantage says that a nation should specialize in producing and exporting those commodities which it can produce at *relatively lower cost* and that it should import those goods for which it is a *relatively high-cost producer*. Thus it is a comparative advantage, not an absolute advantage, that should dictate trade patterns.

Compensating differentials. Differences in wage rates among jobs that serve to offset or compensate for the nonmonetary differences of the jobs. For example, unpleasant jobs that require isolation for many months in Alaska pay wages much higher than those for similar jobs nearer to civilization.

Competition, imperfect. Term applied to markets in which perfect competition does not hold because at least one seller (or buyer) is large enough to affect the market price and therefore faces a downward-sloping demand (or supply) curve. Imperfect competition refers to any kind of market imperfection—pure **monopoly, oligopoly, or monopolistic competition**.

Competition, perfect. Term applied to markets in which no firm or consumer is large enough to affect the market price. This situation arises where (1) the number of sellers and buyers is very large and (2) the products offered by sellers are homogeneous (or indistinguishable). Under such conditions, each firm faces a horizontal (or perfectly elastic) demand curve.

Competitive equilibrium. The balancing of supply and demand in a market or economy characterized by **perfect competition**. Because perfectly competitive sellers and buyers individually have no power to influence the market, price will move to the point at which it equals both marginal cost and marginal utility.

Competitive market. See **competition, perfect**.

Complements. Two goods which “go together” in the eyes of consumers (e.g., left shoes and right shoes). Goods are *substitutes* when they compete with each other (as do gloves and mittens).

Compound interest. Interest computed on the accrued total of interest and principal. For example,

suppose \$100 (the principal) is deposited in an account earning 10 percent interest compounded annually. At the end of year 1, interest of \$10 is earned. At the end of year 2, the interest payment is \$11, \$10 on the original principal and \$1 on the interest—and so on in future years.

Concentration ratio. The percentage of an industry's total output accounted for by the largest firms. A typical measure is the *four-firm concentration ratio*, which is the fraction of output accounted for by the four largest firms.

Constant returns to scale. See **returns to scale**.

Consumer price index (CPI). A price index that measures the cost of a fixed basket of consumer goods in which the weight assigned to each commodity is the share of expenditures on that commodity in a base year.

Consumer surplus. The difference between the amount that a consumer would be willing to pay for a commodity and the amount actually paid. This difference arises because the marginal utilities (in dollar terms) of all but the last unit exceed the price. Under certain conditions, the money value of consumer surplus can be measured (using a demand curve diagram) as the area under the demand curve but above the price line.

Consumption. In macroeconomics, the total spending, by individuals or a nation, on consumer goods during a given period. Strictly speaking, consumption should apply only to those goods totally used, enjoyed, or “eaten up” within that period. In practice, consumption expenditures include all consumer goods bought, many of which last well beyond the period in question—e.g., furniture, clothing, and automobiles.

Consumption function. A schedule relating total consumption to

personal disposable income (DI). Total wealth and other variables are also frequently assumed to influence consumption.

Consumption-possibility line. See budget line.

Cooperative equilibrium. In game theory, an outcome in which the parties act in unison to find strategies that will optimize their joint payoffs.

Core rate of inflation. Inflation after removing the influence of volatile elements like food and energy prices. This concept is often used by central banks in inflation targeting.

Corporate income tax. A tax levied on the annual net income of a corporation.

Corporation. The dominant form of business organization in modern capitalist economies. A corporation is a firm owned by individuals or other corporations. It has the same rights to buy, sell, and make contracts as a person would have. It is legally separate from those who own it and has **limited liability**.

Correlation. The degree to which two variables are systematically associated with each other.

Cost, average. Total cost (refer to **cost, total**) divided by the number of units produced.

Cost, average fixed. Fixed cost (refer to **cost, fixed**) divided by the number of units produced.

Cost, average variable. Variable cost (refer to **cost, variable**) divided by the number of units produced.

Cost, fixed. The cost a firm would incur even if its output for the period in question were zero. Total fixed cost is made up of such individual contractual costs as interest payments, mortgage payments, and directors' fees.

Cost, marginal. The extra cost (or the increase in total cost) required to produce 1 extra unit of output (or the reduction in total cost from producing 1 unit less).

Cost, minimum. The lowest attainable cost per unit (whether average, variable, or marginal). Every point on an average cost curve is a minimum in the sense that it is the best the firm can do with respect to cost for the output which that point represents. Minimum average cost is the lowest point, or points, on that curve.

Cost, total. The minimum attainable total cost, given a particular level of technology and set of input prices. *Short-run total cost* takes existing plant and other fixed costs as given. *Long-run total cost* is the cost that would be incurred if the firm had complete flexibility with respect to all inputs and decisions.

Cost, variable. A cost that varies with the level of output, such as raw-material, labor, and fuel costs. Variable costs equal total cost minus fixed cost.

Cost-push inflation. See **supply-shock inflation**.

Credit. (1) In monetary theory, the use of someone else's funds in exchange for a promise to pay (usually with interest) at a later date. The major examples are short-term loans from a bank, credit extended by suppliers, and commercial paper. (2) In balance-of-payments accounting, an item such as exports that earns a country foreign currency.

Cross elasticity of demand. A measure of the influence of a change in one good's price on the demand for another good. More precisely, the cross elasticity of demand equals the percentage change in demand for good A when the price of good B changes by 1 percent, assuming other variables are held constant.

Currency. Coins and paper money.

Currency appreciation (or depreciation). See **depreciation** (of a currency).

Currency board. A monetary institution operating like a central bank

for a country that issues only currency that is fully backed by assets denominated in a key foreign currency, often the U.S. dollar.

Current account. See **balance of trade**.

Cyclical budget. See **actual, cyclical, and structural budget**.

Cyclical unemployment. See **frictional unemployment**.

D

Deadweight loss. The loss in real income or consumer and producer surplus that arises because of monopoly, tariffs and quotas, taxes, or other distortions. For example, when a monopolist raises its price, the loss in consumer satisfaction is more than the gain in the monopolist's revenue—the difference being the deadweight loss to society due to monopoly.

Debit. (1) An accounting term signifying an increase in assets or decrease in liabilities. (2) In balance-of-payments accounting, a debit is an item such as imports that reduces a country's stock of foreign currencies.

Decreasing returns to scale. See **returns to scale**.

Deficit spending. Government's expenditures on goods and services and transfer payments in excess of its receipts from taxation and other revenue sources. The difference must be financed by borrowing from the public.

Deflating (of economic data). The process of converting "nominal" or current-dollar variables into "real" terms. This is accomplished by dividing current-dollar variables by a **price index**.

Deflation. A fall in the general level of prices.

Demand curve (or demand schedule). A schedule or curve showing the quantity of a good that buyers would purchase at each price, other things equal. Normally a demand curve has price on

the vertical or *Y* axis and quantity demanded on the horizontal or *X* axis. Also see **change in demand vs. change in quantity demanded**.

Demand for money. A summary term used by economists to explain why individuals and businesses hold money balances. The major motivations for holding money are (1) *transactions demand*, signifying that people need money to purchase things, and (2) *asset demand*, relating to the desire to hold a very liquid, risk-free asset.

Demand-pull inflation. Price inflation caused by an excess demand for goods in general, caused, e.g., by a major increase in aggregate demand. Often contrasted with **supply-shock inflation**.

Demography. The study of the behavior of a population.

Depreciation (of an asset). A decline in the value of an asset. In both business and national accounts, depreciation is the dollar estimate of the extent to which capital has been “used up” or worn out over the period in question. Also termed *capital consumption allowance* in national-income accounting.

Depreciation (of a currency). A nation’s currency is said to depreciate when it declines relative to other currencies. For example, if the foreign exchange rate of the dollar falls from 200 to 100 Japanese Yen per U.S. dollar, the dollar’s value has fallen, and the dollar has undergone a depreciation. The opposite of a depreciation is an *appreciation*, which occurs when the foreign exchange rate of a currency rises.

Depression. A prolonged period characterized by high unemployment, low output and investment, depressed business confidence, falling prices, and widespread business failures. A milder form of business downturn is a **recession**, which has many of the features of a depression to a lesser extent.

Derived demand. The demand for a factor of production that results (is “derived”) from the demand for the final good to which it contributes. Thus the demand for tires is derived from the demand for automobile transportation.

Devaluation. A decrease in the official price of a nation’s currency, usually expressed in the currency of another nations (such as the U.S. dollar) or in terms of gold (in a gold standard). The opposite of devaluation is *revaluation*, which occurs when a nation raises its official foreign exchange rate relative to another currency.

Developing country. A country with a per capita income far below that of “developed” nations (the latter usually includes most nations of North America and Western Europe). Same as *less developed country*.

Differentiated products. Products which compete with each other and are close substitutes but are not identical. Differences may be manifest in the product’s function, appearance, location, quality, or other attributes.

Diminishing marginal utility, law of. The law which says that as more and more of any one commodity is consumed, its marginal utility declines.

Diminishing returns, law of. A law stating that the additional output from successive increases of one input will eventually diminish when other inputs are held constant. Technically, the law is equivalent to saying that the marginal product of the varying input declines after a point.

Direct taxes. Taxes levied directly on individuals or firms, including taxes on income, labor earnings, and profits. Direct taxes contrast with *indirect taxes*, which are levied on goods and services and thus only indirectly on people, such as sales taxes and taxes on property, alcohol, imports, and gasoline.

Discount rate. (1) The interest rate charged by a Federal Reserve Bank (the central bank) on a loan that it makes to a commercial bank. (2) The rate used to calculate the present value of some asset.

Discounting (of future income). The process of converting future income into an equivalent present value. This process takes a future dollar amount and reduces it by a discount factor that reflects the appropriate interest rate. For example, if someone promises you \$121 in 2 years, and the appropriate interest rate or discount rate is 10 percent per year, then we can calculate the present value by discounting the \$121 by a discount factor of $(1.10)^2$. The rate at which future incomes are discounted is called the **discount rate**.

Discrimination. Differences in earnings that arise because of personal characteristics that are unrelated to job performance, especially those related to gender, race, ethnicity, sexual orientation, or religion.

Disequilibrium. The state in which an economy is not in **equilibrium**. This may arise when shocks (to income or prices) have shifted demand or supply schedules but the market price (or quantity) has not yet adjusted fully. In macroeconomics, unemployment is often thought to stem from market disequilibria.

Disinflation. The process of reducing a high inflation rate. For example, the deep recession of 1980–1983 led to a sharp disinflation over that period.

Disposable income (DI). Roughly, take-home pay, or that part of the total national income that is available to households for consumption or saving. More precisely, it is equal to GDP less all taxes, business saving, and depreciation plus government and other transfer payments and government interest payments.

Disposable personal income. Same as **disposable income**.

Dissaving. Negative saving; spending more on consumption goods during a period than the disposable income available for that period (the difference being financed by borrowing or drawing on past savings).

Distribution. In economics, the manner in which total output and income is distributed among individuals or factors (e.g., the distribution of income between labor and capital).

Distribution theory. See **theory of income distribution**.

Division of labor. A method of organizing production whereby each worker specializes in part of the productive process. Specialization of labor yields higher total output because labor can become more skilled at a particular task and because specialized machinery can be introduced to perform more carefully defined subtasks.

Dominant equilibrium. See **dominant strategy**.

Dominant strategy. In game theory, a situation where one player has a best strategy no matter what strategy the other player follows. When all players have a dominant strategy, we say that the outcome is a *dominant equilibrium*.

Downward-sloping demand, law of. The rule which says that when the price of some commodity falls, consumers will purchase more of that good, other things held equal.

Duopoly. A market structure in which there are only two sellers. (Compare with **oligopoly**.)

E

Econometrics. The branch of economics that uses the methods of statistics to measure and estimate quantitative economic relationships.

Economic efficiency. See **efficiency**.

Economic good. A good that is scarce relative to the total amount of it that is desired. It must therefore be rationed, usually by charging a positive price.

Economic growth. An increase in the total output of a nation over time. Economic growth is usually measured as the annual rate of increase in a nation's real GDP (or real potential GDP).

Economic regulation. See **regulation**.

Economic rent. Refer to **rent, economic**.

Economic surplus. A term denoting the excess in total satisfaction or utility over the costs of production; equals the sum of consumer surplus (the excess of consumer satisfaction over total value of purchases) and producer surplus (the excess of producer revenues over costs).

Economics. The study of how societies use scarce resources to produce valuable commodities and distribute them among different people.

Economics of information. Analysis of economic situations that involve information as a commodity. Because information is costly to produce but cheap to reproduce, market failures are common in markets for informational goods and services such as invention, publishing, and software.

Economies of scale. Increases in productivity, or decreases in average cost of production, that arise from increasing all the factors of production in the same proportion.

Effective tax rate. Total taxes paid as a percentage of the total income or other tax base; also known as *average tax rate*.

Efficiency. Absence of waste, or the use of economic resources that produces the maximum level of satisfaction possible with the given inputs and technology. A shorthand expression for **Pareto efficiency**.

Efficiency-wage theory. According to this theory, higher wages lead to higher productivity. This occurs because with higher wages workers are healthier, have higher morale, and have lower turnover.

Efficient financial market. A financial market displaying the characteristics of an **efficient market**.

Efficient market (also efficient-market theory). A market or theory in which all new information is quickly absorbed by market participants and becomes immediately incorporated into market prices.

In economics, efficient-market theory holds that all currently available information is already incorporated into the price of common stocks (or other assets).

Elasticity. A term widely used in economics to denote the responsiveness of one variable to changes in another. Thus the elasticity of *X* with respect to *Y* means the percentage change in *X* for every 1 percent change in *Y*. For especially important examples, see **price elasticity of demand** and **price elasticity of supply**.

Employed. According to official U.S. definitions, persons are employed if they perform any paid work or if they hold jobs but are absent because of illness, strike, or vacations.

Equal-cost line. A line in a graph showing the various possible combinations of factor inputs that can be purchased with a given quantity of money.

Equal-product curve (or isoquant). A line in a graph showing the various possible combinations of factor inputs which will yield a given quantity of output.

Equation of exchange. A definitional equation which states that $MV = PQ$, or the money stock times velocity of money equals the price level times output. This equation forms the core of **monetarism**.

Equilibrium. The state in which an economic entity is at rest or in which the forces operating on the entity are in balance so that there is no tendency for change.

Equilibrium (for a business firm). That position or level of output in which the firm is maximizing its profit, subject to any constraints it may face, and therefore has no incentive to change its output or price level. In the standard theory of the firm, this means that the firm has chosen an output at which marginal revenue is just equal to marginal cost.

Equilibrium (for the individual consumer). That position in which the consumer is maximizing utility, i.e., has chosen the bundle of goods which, given income and prices, best satisfies the consumer's wants.

Equilibrium, competitive. Refer to **competitive equilibrium**.

Equilibrium, general. Refer to **general-equilibrium analysis**.

Equilibrium, macroeconomic. A GDP level at which intended aggregate demand equals intended aggregate supply. At the equilibrium, desired consumption (C), government expenditures (G), investment (I), and net exports (X) just equal the quantity that businesses wish to sell at the going price level.

Equilibrium unemployment. Equilibrium unemployment arises when people are voluntarily unemployed rather than unemployed because of a failure of labor markets to clear. An example is the frictional unemployed that occurs when people move voluntarily from job to job or in and out of the labor force.

Equimarginal principle. A principle for deciding the allocation of income among different consumption goods. Under this principle, a consumer's utility is maximized by choosing the consumption

bundle such that the marginal utility per dollar spent is equal for all goods.

Exchange rate. See **foreign exchange rate**.

Exchange-rate system. The set of rules, arrangements, and institutions under which payments are made among nations. Historically, the most important exchange-rate systems have been the gold exchange standard, the Bretton Woods system, and today's flexible-exchange-rate system.

Excise tax vs. sales tax. An excise tax is one levied on the purchase of a specific commodity or group of commodities (e.g., alcohol or tobacco). A *sales tax* is one levied on all commodities with only a few specific exclusions (e.g., all purchases except food).

Exclusion principle. A criterion by which public goods are distinguished from private goods. When a producer sells a commodity to person A and can easily exclude B, C, D, etc., from enjoying the benefits of the commodity, the exclusion principle holds and the good is a private good. If, as in public health or national defense, people cannot easily be excluded from enjoying the benefits of the good's production, then the good has public-good characteristics.

Exogenous vs. induced variables. Exogenous variables are those determined by conditions outside the economy. They are contrasted with *induced variables*, which are determined by the internal workings of the economic system. Changes in the weather are exogenous; changes in consumption are often induced by changes in income.

Expectations. Views or beliefs about uncertain variables (such as future interest rates, prices, or tax rates). Expectations are said to be *rational* if they are not systematically wrong (or "biased") and use all available

information. Expectations are said to be *adaptive* if people form their expectations on the basis of past behavior.

Expected rate of inflation. A process of steady inflation that occurs when inflation is expected to persist and the ongoing rate of inflation is built into contracts and people's expectations.

Expenditure multiplier. See **multiplier**.

Exports. Goods or services that are produced in the home country and sold to another country. These include merchandise trade (like cars), services (like transportation), and interest on loans and investments. *Imports* are simply flows in the opposite direction—into the home country from another country.

External diseconomies. Situations in which production or consumption imposes uncompensated costs on other parties. Steel factories that emit smoke and sulfurous fumes harm local property and public health, yet the injured parties are not paid for the damage. The pollution is an external diseconomy.

External economies. Situations in which production or consumption yields positive benefits to others without those others paying. A firm that hires a security guard scares thieves from the neighborhood, thus providing external security services. Together with external diseconomies, these are often referred to as *externalities*.

External variables. Same as **exogenous variables**.

Externalities. Activities that affect others for better or worse, without those others paying or being compensated for the activity. Externalities exist when private costs or benefits do not equal social costs or benefits. The two major species are **external economies** and **external diseconomies**.

F

Factors of production. Productive inputs, such as labor, land, and capital; the resources needed to produce goods and services. Also called *inputs*.

Fallacy of composition. The fallacy of assuming that what holds for individuals also holds for the group or the entire system.

Federal funds rate. The interest rate that banks pay each other for the overnight use of bank reserves.

Federal Reserve System. The central bank of the United States; consists of the Board of Governors and 12 regional Federal Reserve Banks.

Fiat money. Money, like today's paper currency, without **intrinsic value** but decreed (by fiat) to be legal tender by the government. Fiat money is accepted only as long as people have confidence that it will be accepted.

Final good. A good that is produced for final use and not for resale or further manufacture. (Compare with **intermediate goods**.)

Finance. The process by which economic agents borrow from and lend to other agents in order to save and spend.

Financial account. See **balance of trade**.

Financial assets. Monetary claims or obligations by one party against another party. Examples are bonds, mortgages, bank loans, and equities.

Financial economics. That branch of economics which analyzes how rational investors should invest their funds to attain their objectives in the best possible manner.

Financial intermediaries. Institutions which provide financial services and products. These include depository institutions (such as commercial or savings banks) and nondepository institutions (such as money market mutual funds, brokerage houses, insurance companies, or pension funds).

Financial markets. Markets whose products and services consist of financial instruments like stocks and bonds.

Financial system. The markets, firms, and other institutions which carry out the financial decisions of households, businesses, governments, and the rest of the world. Important parts of the financial system include the money market, markets for fixed-interest assets like bonds or mortgages, stock markets for the ownership of firms, and foreign exchange markets which trade the monies of different countries.

Firm (business firm). The basic, private producing unit in an economy. It hires labor, rents or owns capital and land, and buys other inputs in order to make and sell goods and services.

Fiscal-monetary mix. The combination of fiscal and monetary policies used to influence macroeconomic activity. A tight monetary-loose fiscal policy will tend to encourage consumption and retard investment, while an easy monetary-tight fiscal policy will have the opposite effect.

Fiscal policy. A government's program with respect to (1) the purchase of goods and services and spending on transfer payments and (2) the amount and type of taxes.

Fixed cost. Refer to **cost, fixed**.

Fixed exchange rate. See **foreign exchange rate**.

Flexible exchange rates. A system of foreign exchange rates among countries wherein the exchange rates are predominantly determined by private market forces (i.e., by supply and demand) without governments' setting and maintaining a particular pattern of exchange rates; also sometimes called *floating exchange rates*. When the government refrains from any intervention in exchange markets,

the system is called a pure flexible-exchange-rate system.

Floating exchange rates. See **flexible exchange rates**.

Flow of funds. The account which traces how money and other financial instruments flow through the economy.

Flow vs. stock. A *flow* variable is one that has a time dimension or flows over time (like the flow through a stream). A *stock* variable is one that measures a quantity at a point of time (like the water in a lake). Income represents dollars per year and is thus a flow. Wealth as of December 2005 is a stock.

Foreign exchange. Currency (or other financial instruments) of different countries that allow one country to settle amounts owed to other countries.

Foreign exchange market. The market in which currencies of different countries are traded.

Foreign exchange rate. The rate, or price, at which one country's currency is exchanged for the currency of another country. For example, if you can buy 10 Mexican pesos for 1 U.S. dollar, then the exchange rate for the peso is 10. A country has a *fixed exchange rate* if it pegs its currency at a given exchange rate and stands ready to defend that rate. Exchange rates which are determined by market supply and demand are called **flexible exchange rates**.

Four-firm concentration ratio. See **concentration ratio**.

Fractional-reserve banking. A regulation in modern banking systems whereby financial institutions are legally required to keep a specified fraction of their deposits in the form of deposits with the central bank (or in vault cash).

Free goods. Those goods that are not **economic goods**. Like air or seawater, they exist in such large quantities that they need not be rationed out among those wishing

to use them. Thus, their market price is zero.

Free trade. A policy whereby the government does not intervene in trading between nations by tariffs, quotas, or other means.

Frictional unemployment. Temporary unemployment caused by changes in individual markets. It takes time, for example, for new workers to search among different job possibilities; even experienced workers often spend a minimum period of unemployed time moving from one job to another. Frictional is thus distinct from *cyclical unemployment*, which results from a low level of aggregate demand in the context of sticky wages and prices.

Full employment. A term that is used in many senses. Historically, it was taken to be that level of employment at which no (or minimal) involuntary unemployment exists. Today, economists rely upon the concept of the **nonaccelerating inflation rate of unemployment (NAIRU)** to indicate the highest sustainable level of employment over the long run.

G

Gains from trade. The aggregate increase in welfare accruing from voluntary exchange; equal to the sum of consumer surplus and gains in producer profits.

Galloping inflation. See **inflation**.

Game theory. An analysis of situations involving two or more decision makers with at least partially conflicting interests. It can be applied to the interaction of oligopolistic markets as well as to bargaining situations such as strikes or to conflicts such as games and war.

GDP deflator. The “price” of GDP, i.e., the price index that measures the average price of the components in GDP relative to a base year.

General-equilibrium analysis. Analysis of the equilibrium state for the economy as a whole in which the markets for all goods and services are simultaneously in equilibrium. By contrast, **partial-equilibrium analysis** concerns the equilibrium in a single market.

GNP. See **gross national product**.

Gold standard. A system under which a nation (1) declares its currency unit to be equivalent to some fixed weight of gold, (2) holds gold reserves against its money, and (3) will buy or sell gold freely at the price so proclaimed, with no restrictions on the export or import of gold.

Government debt. The total of government obligations in the form of bonds and shorter-term borrowings. Government debt held by the public excludes bonds held by quasi-governmental agencies such as the central bank.

Government expenditure multiplier. The increase in GDP resulting from an increase of \$1 in government purchases.

Gross domestic product, nominal (or nominal GDP). The value, at current market prices, of the total final output produced inside a country during a given year.

Gross domestic product, real (or real GDP). The quantity of goods and services produced in a nation during a year. Real GDP takes nominal GDP and corrects for price increases.

Gross national product, real (or real GNP). Nominal GNP corrected for inflation; i.e., real GNP equals nominal GNP divided by the GNP deflator. This was the central accounting concept in earlier times but has been replaced by **gross domestic product**.

Growth accounting. A technique for estimating the contribution of different factors to economic growth. Using marginal productivity theory, growth accounting

decomposes the growth of output into the growth in labor, land, capital, education, technical knowledge, and other miscellaneous sources.

H

Hedging. A technique for avoiding a risk by making a counteracting transaction. For example, if a farmer produces wheat that will be harvested in the fall, the risk of price fluctuations can be offset, or hedged, by selling in the spring or summer the quantity of wheat that will be produced.

Herfindahl-Hirschman Index (HHI). A measure of market power often used in analysis of market structure. It is calculated by summing the squares of the percentage market shares of all participants in a market. Perfect competition would have an HHI of near zero, while complete monopoly has an HHI of 10,000.

High-powered money. Same as **monetary base**.

Horizontal equity vs. vertical equity. *Horizontal equity* refers to the fairness or equity in treatment of persons in similar situations; the principle of horizontal equity states that those who are essentially equal should receive equal treatment. *Vertical equity* refers to the equitable treatment of those who are in different circumstances.

Horizontal integration. See **integration, vertical vs. horizontal**.

Horizontal merger. See **merger**.

Human capital. The stock of technical knowledge and skill embodied in a nation’s workforce, resulting from investments in formal education and on-the-job training.

Hyperinflation. See **inflation**.

I

Imperfect competition. Refer to **competition, imperfect**.

Imperfect competitor. Any firm that buys or sells a good in large enough quantities to be able to affect the price of that good.

Implicit-cost elements. Costs that do not show up as explicit money costs but nevertheless should be counted as such (such as the labor cost of the owner of a small store). Sometimes called **opportunity cost**, although “opportunity cost” has a broader meaning.

Imports. See **exports**.

Inappropriability. See **inappropriate**.

Inappropriate. Term applied to resources for which the individual cost of use is free or less than the full social costs. These resources are characterized by the presence of externalities, and thus markets will allocate their use inefficiently from a social point of view.

Incidence (or tax incidence). The ultimate economic effect of a tax on the real incomes of producers or consumers (as opposed to the legal requirement for payment). Thus a sales tax may be paid by a retailer, but it is likely that the incidence falls upon the consumer. The exact incidence of a tax depends on the price elasticities of supply and demand.

Income. The flow of wages, interest payments, dividends, and other receipts accruing to an individual or nation during a period of time (usually a year).

Income effect (of a price change). Change in the quantity demanded of a commodity because the change in its price has the effect of changing a consumer's real income. Thus it supplements the **substitution effect** of a price change.

Income elasticity of demand. The demand for any given good is influenced not only by the good's price but by buyers' incomes. Income elasticity measures this responsiveness. Its precise definition is percentage change in quantity demanded divided by percentage

change in income. (Compare with **price elasticity of demand**.)

Income statement. A company's statement, covering a specified time period (usually a year), showing sales or revenue earned during that period, all costs properly charged against the goods sold, and the profit (net income) remaining after deduction of such costs. Also called a *profit-and-loss statement*.

Income tax, personal. Tax levied on the income received by individuals in the form of either wages and salaries or income from property, such as rents, dividends, or interest. In the United States, personal income tax is **progressive**, meaning that people with higher incomes pay taxes at a higher average rate than people with lower incomes.

Income velocity of money. See **velocity of money**.

Increasing returns to scale. See **returns to scale**.

Independent goods. Goods whose demands are relatively separate from each other. More precisely, goods A and B are independent when a change in the price of good A has no effect on the quantity demanded of good B, other things equal.

Indexing (or indexation). A mechanism by which wages, prices, and contracts are partially or wholly adjusted to compensate for changes in the general price level.

Indifference curve. A curve drawn on a graph whose two axes measure amounts of different goods consumed. Each point on one curve (indicating different combinations of the two goods) yields exactly the same level of satisfaction for a given consumer.

Indifference map. A graph showing a family of indifference curves for a consumer. In general, curves that lie farther northeast from the graph's origin represent higher levels of satisfaction.

Indirect taxes. See **direct taxes**.

Induced variables. See **exogenous vs. induced variables**.

Industry. A group of firms producing similar or identical products.

Infant industry. In foreign-trade theory, an industry that has not had sufficient time to develop the experience or expertise to exploit the economies of scale needed to compete successfully with more mature industries producing the same commodity in other countries. Infant industries are often thought to need tariffs or quotas to protect them while they develop.

Inferior good. A good whose consumption goes down as income rises.

Inflation (or inflation rate). The inflation rate is the percentage of annual increase in a general price level. *Hyperinflation* is inflation at extremely high rates (say, 1000, 1 million, or even 1 billion percent a year). *Galloping inflation* is a rate of 50 or 100 or 200 percent annually. *Moderate inflation* is a price-level rise that does not distort relative prices or incomes severely.

Inflation targeting. The announcement of official target ranges for the inflation rate along with an explicit statement that low and stable inflation is the overriding goal of monetary policy. Inflation targeting in hard or soft varieties has been adopted in recent years by many industrial countries.

Innovation. A term particularly associated with Joseph Schumpeter, who meant by it (1) the bringing to market of a new and significantly different product, (2) the introduction of a new production technique, or (3) the opening up of a new market. (Contrast with **invention**.)

Inputs. Commodities or services used by firms in their production processes; also called *factors of production*.

Insurance. A system by which individuals can reduce their exposure to risk of large losses by spreading the risks among a large number of persons.

Integration, vertical vs. horizontal. The production process is one of stages—e.g., iron ore into steel ingots, steel ingots into rolled steel sheets, rolled steel sheets into an automobile body. *Vertical integration* is the combination in a single firm of two or more different stages of this process (e.g., iron ore with steel ingots). *Horizontal integration* is the combination in a single firm of different units that operate at the same stage of production.

Intellectual property rights. Laws governing patents, copyrights, trade secrets, electronic media, and other commodities comprised primarily of information. These laws generally provide the original creator the right to control and be compensated for reproduction of the work.

Interest. The return paid to those who lend money.

Interest rate. The price paid for borrowing money for a period of time, usually expressed as a percentage of the principal per year. Thus, if the interest rate is 10 percent per year, then \$100 would be paid for a loan of \$1000 for 1 year.

Intermediate goods. Goods that have undergone some manufacturing or processing but have not yet reached the stage of becoming final products. For example, steel and cotton yarn are intermediate goods.

International monetary system (also international financial system). The institutions under which payments are made for transactions that reach across national boundaries. A central policy issue concerns the arrangement for determining how foreign exchange rates are set and how

governments can affect exchange rates.

Intervention. An activity in which a government buys or sells its currency in the foreign exchange market in order to affect its currency's exchange rate.

Intrinsic value (of money). The commodity value of a piece of money (e.g., the market value of the weight of copper in a copper coin).

Invention. The creation of a new product or discovery of a new production technique. (Distinguish from **innovation**.)

Investment. (1) Economic activity that forgoes consumption today with an eye to increasing output in the future. It includes tangible capital such as houses and intangible investments such as education. *Net investment* is the value of total investment after an allowance has been made for depreciation. *Gross investment* is investment without allowance for depreciation. (2) In finance terms, “investment” has an altogether different meaning and denotes the purchase of a security, such as a stock or a bond.

Investment demand (or investment demand curve). The schedule showing the relationship between the level of investment and the cost of capital (or, more specifically, the real interest rate); also, the graph of that relationship.

Invisible hand. A concept introduced by Adam Smith in 1776 to describe the paradox of a laissez-faire market economy. The invisible-hand doctrine holds that, with each participant pursuing his or her own private interest, a market system nevertheless works to the benefit of all as though a benevolent invisible hand were directing the whole process.

Involuntarily unemployed. See **unemployment**.

Isoquant. See **equal-product curve**.

K

Keynesian economics. The body of macroeconomic analysis developed by John Maynard Keynes holding that a market economy does not automatically tend toward a full-employment equilibrium. According to Keynes, the resulting underemployment equilibrium could be cured by fiscal or monetary policies to raise aggregate demand.

Keynesian macroeconomics. A theory of macroeconomic activity used to explain business cycles. It relies on an upward-sloping aggregate supply curve, so that changes in aggregate demand can affect output and employment.

Keynesian school. See **Keynesian economics**.

L

Labor force. In official U.S. statistics, that group of people 16 years of age and older who are either employed or unemployed.

Labor-force participation rate. The ratio of those in the labor force to the entire population 16 years of age or older.

Labor productivity. See **productivity**.

Labor supply. The number of workers (or, more generally, the number of labor-hours) available to an economy. The principal determinants of labor supply are population, real wages, and social traditions.

Labor theory of value. The view, often associated with Karl Marx, that every commodity should be valued solely according to the quantity of labor required for its production.

Laissez-faire (“Leave us alone”). The view that government should interfere as little as possible in economic activity and leave decisions to the marketplace. As expressed by classical economists like Adam Smith, this view held that the role of government should be limited

to maintenance of law and order, national defense, and provision of certain public goods that private business would not undertake (e.g., public health and sanitation).

Land. In classical and neoclassical economics, one of the three basic factors of production (along with labor and capital). More generally, land is taken to include land used for agricultural or industrial purposes as well as natural resources taken from above or below the soil.

Law of diminishing marginal utility. See **diminishing marginal utility, law of.**

Law of diminishing returns. See **diminishing returns, law of.**

Law of downward-sloping demand. The nearly universal observation that when the price of a commodity is raised (and other things are held constant), buyers buy less of the commodity. Similarly, when the price is lowered, other things being constant, quantity demanded increases.

Least-cost rule (of production). The rule that the cost of producing a specific level of output is minimized when the ratio of the marginal revenue product of each input to the price of that input is the same for all inputs.

Legal tender. Money that by law must be accepted as payment for debts. All U.S. coins and currency are legal tender, but checks are not.

Liabilities. In accounting, debts or financial obligations owed to other firms or persons.

Libertarianism. An economic philosophy that emphasizes the importance of personal freedom in economic and political affairs; also sometimes called “liberalism.”

Limited liability. The restriction of an owner’s loss in a business to the amount of capital that the owner has contributed to the company. Limited liability was an important

factor in the rise of large corporations. By contrast, owners in partnerships and individual proprietorships generally have *unlimited liability* for the debts of those firms.

Long run. A term used to denote a period over which full adjustment to changes can take place. In microeconomics, it denotes the time over which firms can enter or leave an industry and the capital stock can be replaced. In macroeconomics, it is often used to mean the period over which all prices, wage contracts, tax rates, and expectations can fully adjust.

Long-run aggregate supply schedule. A schedule showing the relationship between output and the price level after all price and wage adjustments have taken place, and the AS curve is therefore vertical.

Lorenz curve. A graph used to show the extent of inequality of income or wealth.

M

M_1 . See **money supply**.

Macroeconomic equilibrium. Refer to **equilibrium, macroeconomic**.

Macroeconomics. Analysis dealing with the behavior of the economy as a whole with respect to output, income, the price level, foreign trade, unemployment, and other aggregate economic variables. (Contrast with **microeconomics**.)

Malthusian theory of population growth. The hypothesis, first expressed by Thomas Malthus, that the “natural” tendency of population is to grow more rapidly than the food supply. Per capita food production would thus decline over time, thereby putting a check on population. In general, a view that population tends to grow more rapidly as incomes or living standards of the population rise.

Managed exchange rate. The most prevalent exchange-rate system

today. In this system, a country occasionally intervenes to stabilize its currency but there is no fixed or announced parity.

Marginal cost. Refer to **cost, marginal**.

Marginal principle. The fundamental notion that people will maximize their income or profits when the marginal costs and marginal benefits of their actions are equal.

Marginal product (MP). The extra output resulting from 1 extra unit of a specified input when all other inputs are held constant. Sometimes called *marginal physical product*.

Marginal product theory of distribution. A theory of the distribution of income proposed by John B. Clark, according to which each productive input is paid according to its **marginal product**.

Marginal propensity to consume (MPC). The extra amount that people consume when they receive an extra dollar of disposable income. To be distinguished from the *average propensity to consume*, which is the ratio of total consumption to total disposable income.

Marginal propensity to import (MPm). In macroeconomics, the increase in the dollar value of imports resulting from each dollar increase in the value of GDP.

Marginal propensity to save (MPS). That fraction of an additional dollar of disposable income that is saved. Note that, by definition, $MRC + MPS = 1$.

Marginal revenue (MR). The additional revenue a firm would earn if it sold 1 extra unit of output. In perfect competition, MR equals price. Under imperfect competition, MR is less than price because, in order to sell the extra unit, the price must be reduced on all prior units sold.

Marginal revenue product (MRP) (of an input). Marginal revenue multiplied by marginal product. It is the extra revenue that would

be brought in if a firm were to buy 1 extra unit of an input, put it to work, and sell the extra product it produced.

Marginal tax rate. For an income tax, the percentage of the last dollar of income paid in taxes. If a tax system is progressive, the marginal tax rate is higher than the average tax rate.

Marginal utility (MU). The additional or extra satisfaction yielded from consuming 1 additional unit of a commodity, with amounts of all other goods consumed held constant.

Market. An arrangement whereby buyers and sellers interact to determine the prices and quantities of a commodity. Some markets (such as the stock market or a flea market) take place in physical locations; other markets are conducted over the telephone or are organized by computers, and some markets now are organized on the Internet.

Market-clearing price. The price in a supply-and-demand equilibrium. This denotes that all supply and demand orders are filled at that price, so that the books are “cleared” of orders.

Market economy. An economy in which the *what, how, and for whom* questions concerning resource allocation are primarily determined by supply and demand in markets. In this form of economic organization, firms, motivated by the desire to maximize profits, buy inputs and produce and sell outputs. Households, armed with their factor incomes, go to markets and determine the demand for commodities. The interaction of firms’ supply and households’ demand then determines the prices and quantities of goods.

Market equilibrium. Same as **competitive equilibrium**.

Market failure. An imperfection in a price system that prevents an

efficient allocation of resources. Important examples are **externalities** and **imperfect competition**.

Market power. The degree of control that a firm or group of firms has over the price and production decisions in an industry. In a monopoly, the firm has a high degree of market power; firms in perfectly competitive industries have no market power. **Concentration ratios** are the most widely used measures of market power.

Market share. That fraction of an industry’s output accounted for by an individual firm or group of firms.

Marxism. The set of social, political, and economic doctrines developed by Karl Marx in the nineteenth century. As an economic theory, Marxism predicted that capitalism would collapse as a result of its own internal contradictions, especially its tendency to exploit the working classes.

Mean. In statistics, the same thing as “average.” Thus for the numbers 1, 3, 6, 10, 20, the mean is 8.

Median. In statistics, the figure exactly in the middle of a series of numbers ordered or ranked from lowest to highest (e.g., incomes or examination grades). Thus for the numbers 1, 3, 6, 10, 20, the median is 6.

Mercantilism. A political doctrine emphasizing the importance of balance-of-payments surpluses as a device to accumulate gold. Proponents therefore advocated tight government control of economic policies, believing that laissez-faire policies might lead to a loss of gold.

Merchandise trade balance. See **balance of trade**.

Merger. The acquisition of one corporation by another, which usually occurs when one firm buys the stock of another. Important examples are (1) *vertical mergers*, which occur when the two firms are at

different stages of a production process (e.g., iron ore and steel), (2) *horizontal mergers*, which occur when the two firms produce in the same market (e.g., two automobile manufacturers), and (3) *conglomerate mergers*, which occur when the two firms operate in unrelated markets (e.g., shoelaces and oil refining).

Microeconomics. Analysis dealing with the behavior of individual elements in an economy—such as the determination of the price of a single product or the behavior of a single consumer or business firm. (Contrast with **macroeconomics**.)

Minimum cost. Refer to **cost, minimum**.

Mixed economy. The dominant form of economic organization in noncommunist countries. Mixed economies rely primarily on the price system for their economic organization but use a variety of government interventions (such as taxes, spending, and regulation) to handle macroeconomic instability and market failures.

Model. A formal framework for representing the basic features of a complex system by a few central relationships. Models take the form of graphs, mathematical equations, and computer programs.

Momentary run. A period of time that is so short that production is fixed.

Monetarism. A school of thought holding that changes in the money supply are the major cause of macroeconomic fluctuations.

Monetary base. The net monetary liabilities of the government that are held by the public. In the United States, the monetary base is equal to currency and bank reserves. Sometimes called *high-powered money*.

Monetary economy. An economy in which the trade takes place through a commonly accepted medium of exchange.

Monetary policy. The objectives of the central bank in exercising its control over money, interest rates, and credit conditions. The instruments of monetary policy are primarily open-market operations, reserve requirements, and the discount rate.

Monetary rule. The cardinal tenet of monetarist economic philosophy is the monetary rule which asserts that optimal monetary policy sets the growth of the money supply at a fixed rate and holds to that rate through thick and thin.

Monetary transmission mechanism. In macroeconomics, the route by which changes in the supply of money are translated into changes in output, employment, prices, and inflation.

Monetary union. An arrangement by which several nations adopt a common currency as a unit of account and medium of exchange. The European Monetary Union adopted the Euro as the common currency in 1999.

Money. The means of payment or medium of exchange. For the items constituting money, see **money supply**.

Money, velocity of. Refer to **velocity of money**.

Money demand schedule. The relationship between holdings of money and interest rates. As interest rates rise, bonds and other securities become more attractive, lowering the quantity of money demanded. See also **demand for money**.

Money funds. Shorthand expression for very liquid short-term financial instruments whose interest rates are not regulated. The major examples are money market mutual funds and commercial-bank money market deposit accounts.

Money market. A term denoting the set of institutions that handle the purchase or sale of short-term

credit instruments like Treasury bills and commercial paper.

Money supply. The narrowly defined money supply (narrow money, or M_1) consists of coins, paper currency, and all demand or checking deposits; this is transactions money. The broadly defined supply (broad money) includes all items in M_1 plus certain liquid assets or near-monies—savings deposits, money market funds, and the like.

Money-supply effect. The relationship whereby a price rise operating on a fixed nominal money supply produces tight money and lowers aggregate spending.

Money-supply multiplier. The ratio of the increase in the money supply (or in deposits) to the increase in bank reserves. Generally, the money-supply multiplier is equal to the inverse of the required reserve ratio. For example, if the required reserve ratio is 0.125, then the money-supply multiplier is 8.

Monopolistic competition. A market structure in which there are many sellers supplying goods that are close, but not perfect, substitutes. In such a market, each firm can exercise some effect on its product's price.

Monopoly. A market structure in which a commodity is supplied by a single firm. Also see **natural monopoly**.

Monopsony. The mirror image of monopoly: a market in which there is a single buyer; a "buyer's monopoly."

Moral hazard. A type of market failure in which the presence of insurance against an insured risk increases the likelihood that the risky event will occur. For example, a car owner insured 100 percent against auto theft may be careless about locking the car because the presence of insurance reduces the incentive to prevent the theft.

MPC. See **marginal propensity to consume**.

MPS. See **marginal propensity to save**.

Multiplier. A term in macroeconomics denoting the change in an induced variable (such as GDP or money supply) per unit of change in an external variable (such as government spending or bank reserves). The *expenditure multiplier* denotes the increase in GDP that would result from a \$1 increase in expenditure (say, on investment).

Multiplier model. In macroeconomics, a theory developed by J. M. Keynes that emphasizes the importance of changes in autonomous expenditures (especially investment, government spending, and net exports) in determining changes in output and employment. Also see **multiplier**.

N

NAIRU. See **nonaccelerating inflation rate of unemployment**.

Nash equilibrium. In game theory, a set of strategies for the players where no player can improve his or her payoff given the other player's strategy. That is, given player A's strategy, player B can do no better, and given B's strategy, A can do no better. The Nash equilibrium is also sometimes called the *noncooperative equilibrium*.

National debt. Same as **government debt**.

National income and product accounts (NIPA). A set of accounts that measures the spending, income, and output of the entire nation for a quarter or a year.

National saving rate. Total saving, private and public, divided by net domestic product.

Natural monopoly. A firm or industry whose average cost per unit of production falls sharply over the entire range of its output, as, e.g., in local electricity distribution.

Thus a single firm, a monopoly, can supply the industry output more efficiently than can multiple firms.

Natural rate of unemployment. The same concept as the **nonaccelerating inflation rate of unemployment (NAIRU)**.

Neoclassical model of growth. A theory or model used to explain long-term trends in the economic growth of industrial economies. This model emphasizes the importance of capital deepening (i.e., a growing capital-labor ratio) and technological change in explaining the growth of potential real GDP.

Net domestic product (NDP). GDP less an allowance for depreciation of capital goods.

Net exports. In the national product accounts, the value of exports of goods and services minus the value of imports of goods and services.

Net foreign investment. Net saving by a country abroad; approximately equal to net exports.

Net investment. Gross investment minus depreciation of capital goods.

Net worth. In accounting, total assets minus total liabilities.

New classical macroeconomics. A theory which holds that (1) prices and wages are flexible and (2) people make forecasts in accordance with the **rational-expectations hypothesis**.

Nominal GDP. See **gross domestic product, nominal**.

Nominal (or money) interest rate. The **interest rate** paid on different assets. This represents a dollar return per year per dollar invested. Compare with the **real interest rate**, which represents the return per year in goods per unit of goods invested.

Nonaccelerating inflation rate of unemployment (NAIRU). An unemployment rate that is consistent with a constant inflation rate. At the NAIRU, upward and downward

forces on price and wage inflation are in balance, so there is no tendency for inflation to change. The NAIRU is the unemployment rate at which the long-run Phillips curve is vertical.

Noncooperative equilibrium. See **Nash equilibrium**.

Nonrenewable resources. Those natural resources, like oil and gas, that are essentially fixed in supply and whose regeneration is not quick enough to be economically relevant.

Normative vs. positive economics. *Normative economics* considers “what ought to be”—value judgments, or goals, of public policy. *Positive economics*, by contrast, is the analysis of facts and behavior in an economy, or “the way things are.”

Not in the labor force. That part of the adult population that is neither working nor looking for work.

○

Okun's Law. The empirical relationship, discovered by Arthur Okun, between cyclical movements in GDP and unemployment. The law states that when actual GDP declines 2 percent relative to potential GDP, the unemployment rate increases by about 1 percentage point. (Earlier estimates placed the ratio at 3 to 1.)

Oligopoly. A situation of imperfect competition in which an industry is dominated by a small number of suppliers.

Open economy. An economy that engages in international trade (i.e., imports and exports) of goods and capital with other countries. A *closed economy* is one that has no imports or exports.

Open-economy multiplier. Multiplier analysis as applied to economies that have foreign trade. The open-economy multiplier is smaller than the closed-economy multiplier because there is a leakage of

spending into imports as well as into saving.

Open-market operations. The activity of a central bank in buying or selling government bonds to influence bank reserves, the money supply, and interest rates. If securities are bought, the money paid out by the central bank increases commercial-bank reserves, and the money supply increases. If securities are sold, the money supply contracts.

Opportunity cost. The value of the best alternative use of an economic good. Thus, say that the best alternative use of the inputs employed to mine a ton of coal was to grow 10 bushels of wheat. The opportunity cost of a ton of coal is thus the 10 bushels of wheat that could have been produced but were not. Opportunity cost is particularly useful for valuing nonmarketed goods such as environmental health or safety.

Optimal currency area. A grouping of regions or countries which have high labor mobility or have common and synchronous aggregate supply or demand shocks. Under such conditions, significant changes in exchange rates are not necessary to ensure rapid macroeconomic adjustment, and the countries can have fixed exchange rates or a common currency.

Ordinal utility. A dimensionless utility measure used in demand theory. Ordinal utility enables one to state that A is preferred to B, but we cannot say by how much. That is, any two bundles of goods can be ranked relative to each other, but the absolute difference between bundles cannot be measured. This contrasts with *cardinal utility*, or dimensional utility, which is sometimes used in the analysis of behavior toward risk. An example of a cardinal measure comes when we say that a substance at 100 K (kelvin) is twice as hot as one at 50 K.

Other things constant. A phrase (sometimes stated “*ceteris paribus*”) which signifies that a factor under consideration is changed while all other factors are held constant or unchanged. For example, a downward-sloping demand curve shows that the quantity demanded will decline as the price rises, as long as other things (such as incomes) are held constant.

Outputs. The various useful goods or services that are either consumed or used in further production.

P

Paradox of thrift. The principle, first proposed by John Maynard Keynes, that an attempt by a society to increase its saving may result in a reduction in the amount which it actually saves.

Paradox of value. The paradox that many necessities of life (e.g., water) have a low “market” value while many luxuries (e.g., diamonds) with little “use” value have a high market price. It is explained by the fact that a price reflects not the total utility of a commodity but its marginal utility.

Pareto efficiency (or Pareto optimality). A situation in which no reorganization or trade could raise the utility or satisfaction of one individual without lowering the utility or satisfaction of another individual. Under certain limited conditions, perfect competition leads to allocative efficiency. Also called *allocative efficiency*.

Partial-equilibrium analysis. Analysis concentrating on the effect of changes in an individual market, holding other things equal (e.g., disregarding changes in income).

Partnership. An association of two or more persons to conduct a business which is not in corporate form and does not enjoy limited liability.

Patent. An exclusive right granted to an inventor to control the use

of an invention for, in the United States, a period of 20 years. Patents create temporary monopolies as a way of rewarding inventive activity and, like other intellectual property rights, are a tool for promoting invention among individuals or small firms.

Payoff table. In game theory, a table used to describe the strategies and payoffs of a game with two or more players. The profits or utilities of the different players are the *payoffs*.

Payoffs. See *payoff table*.

Perfect competition. Refer to *competition, perfect*.

Personal disposable income. Personal income minus taxes plus transfers. The amount households have for consumption and saving.

Personal income. A measure of income before taxes have been deducted. More precisely, it equals disposable personal income plus net taxes.

Personal saving. That part of income which is not consumed; in other words, the difference between disposable income and consumption.

Personal saving rate. The ratio of personal saving to personal disposable income, in percent.

Phillips curve. A graph, first devised by A. W. Phillips, showing the tradeoff between unemployment and inflation. In modern mainstream macroeconomics, the downward-sloping “tradeoff” Phillips curve is generally held to be valid only in the short run; in the long run, the Phillips curve is usually thought to be vertical at the nonaccelerating inflation rate of unemployment (NAIRU).

Policy-ineffectiveness theorem. A theorem which asserts that, with rational expectations and flexible prices and wages, anticipated government monetary or fiscal policy cannot affect real output or unemployment.

Portfolio theory. An economic theory that describes how rational investors allocate their wealth among different financial assets—that is, how they put their wealth into a “portfolio.”

Positive economics. See *normative vs. positive economics*.

Post hoc fallacy. From the Latin, *post hoc, ergo propter hoc*, which translates as “after this, therefore because of this.” This fallacy arises when it is assumed that because event A precedes event B, it follows that A causes B.

Potential GDP. High-employment GDP; more precisely, the maximum level of GDP that can be sustained with a given state of technology and population size without accelerating inflation. Today, it is generally taken to be equivalent to the level of output corresponding to the *nonaccelerating inflation rate of unemployment (NAIRU)*. Potential output is not necessarily maximum output.

Potential output. Same as *potential GDP*.

Poverty. Today, the U.S. government defines the “poverty line” to be the minimum adequate standard of living.

PPF. See *production-possibility frontier*.

Present value (of an asset). Today’s value for an asset that yields a stream of income over time. Valuation of such time streams of returns requires calculating the present worth of each component of the income, which is done by applying a discount rate (or interest rate) to future incomes.

Price. The money cost of a good, service, or asset. Price is measured in monetary units per unit of the good (as in 3 dollars per 1 hamburger).

Price discrimination. A situation where the same product is sold to different consumers for different prices.

Price-elastic demand (or elastic demand). The situation in which price elasticity of demand exceeds 1 in absolute value. This signifies that the percentage change in quantity demanded is greater than the percentage change in price. In addition, elastic demand implies that total revenue (price times quantity) rises when price falls because the increase in quantity demanded is so large. (Contrast with **price-inelastic demand**.)

Price elasticity of demand. A measure of the extent to which quantity demanded responds to a price change. The elasticity coefficient (price elasticity of demand E_p) is the percentage change in quantity demanded divided by percentage change in price. In figuring percentages, use the averages of old and new quantities in the numerator and of old and new prices in the denominator; disregard the minus sign. Refer also to **price-elastic demand**, **price-inelastic demand**, and **unit-elastic demand**.

Price elasticity of supply. Conceptually similar to **price elasticity of demand**, except that it measures the supply responsiveness to a price change. More precisely, the price elasticity of supply measures the percentage change in quantity supplied divided by the percentage change in price. Supply elasticities are most useful in perfect competition.

Price flexibility. Price behavior in “auction” markets (e.g., for many raw commodities or the stock market), in which prices immediately respond to changes in demand or in supply.

Price index. An index number that shows how the average price of a bundle of goods changes over time. In computation of the average, the prices of the different goods are generally weighted by their economic importance (e.g., by each commodity’s share of total

consumer expenditures in the **consumer price index**).

Price-inelastic demand (or inelastic demand). The situation in which price elasticity of demand is below 1 in absolute value. In this case, when price declines, total revenue declines, and when price is increased, total revenue goes up. Perfectly inelastic demand means that there is no change at all in quantity demanded when price goes up or down. (Contrast with **price-elastic demand** and **unit-elastic demand**.)

Price of GDP. See **GDP deflator**.

Private good. See **public good**.

Producer price index. The price index of goods sold at the wholesale level (such as steel, wheat, oil).

Producer surplus. The difference between the producer sales revenue and the producer cost. The producer surplus is generally measured as the area above the supply curve but under the price line up to the amount sold.

Product, average. Refer to **average product**.

Product, marginal. Refer to **marginal product**.

Product differentiation. The existence of characteristics that make similar goods less-than-perfect substitutes. Thus locational differences make similar types of gasoline sold at separate points imperfect substitutes. Firms enjoying product differentiation face a downward-sloping demand curve instead of the horizontal demand curve of the perfect competitor.

Production function. A relation (or mathematical function) specifying the maximum output that can be produced with given inputs for a given level of technology; applies to a firm or, as an aggregate production function, to the economy as a whole.

Production-possibility frontier (PPF). A graph showing the menu of

goods that can be produced by an economy. In a frequently cited case, the choice is reduced to two goods, guns and butter. Points outside the *PPF* (to the northeast of it) are unattainable. Points inside it are inefficient since resources are not being fully employed, resources are not being used properly, or outdated production techniques are being utilized.

Productive efficiency. A situation in which an economy cannot produce more of one good without producing less of another good; this implies that the economy is on its production-possibility frontier.

Productivity. A term referring to the ratio of output to inputs (total output divided by labor inputs is *labor productivity*). Productivity increases if the same quantity of inputs produces more output. Labor productivity increases because of improved technology, improvements in labor skills, or capital deepening.

Productivity growth. The rate of increase in **productivity** from one period to another. For example, if an index of labor productivity is 100 in 2004 and 101.7 in 2005, the rate of productivity growth is 1.7 percent per year for 2005 over 2004.

Productivity of capital, net. See **rate of return on capital**.

Profit. (1) In accounting terms, total revenue minus costs properly chargeable against the goods sold (see **income statement**). (2) In economic theory, the difference between sales revenue and the full opportunity cost of resources involved in producing the goods.

Profit-and-loss statement. See **income statement**.

Progressive, proportional, and regressive taxes. A progressive tax weighs more heavily upon the rich; a regressive tax does the opposite. More precisely, a tax is *progressive* if the average tax rate (i.e., taxes divided by income) is higher for

those with higher incomes; it is a *regressive* tax if the average tax rate declines with higher incomes; it is a *proportional* tax if the average tax rate is equal at all income levels.

Property rights. Rights that define the ability of individuals or firms to own, buy, sell, and use the capital goods and other property in a market economy.

Proportional tax. See **progressive, proportional, and regressive taxes.**

Proprietorship, individual. A business firm owned and operated by one person.

Protectionism. Any policy adopted by a country to protect domestic industries against competition from imports (most commonly, a tariff or quota imposed on such imports).

Public choice (also public-choice theory). Branch of economics and political science dealing with the way that governments make choices and direct the economy. This theory differs from the theory of markets in emphasizing the influence of vote maximizing for politicians, which contrasts to profit maximizing by firms.

Public debt. See **government debt.**

Public good. A commodity whose benefits are indivisibly spread among the entire community, whether or not particular individuals desire to consume the public good. For example, a public-health measure that eradicates polio protects all, not just those paying for the vaccinations. To be contrasted with *private goods*, such as bread, which, if consumed by one person, cannot be consumed by another person.

Pure economic rent. See **rent, economic.**

Q

Quantity demanded. See **change in demand vs. change in quantity demanded.**

Quantity equation of exchange. A tautology, $MV \equiv PQ$, where M is the money supply, V is the income velocity of money, and PQ (price times quantity) is the money value of total output (nominal GDP). The equation must always hold exactly since V is defined as PQ/M .

Quantity supplied. See **change in supply vs. change in quantity supplied.**

Quantity theory of money and prices. A theory of the determination of output and the overall price level holding that prices move proportionately with the money supply. A more cautious approach put forth by monetarists holds that the money supply is the most important determinant of changes in nominal GDP (see **monetarism**).

Quota. A form of import protectionism in which the total quantity of imports of a particular commodity (e.g., sugar or cars) during a given period is limited.

R

Random-walk theory (of stock market prices). See **efficient market.**

Rate of inflation. See **inflation.**

Rate of return (or return) on capital. The yield on an investment or on a capital good. Thus, an investment costing \$100 and yielding \$12 annually has a rate of return of 12 percent per year.

Rate of return on investment. The net dollar return per year for every dollar of invested capital. For example, if \$100 of investment yields \$12 per year of return, the rate of return on investment is 12 percent per year.

Rational expectations. See **expectations.**

Rational-expectations hypothesis. A hypothesis which holds that people make unbiased forecasts and, further, that people use all available information and economic theory to make these forecasts.

Rational-expectations macroeconomics.

A school holding that markets clear quickly and that expectations are rational. Under these and other conditions it can be shown that predictable macroeconomic policies have no effect on real output or unemployment. Sometimes called **new classical macroeconomics**.

Real-business-cycle (RBC) theory. A theory that explains business cycles purely as shifts in aggregate supply, primarily due to technological disturbances, without any reference to monetary or other demand-side forces.

Real GDP. See **gross domestic product, real.**

Real interest rate. The interest rate measured in terms of goods rather than money. It is thus equal to the money (or nominal) interest rate less the rate of inflation.

Real wages. The purchasing power of a worker's wages in terms of goods and services. It is measured by the ratio of the money wage rate to the consumer price index.

Recession. A period of significant decline in total output, income, and employment, usually lasting from 6 months to a year and marked by widespread contractions in many sectors of the economy. See also **depression**.

Regressive tax. See **progressive, proportional, and regressive taxes.**

Regulation. Government laws or rules designed to control the behavior of firms. The major kinds are *economic regulation* (which affects the prices, entry, or service of a single industry, such as telephone service) and *social regulation* (which attempts to correct externalities that prevail across a number of industries, such as air or water pollution).

Renewable resources. Natural resources (like agricultural land) whose services replenish regularly and which, if properly managed, can yield useful services indefinitely.

Rent, economic (or pure economic rent). Term applied to income earned from land. The total supply of land available is (with minor qualifications) fixed, and the return paid to the landowner is rent. The term is often extended to the return paid to any factor in fixed supply—i.e., to any input having a perfectly inelastic or vertical supply curve.

Required reserve ratio. See **reserves, bank.**

Reserves, bank. That portion of deposits that a bank sets aside in the form of vault cash or non-interest-earning deposits with Federal Reserve Banks. In the United States, banks are required to hold 10 percent of checking deposits (or transactions accounts) in the form of reserves.

Reserves, international. International money held by a nation to stabilize or “peg” its foreign exchange rate or provide financing when the nation faces balance-of-payments difficulties. Today, the bulk of reserves are U.S. dollars, with Euros and Japanese yen the other major reserve currencies.

Resource allocation. The manner in which an economy distributes its resources (its factors of production) among the potential uses so as to produce a particular set of final goods.

Returns to scale. The rate at which output increases when all inputs are increased proportionately. For example, if all the inputs double and output is exactly doubled, that process is said to exhibit *constant returns to scale*. If, however, output grows by less than 100 percent when all inputs are doubled, the process shows *decreasing returns to scale*; if output more than doubles, the process demonstrates *increasing returns to scale*.

Revaluation. An increase in the official foreign exchange rate of a currency. See also **devaluation**.

Ricardian view of fiscal policy. A theory developed by Harvard’s Robert Barro which holds that changes in tax rates have no impact upon consumption spending because households foresee, say, that tax cuts today will require tax increases tomorrow to finance the government’s financing requirements.

Risk. In financial economics, refers to the variability of the returns on an investment.

Risk averse. A person is risk-averse when, faced with an uncertain situation, the displeasure from losing a given amount of income is greater than the pleasure from gaining the same amount of income.

Risk spreading. The process of taking large risks and spreading them around so that they are but small risks for a large number of people. The major form of risk spreading is **insurance**, which is a kind of gambling in reverse.

Rule of 70. A useful shortcut for approximating compound interest. A quantity that grows at r percent per year will double in about $70/r$ years.

S

Sacrifice ratio. The sacrifice ratio is the cumulative loss in output, measured as a percent of one year’s GDP, associated with a one-percentage-point permanent reduction in inflation.

Sales tax. See **excise tax vs. sales tax.**

Saving function. The schedule showing the amount of saving that households or a nation will undertake at each level of income.

Say’s Law of Markets. The theory that “supply creates its own demand.” J. B. Say argued in 1803 that, because total purchasing power is exactly equal to total incomes and outputs, excess demand or supply is impossible. Keynes attacked Say’s Law, pointing

out that an extra dollar of income need not be spent entirely (i.e., the marginal propensity to spend is not necessarily unity).

Scarcity. The distinguishing characteristic of an economic good. That an economic good is scarce means not that it is rare but only that it is not freely available for the taking. To obtain such a good, one must either produce it or offer other economic goods in exchange.

Scarcity, law of. The principle that most things that people want are available only in limited supply (the exception being **free goods**). Thus goods are generally scarce and must somehow be rationed, whether by price or some other means.

Schedule (demand, supply, aggregate demand, aggregate supply). Term used interchangeably with “curve,” as in demand curve, supply curve, etc.

Securities. A term used to designate a wide variety of financial assets, such as stocks, bonds, options, and notes; more precisely, the documents used to establish ownership of these assets.

Short run. A period in which not all factors can adjust fully. In microeconomics, the capital stock and other “fixed” inputs cannot be adjusted and entry is not free in the short run. In macroeconomics, prices, wage contracts, tax rates, and expectations may not fully adjust in the short run.

Short-run aggregate supply schedule. The schedule showing the relationship between output and prices in the short run wherein changes in aggregate demand can affect output; represented by an upward-sloping or horizontal AS curve.

Shutdown price (or point or rule). In the theory of the firm, the shutdown point comes at that point where the market price is just sufficient to cover average variable cost

and no more. Hence, the firm's losses per period just equal its fixed costs; it might as well shut down.

Single-tax movement. A nineteenth-century movement, originated by Henry George, holding that continued poverty in the midst of steady economic progress was attributable to the scarcity of land and the large rents flowing to landowners. The "single tax" was to be a tax on economic rent earned from landownership.

Slope. In a graph, the change in the variable on the vertical axis per unit of change in the variable on the horizontal axis. Upward-sloping lines have positive slopes, downward-sloping curves (like demand curves) have negative slopes, and horizontal lines have slopes of zero.

Social insurance. Mandatory insurance provided by government to improve social welfare by preventing the losses created by market failures such as moral hazard or adverse selection.

Social overhead capital. The essential investments on which economic development depends, particularly for sanitation and drinking water, transportation, and communications; sometimes called *infrastructure*.

Social regulation. See **regulation**.

Socialism. A political theory which holds that all (or almost all) the means of production, other than labor, should be owned by the community. This allows the return on capital to be shared more equally than under capitalism.

Speculator. Someone engaged in speculation, i.e., someone who buys (or sells) a commodity or financial asset with the aim of profiting from later selling (or buying) the item at a higher (or lower) price.

Spillovers. Same as **externalities**.

Stagflation. A term, coined in the early 1970s, describing the coexistence of high unemployment, or *stagnation*, with persistent

inflation. Its explanation lies primarily in the inertial nature of the inflationary process.

Statistical discrimination. Treatment of individuals on the basis of the average behavior or characteristics of members of the group to which they belong. Statistical discrimination can be self-fulfilling by reducing incentives for individuals to overcome the stereotype.

Stock, common. Refer to **common stock**.

Stock market. An organized marketplace in which common stocks are traded. In the United States, the largest stock market is the New York Stock Exchange, on which are traded the stocks of the largest U.S. companies.

Stock vs. flow. See **flow vs. stock**.

Strategic interaction. A situation in oligopolistic markets in which each firm's business strategies depend upon its rival's plans. A formal analysis of strategic interaction is given in **game theory**.

Structural budget. See **actual, cyclical, and structural budget**.

Structural unemployment. Unemployment resulting because the regional or occupational pattern of job vacancies does not match the pattern of worker availability. There may be jobs available, but unemployed workers may not have the required skill or the jobs may be in different regions from where the unemployed workers live.

Subsidy. A payment by a government to a firm or household that provides or consumes a commodity. For example, governments often subsidize food by paying for part of the food expenditures of low-income households.

Substitutes. Goods that compete with each other (as do gloves and mittens). By contrast, goods that go together in the eyes of consumers (such as left shoes and right shoes) are *complements*.

Substitution effect (of a price change). The tendency of consumers to

consume more of a good when its relative price falls (to "substitute" in favor of that good) and to consume less of the good when its relative price increases (to "substitute" away from that good). This substitution effect of a price change leads to a downward-sloping demand curve. (Compare with **income effect**.)

Substitution rule. A rule which asserts that if the price of one factor falls while all other factor prices remain the same, firms will profit by substituting the now-cheaper factor for all the other factors. The rule is a corollary of the **least-cost rule**.

Supply curve (or supply schedule). A schedule showing the quantity of a good that suppliers in a given market desire to sell at each price, holding other things equal.

Supply shock. In macroeconomics, a sudden change in production costs or productivity that has a large and unexpected impact upon aggregate supply. As a result of a supply shock, real GDP and the price level change unexpectedly.

Supply-shock inflation. Inflation originating on the supply side of markets from a sharp increase in costs. In the aggregate supply-and-demand framework, cost-push is illustrated as an upward shift of the AS curve. Also called *cost-push inflation*.

Supply-side economics. A view emphasizing policy measures to affect aggregate supply or potential output. This approach holds that high marginal tax rates on labor and capital incomes reduce work effort and saving.

T

Tangible assets. Those assets, such as land or capital goods like computers, buildings, and automobiles, that are used to produce further goods and services.

Tariff. A levy or tax imposed upon each unit of a commodity imported into a country.

Tax incidence. See **incidence**.

Technological change. A change in the process of production or an introduction of a new product such that more or improved output can be obtained from the same bundle of inputs. It results in an outward shift in the production possibility curve. Often called *technological progress*.

Technological progress. See **technological change**.

Terms of trade (in international trade). The “real” terms at which a nation sells its export products and buys its import products. This measure equals the ratio of an index of export prices to an index of import prices.

Theory of income distribution. A theory explaining the manner in which personal income and wealth are distributed in a society.

Time deposit. Funds, held in a bank, that have a minimum “time of withdrawal”; included in broad money but not in M_1 because they are not accepted as a means of payment. Similar to *savings deposits*.

Total cost. Refer to **cost, total**.

Total factor productivity. An index of productivity that measures total output per unit of total input. The numerator of the index is total output (say, GDP), while the denominator is a weighted average of inputs of capital, labor, and resources. The growth of total factor productivity is often taken as an index of the rate of technological progress. Also sometimes called *multifactor productivity*.

Total product (or output). The total amount of a commodity produced, measured in physical units such as bushels of wheat, tons of steel, or number of haircuts.

Total revenue (TR). Price times quantity, or total sales.

Trade balance or merchandise trade balance. See **balance of trade**.

Trade barrier. Any of a number of protectionist devices by which nations discourage imports. Tariffs and

quotas are the most visible barriers, but in recent years nontariff barriers (or NTBs), such as burdensome regulatory proceedings, have replaced more traditional measures.

Transactions demand for money. See **demand for money**.

Transactions money (M_1). A measure of the **money supply** which consists of items that are actually for transactions, namely, currency and checking accounts.

Transfer payments, government. Payments made by a government to individuals, for which the individual performs no current service in return. Examples are social security payments and unemployment insurance.

Treasury bills (T-bills). Short-term bonds or securities issued by the federal government.

U

Unemployed. People who are not employed but are actively looking for work or waiting to return to work.

Unemployment. (1) In economic terms, *involuntary unemployment* occurs when there are qualified workers who are willing to work at prevailing wages but cannot find jobs. (2) In the official (U.S. Bureau of Labor Statistics) definition, a worker is unemployed if he or she (a) is not working and (b) either is waiting for recall from layoff or has actively looked for work in the last 4 weeks. See also **frictional unemployment** and **structural unemployment**.

Unemployment rate. The percentage of the labor force that is unemployed.

Unit-elastic demand. The situation, between **price-elastic demand** and **price-inelastic demand**, in which price elasticity is just equal to 1 in absolute value. See also **price elasticity of demand**.

Unlimited liability. See **limited liability**.

Usury. The charging of an interest rate above a legal maximum on borrowed money.

Utility (also total utility). The total satisfaction derived from the consumption of goods or services. To be contrasted with *marginal utility*, which is the additional utility arising from consumption of an additional unit of the commodity.

V

Value, paradox of. Refer to **paradox of value**.

Value added. The difference between the value of goods produced and the cost of materials and supplies used in producing them. In a \$1 loaf of bread embodying \$0.60 worth of wheat and other materials, the value added is \$0.40. Value added consists of the wages, interest, and profit components added to the output by a firm or industry.

Value-added tax (VAT). A tax levied upon a firm as a percentage of its value added.

Variable. A magnitude of interest that can be defined and measured. Important variables in economics include prices, quantities, interest rates, exchange rates, dollars of wealth, and so forth.

Variable cost. Refer to **cost, variable**.

Velocity of money. In serving its function as a medium of exchange, money moves from buyer to seller to new buyer and so on. Its “velocity” refers to the speed of this movement.

Vertical equity. See **horizontal equity vs. vertical equity**.

Vertical integration. See **integration, vertical vs. horizontal**.

Vertical merger. See **merger**.

W

Wealth. The net value of tangible and financial items owned by a nation or person at a point in time. It equals all assets less all liabilities.

Welfare economics. The normative analysis of economic systems, i.e., the study of what is “wrong” or “right” about the economy’s functioning.

Welfare state. A concept of the mixed economy arising in Europe in the late nineteenth century and introduced in the United States in the 1930s. In the modern conception of the welfare state, markets direct the detailed activities of day-to-day economic life while governments regulate social conditions and provide pensions, health care, and other aspects of the social safety net.

What, how, and for whom. The three fundamental problems of economic organization. *What* is the problem of how much of each possible good and service will be produced with the society’s limited stock of resources or inputs. *How* is the choice of the particular technique by which each good shall be produced. *For whom* refers to the distribution of consumption goods among the members of that society.

Y

Yield. Same as the **interest rate** or **rate of return** on an asset.

Z

Zero economic profit. In a perfectly competitive industry in long-run equilibrium, there will be zero economic profit. This definition pertains to all revenues less all costs, including the implicit costs of factors owned by the firms.

Zero-profit point. For a business firm, that level of price at which the firm breaks even, covering all costs but earning zero profit.