18 Fiscal Policy

How much should the government spend? How should it pay for it? Are higher taxes needed to balance the budget or will they merely stifle economic growth? Do deficits raise interest rates? Is the debt a burden to future generations? These and related questions concern fiscal policy. Directly or indirectly they are the main topics of political economic debate? In Chapter 12, we explored the role of fiscal policy in the determination of aggregate demand. In this chapter, we go into greater depth to investigate fiscal policy in the long and short runs.

In the United States, monetary policy is relatively independent of politics. The Federal Reserve was created by Congress, and Fed chairmen testify regularly before congressional committees about the state of monetary policy. Nevertheless, the Federal Reserve has been structured to be free of day-to-day political control. Central banks are not independent in every country, but the idea that they should be independent has steadily gained support throughout the world over the past quarter century.

In contrast, fiscal policy is the warp and woof of politics. The word "fiscal" is derived from the Latin word *fisc* meaning the emperor's privy purse or the public treasury. More political heat is generated on questions about filling or depleting the purse – on getting and spending – than on any other question.

Ronald Reagan, in his successful presidential campaign in 1980, argued simultaneously for a smaller government and a balanced budget. He argued that lower tax rates and less government would encourage private-sector growth and help to balance

the budget, as revenues rose in response to higher incomes, despite the lower tax rates. In fact, while growth increased, so did deficits. Republicans at the turn of the 21st century are still the party of tax cuts.

The Democrats under Clinton argued that the balanced budgets actually achieved at the end of the 1990s contributed to the longest business-cycle expansion on record. They argued that lower Federal borrowing led to lower interest rates which, in turn, spurred private investment. The Democrats were left in a puzzling position when the recession developed in 2001. It was politically expedient to blame it on the George W. Bush's tax cuts and the reemergence of a budget deficit. But their rhetoric was inconsistent with their own economic analysis: interest rates did not actually rise, and no politician wanted to raise taxes and cut spending at the bottom of the recession, knowing that the resulting fall in aggregate demand would worsen unemployment.

The point, however, is not to take sides in past (if recent) political debates. Rather those debates illustrate just how politically charged fiscal policy can be. Macroeconomists should contribute constructively to the public discourse by clarifying how fiscal policy works.

The recent debates highlight two questions. First, how might fiscal policy help to push the economy out of recession or to restrain recrudescent inflation? Second, what effect does fiscal policy have on the long-run prospects for economic growth?

18.1 Countercyclical Fiscal Policy

18.1.1 Fiscal Responses to Aggregate Demand and Supply Shocks

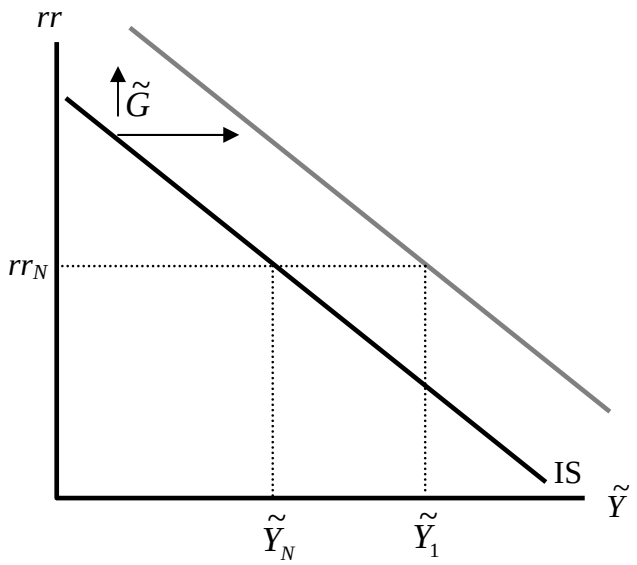
Active and Passive Fiscal Policy

Some of the key features of fiscal policy have already been discussed in Chapter 12. There we saw that changes in taxes, transfers, and government expenditure have multiplied effects on aggregate demand. Fiscal policy can be either discretionary or automatic (section 12.2): **AUTOMATIC FISCAL POLICY** is *built into the design of the tax code and spending programs*; **DISCRETIONARY FISCAL POLICY** is *deliberately chosen to achieve a particular result.*

Figure 18.1 uses the IS curve and long-term interest rate to illustrate a particular discretionary fiscal-policy action: an increase in government expenditure. (Problem 18.2 considers other types of discretionary fiscal policy.) Automatic fiscal policy is embodied in the shape and location of the IS curve and in the degree to which a non-policy factor, such as a change in net exports or the marginal propensity to consume, shift or rotate the IS curve (that is, in the multipliers).

The most straightforward illustration is shown in Figure 18.1. As in Chapters 16 and 17, GDP and its components are scaled by potential output in the figure. An increase of government expenditure ($\tilde{G}$) shifts the IS curve rightward. At a fixed real interest rate, aggregate demand rises from $\tilde{Y}_0$ to $\tilde{Y}_1$. As we saw in Chapter 12 (section 12.3.2) magnitude of the rightward shift is given by the autonomous expenditure multiplier times the change in government spending: $\mu\Delta\tilde{G}$.

Figure 18.1
Fiscal Stimulus



If monetary policy maintains a constant real rate of interest, then an increase in government expenditure shifts the IS curve to the right and increases aggregate demand by a fully multiplied effect to $\tilde{Y}_1$.

Aggregate-Demand Shocks

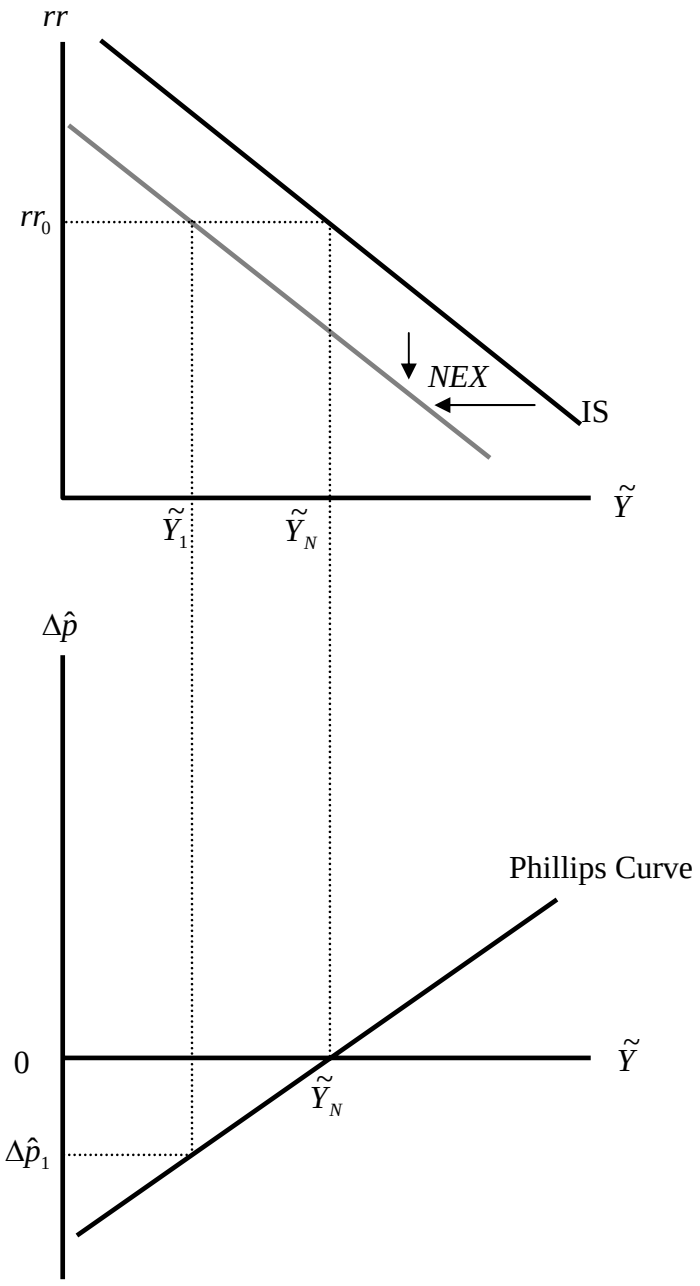
If the economy always grew on a perfectly steady path, the policy problem would be simple. Unfortunately, events at home and abroad can knock the economy off course. In Chapter 16, we classified events into those that affect aggregate expenditure, called **aggregate-demand shocks**, and those that affect potential output, called **aggregate supply shocks**.

The currency crisis and accompanying recession in the East Asian newly industrializing countries (NICs) in the period 1997-1999 provides a real-life example of an aggregate-demand shock to the United States: the NIC's imports of American goods fell from the highest level in 1997 to the lowest level in 1999 by 38 percent. This, of course, contributed to the continuing fall in U.S. net exports during this period.

In Figure 18.2, starting at NAIRU, this is shown as a leftward shift of the IS curve. At the same real interest rate, GDP falls from $\tilde{Y}_N$ to $\tilde{Y}_1$ and prices begin to decelerate with the change in the inflation rate falling from 0 to $\Delta\hat{p}_1$. As we saw in Chapter 17 (section 17.3.2), a movement away from NAIRU can start a spiral of cumulatively decelerating prices and aggregate demand: if left alone, GDP and inflation rates will fall and unemployment will rise at increasing rates.

Of course, the East Asian crises was not the only thing going on in the U.S. economy at the time. Figure 18.2 shows the effect of the aggregate-demand shock *ceteris paribus*. But other factors more than counteracted this negative one (in sum preventing the IS curve from falling and, perhaps, pushing it to the right of NAIRU), so that the

Figure 18.2
An Aggregate-Demand Shock



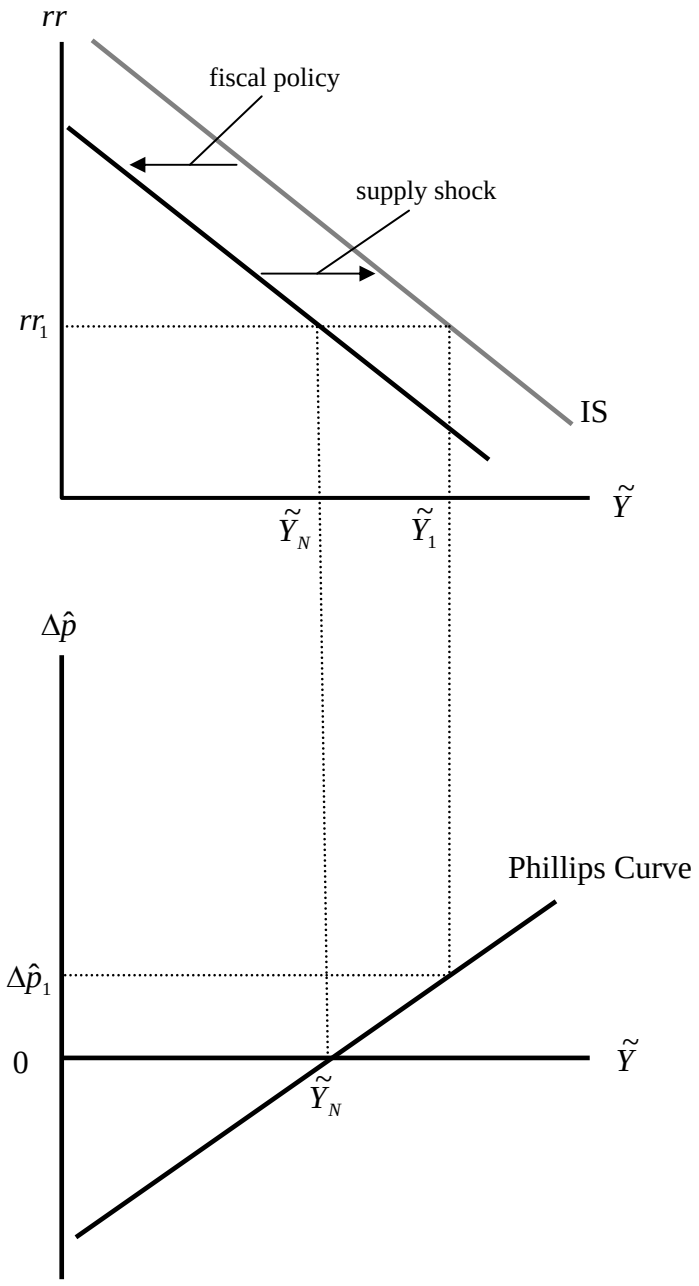
An aggregate-demand shock (here a fall in net exports) shifts the IS curve leftward, reducing aggregate demand below NAIRU and decelerating prices.

period 1997-1999 was, in reality, one of strong growth and low unemployment. Some of the countervailing factors may have been offsetting positive aggregate-demand shocks or monetary or fiscal policy actions. In principle, a fiscal action (an increase in government spending or transfer payments or a cut in taxes) could stimulate spending. If the policy action were properly designed, the IS curve would shift back to its original position, offsetting the negative shock.

Aggregate-Supply Shocks

Supply-shocks affect potential output (Y^{Pot}). Recall that scaled output $\tilde{Y} = \frac{Y}{Y^{Pot}}$. If potential output falls, then, *for the same level of aggregate demand* (Y), scaled output will rise. All other things equal, the IS curve must *initially* shift to the right as shown in Figure 18.3. It is important to recall (Chapter 16, section 16.5.3) that this rightward shift *does not* correspond to an increase in real GDP. Rather, the old level of aggregate demand is now suddenly higher relative to the now lower level of potential output. The acceleration in prices that results ($\Delta\hat{p}_1$) ultimately reduces relative aggregate demand back to its NAIRU level (a leftward shift in the IS curve back to its original position). Because of the fall in potential output, NAIRU now corresponds to a lower level of GDP with lower real-wage rates (since the labor production function shifted down, reducing the marginal product of labor). With lower real-wage rates, labor supply and the level of full employment will fall. Although fewer people are working at NAIRU, the actual NAIRU rate of unemployment may not be any higher, because the labor force may have become smaller as participation rates fall.

Figure 18.3
An Aggregate-Supply Shock



A negative aggregate-supply shock shifts the IS curve rightward as potential output falls in the face of unchanged aggregate demand. Prices accelerate as aggregate demand exceeds NAIRU. A fiscal-policy action can shift the IS curve back to its old position to offset the inflationary effect of the supply shock.

Mixed Shocks

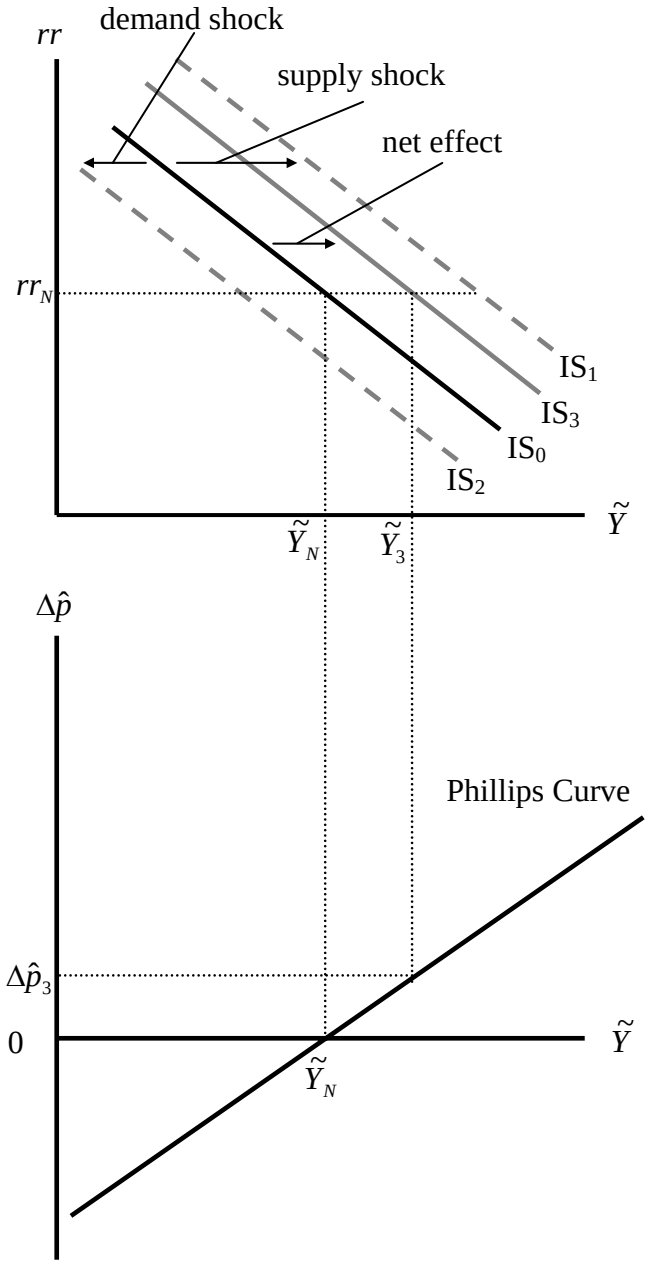
In the real world, pure aggregate-demand or pure aggregate-supply shocks are rare. The massive rises and falls of oil prices in the 1970s and 1980s mixed both kinds of shocks. Consider a large increase in oil prices. The aggregate-demand effect is negative: The United States (like Japan and most of western Europe) are net importers of oil. If the demand for oil is relatively inelastic in the short run, the big price increase translates into a big increase in the dollar value of imports.

The aggregate-supply effect is also negative: The immediate result of an increase in the price of oil relative to other sources of energy and other goods is that the economy is producing with machinery that was adapted to the old relative prices, so that it must be economically less efficient under the new relative prices (see Chapter 6, section 6.4.1). Potential output must fall.

Figure 18.4 shows each aspect of the oil-price increase separately. The original IS curve is IS_0. The supply shock is shown as a rightward shift of the IS curve from IS_0 to IS_1. IS_1 is not an actual IS curve, but a virtual IS curve that represents what would have happened to the IS curve if only the supply shock had been operative. Similarly, the demand shock is shown as the leftward shift from IS_0 to IS_2. IS_2 represents what would have happened if only the demand shock had been operative.

The actual shift of the IS curve is the sum of both shocks. In the figure, the aggregate-supply shock is shown as bigger, so that the net effect is to shift the IS curve rightward to IS_3. (Of course, if the demand shock had been greater, then IS_3 would lie to left of IS_0.)

Figure 18.4
A Mixed Aggregate-Demand and Aggregate-Supply Shock



A mixed supply and demand shock (e.g., an oil-price shock) has two effects. The supply shock alone would shift the IS curve rightward as potential GDP falls in the face of the original demand. The demand shock alone would shift it leftwards. The net effect is shown as IS_3 on the assumption that the supply shock is larger than the demand shock. A contractionary fiscal policy would shift the IS curve back to IS_0, realigning aggregate-demand with now lower aggregate supply and stopping the price acceleration at $\Delta\hat{p}_3$. If potential output is mismeasured, the fiscal authorities may believe that the actual IS curve is IS_2 (i.e., they recognize only the fall in demand). They might then adopt a fiscal policy that would try to close the gap between IS_2 and IS_0. But such an expansionary fiscal policy would only add to price acceleration and not restore the lost potential output.

If there were no policy action, then prices would accelerate at $\Delta\hat{p}_3$. A fiscal policy that aimed to stabilize prices would adjust spending or taxes to shift the IS curve back to IS_1. At that point, the economy would still suffer a loss of real GDP, owing to the supply shock, but the acceleration of prices would be checked. Left along, higher prices would, as in the case of a pure aggregate-supply shock, eventually reduce the real value of aggregate demand, shifting the IS curve back to NAIRU.

The Cost of Misperception

In principle, fiscal policy can offset the collateral damage to inflation operating through aggregate demand. In practice, it is not usually so easy. Unlike GDP itself, potential output and, hence, scaled output ($\tilde{Y}$) and the output gap are not observed directly. They must be calculated from a model as we saw in Chapter 6 (section 6.5.1). The data on the capital stock or the productive capacity of firms that lie behind these calculations are updated less frequently than GDP data and, even when updated, do not always accurately reflect accurately the changes in the economic efficiency of capital implied by a supply shock.

As a result, the policymaker is likely not to recognize the full extent of the supply shock as shown by IS_1. To see the problem, consider what would happen if the supply shock resulted in no revision at all of the potential output data, despite the fact that, economically, potential output had really changed. Then the policymaker would ignore the supply shock altogether, as if the shift corresponding to IS_1 had not happened. Then

the net effect would not be IS_3. Instead, the policymaker would take account only of the aggregate-demand shock and would regard IS_2 as the true post-oil-price-shock IS curve.

Suppose that the policymaker tried to use fiscal policy to offset the shock. A fiscal stimulus big enough to move the *apparent* IS curve (IS_2) back to the original location (IS_0) would shift the true IS curve (IS_3) away from, not towards, the original IS curve. Of course, the result would be to push aggregate demand further past NAIRU and to accelerate prices even further. Such perceptual mistakes may well have contributed to the rapid inflation of the 1970s and early 1980s.

18.1.2 The Limits of Countercyclical Fiscal Policy

In the two decades immediately after World War II, monetary policy was widely regarded as ineffective, and fiscal policy was ascendant. Fiscal policy was credited with a substantial part of the recovery from the Great Depression of the 1930s. Many economists thought that fiscal policy fostered the long expansion of the 1960s. They believed that the tax cuts of 1964, at the least, had prevented a recession from developing and had allowed the economy to grow steadily in what proved to be the then-longest business-cycle expansion in history (surpassed only recently by the 1991-2001 expansion). Opinions differed about the roots of the economic growth of the 1980s, but many economists credited it to the fiscal stimulus of the tax cuts in 1981 through 1986 under Ronald Reagan's administration.[1]

[1] The details of the tax reforms of 1981, 1986, as well as some smaller adjustments in 1982 and 1984 are complicated; see U.S. Treasury, "Fact Sheet on the History of the U.S. Tax System" (http://www.treas.gove/education/fact-sheets/taxes/ustax.shtml) for a concise history.

Opinions have shifted substantially over the last thirty years. Monetary policy is now ascendant. Despite the appeals of the Bush administration for fiscal stimulus in the last recession, *systematic* countercyclical fiscal policy has few advocates. The reason is not that fiscal policy is not powerful. Rather, it is thought to be too unwieldy.

The Lag in Fiscal Policy

Like monetary policy, fiscal policy acts with a tripartite lag (recognition, implementation, and transmission lags). The recognition lag is similar for both monetary and fiscal policy. No countercyclical actions can take place until the policymakers have assessed the changing situation. Such assessments are as difficult and time consuming for fiscal policy as they are for monetary policy.

In contrast, the implementation lag is likely to be much longer for discretionary fiscal policy than for monetary policy. The reason is that in the United States – as in all democracies – there is no fiscal policymaker in the same sense that the Federal Reserve or other central banks can be thought of as monetary policymakers. The Federal Open Market Committee has twelve voting members, yet the committee directs monetary policy with a unified voice. The same cannot be said for fiscal policy.

Federal tax and budget policies are the subject of complex negotiations within Congress and between Congress and the White House. Even after legislation establishes the main outlines of a policy, the Internal Revenue Service (IRS) or spending agencies may have been left with further detailed decisions to make. Exactly how should a tax rule be written? Exactly where should a highway be sited? The process is bound to be a

slow one. So slow, in fact, the combination of the recognition and implementation lags is typically longer than the length of the average recession.

Discretionary fiscal policy is not only likely to be too late, by the time it is finally implemented, it may push the economy in the wrong direction altogether. And it is not possible to know in many cases exactly what the policy action was. Congress and the President, just like every one else, may forecast the dollar value of a particular tax increase based on the rate schedules and other assumptions about the economy, but they cannot say with precision "taxes were raised today by $100 million." In contrast, the Federal Reserve can raise the Federal funds rate and hold it within a small fraction of a point of where it chooses.

Discretionary countercyclical fiscal policy is not necessarily a dead letter. A recession may turn out to be long and deep as in the 1930s. Then, fiscal policy could come into its own. What is more, nondiscretionary fiscal policy – the automatic stabilizers – do not suffer from either the implementation or recognition lags. Without the notice or special care of the policymakers, they quietly dampen fluctuations in aggregate demand. The design of adequate and effective stabilizers is an important role for the policy planner.

The transmission lag is likely to be shorter for fiscal policy than that for monetary policy. Consumer spending is closely related to incomes. Higher paychecks, because of tax cuts or new incomes generated by increasing employment, translate relatively quickly into rents paid, groceries and luxuries bought. Lower interest rates translate into increased investment, but often only after a recognition and implementation lag within firms themselves. The shorter transmission lag was one of the reasons that fiscal policy

was so frequently advocated thirty or forty years ago. The advocates failed to grasp that the ponderous political processes of a democratic government ensures that the implementation lag typically swamps any advantage gained from the shorter transmission lag.

Permanent versus Temporary Policies

In Chapters 13 and 14 we saw that it was necessary to distinguish between permanent and temporary incomes and opportunity costs. For those consumers (probably about half the population) who are able to borrow and lend relatively freely, a temporary increase in income results in little extra consumption. The rational consumer saves the windfall and, at most, consumes the interest it earns – perhaps only $1/20^{th}$ of the increase. For consumers, then, tax cuts or increases in government expenditure that are believed to be long-lived should have a much higher multiplier and a bigger ultimate effect on aggregate demand than do transitory policy actions.

How does it work out in practice? President George H.W. Bush provided a case study in 1992 when, as a stimulus measure, he directed the IRS to reduce tax withholdings from paychecks, with no change in tax rates. More cash was placed in people's pockets immediately. The permanent income/life cycle hypothesis of Chapter 14 suggests that this policy would have almost no effect. Come April 15^{th}, when tax returns must to be filed, the taxpayer would have had to write a check for any shortfall in the tax bill. The policy did not increase anyone's income, but it temporarily shifted personal cash flows. Yet, if some consumers were liquidity constrained or myopic (Chapter 14, section 14.??), then consumption might in fact rise somewhat.

One study of this episode concluded that liquidity effects were unimportant; that 43 percent of the taxpayers displayed myopia and treated the change in withholding as genuine income; and the net direct stimulus to consumption was about $11 billion dollars or 0.2 percent of 1992 GDP.[2] The ultimate effect, of course, depends on the multiplier. If the multiplier were as large as 3.95 (Chapter 12, equation (12.18), then the effect would have been relatively large at $43 billion or 0.9 percent of GDP. Most economists estimate the multiplier to be much lower than 3.95, with a consequently lower ultimate effect of the reduced withholding.

Congress has frequently proposed temporary tax credits for firms engaged in investment. In contrast with consumption, as we saw in Chapter 13, these should relatively powerful in the short run. The payoff to a long-lived investment project is generally not very different if it started now or a year from now. If the government offers a tax credit for this year only, the firm has a reason to move the start date of the project forward. A relatively small incentive might have a large effect on investment spending today. The effect is likely to be larger than for a permanent tax credit, because firms know that the opportunity is fleeting – "make hay while the sun shines."

Still, temporary tax credits generally prove to be ineffective. When the tax credit is removed next year, the incentive for further front-loading investment is removed. What is more, many investment projects that would have been started next year have already been started, so that there could be a large fall in new investment next year,

[2] Matthew Shapiro and Joel Slemrod, "Consumer Response to the Timing of Income: Evidence from a Change in Tax Withholding," *American Economic Review*, vol. 85, no. 1 (March 1995), pp. 274-283.

reversing the gains of the current policy.

Fiscal policy is likely to be more effective if it is permanent. Yet, discretionary fiscal policy is never truly permanent. It may not even be long-lived. Ronald Reagan oversaw a large tax cuts in 1981 and 1986 that he clearly intended to be permanent. Some tax rates were increased even during the Reagan Administration. Reagan's successor, the elder George Bush, campaigned on a pledge of fiscal stability ("Read my lips. . . NO new taxes"). The fact that he reneged on that promise was an important element in his defeat at the next election. His defense was the reasonable one that, as circumstances change, the right policy surely changes. That is just the point: consumers, workers, and firms are well aware that circumstances change and that, whenever they have changed in the past, fiscal policy has also changed. Tax cuts are not *time-consistent* (see Chapter 17, section 17.5.2). The younger George Bush successfully pushed Congress to cut estate taxes. He preferred that the tax cut be permanent, but in fact Congress explicitly limited it to ten years. Whether taxpayers regard it as a permanent cut depends on the probabilities they place on its being renewed before it expires in 2010.

State and Local Budgets

Fiscal policy is often described as if it involved only the Federal government. State and local governments account for about half of all government spending in the United States. State and local governments do not typically conduct countercyclical fiscal policy. One reason is that the states are so interconnected that fiscal actions in one state would spill over into the other states and, as a result, may have little direct effect on employment in the originating state. The same problem could, of course, occur for small countries with

open economies – especially if, as many countries of the European Union now do, they share the same currency. State fiscal actions may nonetheless matter to the U.S. macroeconomy even if they are not used intentionally to smooth the business cycle.

Just as at the Federal level, state tax and transfer policies are part of the economy's automatic fiscal policy. Unfortunately, they may often act as automatic *destabilizers* as well. When Federal expenditures outstrip revenues, the Federal government sells bonds to make up the difference. States are not in the same position. According to their constitutions, most states must – within some limits – balance their budgets. States do sometimes borrow, though their borrowing is typically restricted to capital expenditure and frequently requires direct approval (sometimes with a two-thirds majority) from the voters. The consequence is that when a state goes into recession and revenues fall, it is forced either to raise taxes or to cut expenditures. Both tend to reduce aggregate demand and exacerbate, rather than offset, the recession.

18.2 Fiscal Policy in the Long Run

18.2.1 Monetary Policy as Fiscal Policy

Seigniorage

In Chapter 17 (section 17.1.1), we saw that monetary and fiscal policy are closely connected through the government's budget constraint (equation 17.1) repeated here as

$$G - (T - TR) = \Delta B^G + \Delta MB. \tag{18.1}$$

Any fiscal policy that results in a deficit on the left-hand side of the equation must be financed through additions to government liabilities on the right-hand side of the equation. Financing through the creation of monetary base is known, as we already learned (Chapter 17, section 17.1.1), as **MONETIZATION OF THE DEFICIT**.

Historically, monetization has had a bad name. In older times when money was virtually all gold and silver, kings would often issue new coins with less of the precious metal (and perhaps more of some base metal to maintain the weight and size) but with the same face value. If the king used 8 million old coins to produce 10 million new coins, the difference of 2 million formed part of his revenue and could help to finance his wars or his finery. The increase in the king's expenditure without any reduction in the expenditure of his subjects increased demand relative to supply, and prices rose. The fall in the real value of their nominal wealth is exactly what financed the king's additional expenditures. The *debased* coinage acted as a hidden tax, an **INFLATION TAX**, on his subjects.

Even when the king did not debase the coinage, it was usual for him to require that his subjects give more gold or silver bullion at the mint than would be returned to them as coins. The surplus, known as **SEIGNIORAGE** (from the French *seigneur* meaning "lord") was pure profit.

Debasement was a dishonest practice that counted on the king's subjects accepting a coin at its face value when it was really worth less. In contrast, people would willing pay a moderate seigniorage because coined metal was easier to handle and more easily valued than bullion – it really was worth a small premium.

In modern times, the value of the paper that goes into a dollar bill or even the value of the base metals that go into our coins is small relative to the face value of the money. The potential for seigniorage would seem huge. What is more, when the government issues monetary base, unlike when it sells bonds, it does not have to pay interest. Why then does the government not simply monetize the deficit?

To some extent it does. The monetary base grows over time. However, if it grows relatively fast compared to GDP or to other financial assets, it tends to depress interest rates, stimulating aggregate demand. If the economy is near full employment, the natural result is increased inflation. Just like the kings of old, it has debased the currency. Monetary cranks frequently complain about the Federal Reserve doing the same thing. In fact, seigniorage is a small part of government revenue. In 2001, only 2.7 percent of Federal government outlays were covered by seigniorage. In 1993, the year in which the monetary base grew the fastest in the years since World War II, it covered only 2.6 percent of government outlays.

Risks of Hyperinflation

Seigniorage often forms a much larger portion of government revenue in countries with ineffective or mismanaged fiscal regimes. If a government finds it hard to levy taxes or to sell bonds, "printing money" may be its only alternative. In Argentina, for example, in 1991 seigniorage formed 47 percent of the government's outlays. Economies that rely on seigniorage are prone to bouts of high inflation. Argentina's inflation rate in 1991 was 172 percent per year.

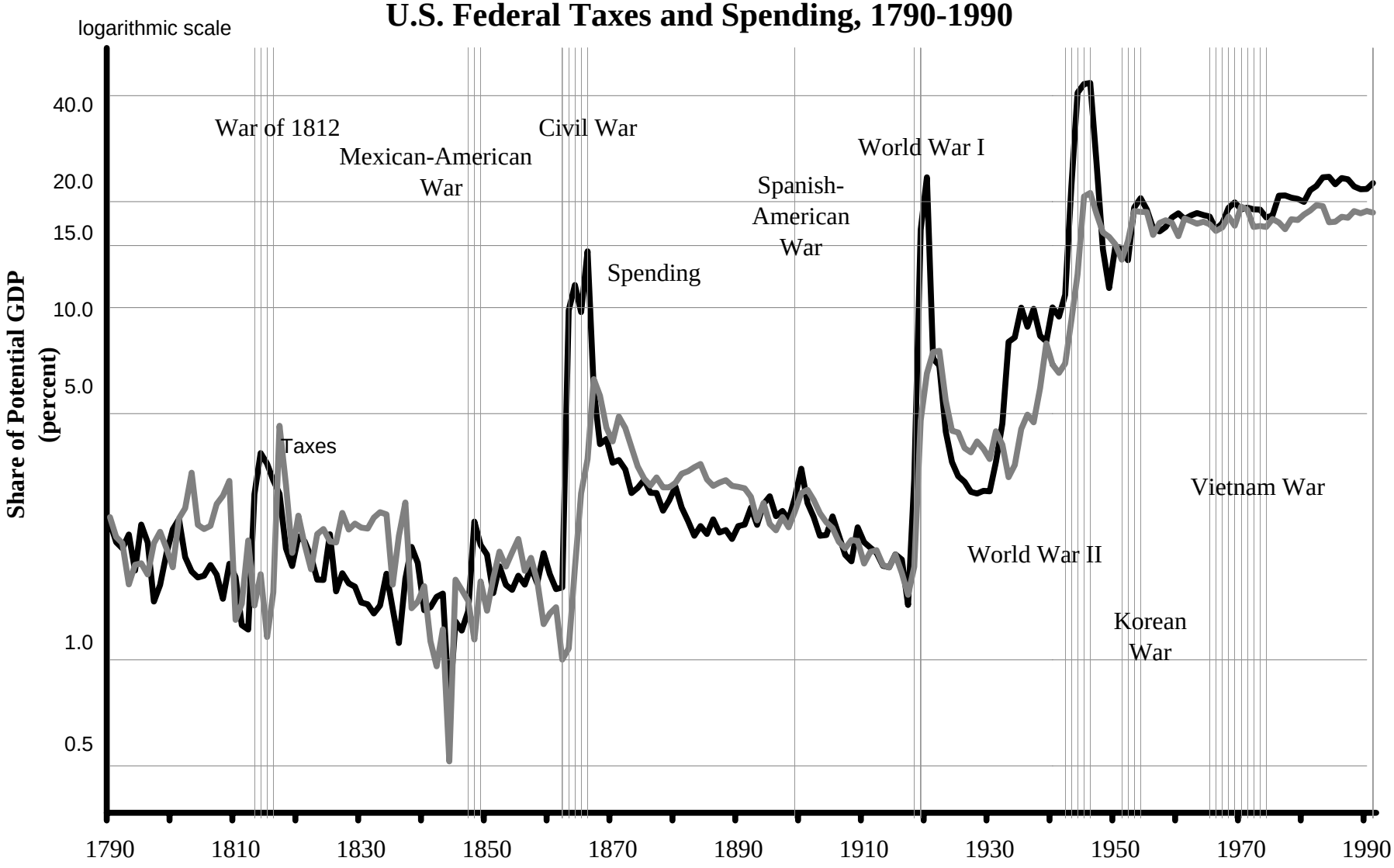
Fiscal disorders, including the reliance on seigniorage for substantial revenue, *sometimes* pave the way for **hyperinflation** (often defined as inflation rates above 50 percent per month). The most famous hyperinflation of all time occurred in Germany in the aftermath of World War I. The victorious allies demanded reparation payments far beyond the scope of ordinary sources of revenue. The German government literally turned to the printing press. Between August 1922 and November 1923, the average German inflation rate was 322 percent per month. The inflation rate in October 1923 rose to 41 percent per day! It took wheelbarrow loads of cash to buy a loaf of bread or a pack of cigarettes.

18.2.2 Deficits and the Debt Through Time

Fiscal policy has long-term as well as cyclical consequences. Government spending, taxation, transfers, and the deficit are all flows. Government debt is the stock counterpart to the government's budget deficit. Through most of U.S. history, the Federal government has regarded a balanced budget, and no borrowing, as the ideal goal of fiscal policy. The history of Federal fiscal policy is reflected in Figure 18.5, which shows expenditures and revenues as a share of GDP over a period of more than 200 years.

It is striking that both expenditures and revenues start low at the beginning of the republic and increase in a series of stair-steps – each step is associated with a national cataclysm – the Civil War, World War I, the Great Depression/New Deal, and World War II. The pattern was the same throughout the 19th century – it even applies to the

Figure 18.5
U.S. Federal Taxes and Spending, 1790-1990



smaller wars (War of 1812 and the Mexican-American War, and the Spanish-American War).

Nineteenth-century wars called for extraordinary expenditures. These were financed through the sale of government bonds. After each war, the government on average ran a surplus and used the surplus to repay the debt. The same pattern can be seen in the case of World War I, but it breaks down with the Great Depression/New Deal and World War II. From the 1930s, the Federal government has generally run a deficit. For 25 years after the end of World War II, revenues and expenditures were never far out of line; but, since about 1970 (around the time of the Vietnam War), expenditures have largely outstripped revenues. Only for a brief period at the end of the 1990s up to the recession of 2001 did the Federal government run a significant surplus.

The evolution of the debt through time depends both on past and present actions. When it sells bonds, the government is committed to pay interest on them. Other parts of government expenditure – including so-called entitlements – are to different degrees discretionary. It is useful to decompose the government deficit into two parts: $(G + TR) - T$ = *the Primary Deficit + Interest Payments*. The **PRIMARY DEFICIT** is the difference between *non-interest* expenditures and revenues. Where interest payments represent the inherited obligations of the past, the primary deficit represents present choices.

The evolution of the debt can, then, be represented by an equation:

$$B_t^G = B_{t-1}^G + r_{t-1}B_{t-1}^G + PD_t \,, \tag{18.2}$$

where the stock of debt at the end of the current (B_t^G) is the sum of the past stock (B_{t-1}^G), the flow of interest payments ($r_{t-1}B_{t-1}^G$), contracted in the past and paid this period, and the current primary deficit (PD_t).

Further insight into the growth of the debt can be gained by dividing both sides by B_{t-1}^G and rearranging to get

$$\frac{B_t^G}{B_{t-1}^G} - 1 = r_{t-1} + \frac{PD_t}{B_{t-1}^G}. \tag{18.3}$$

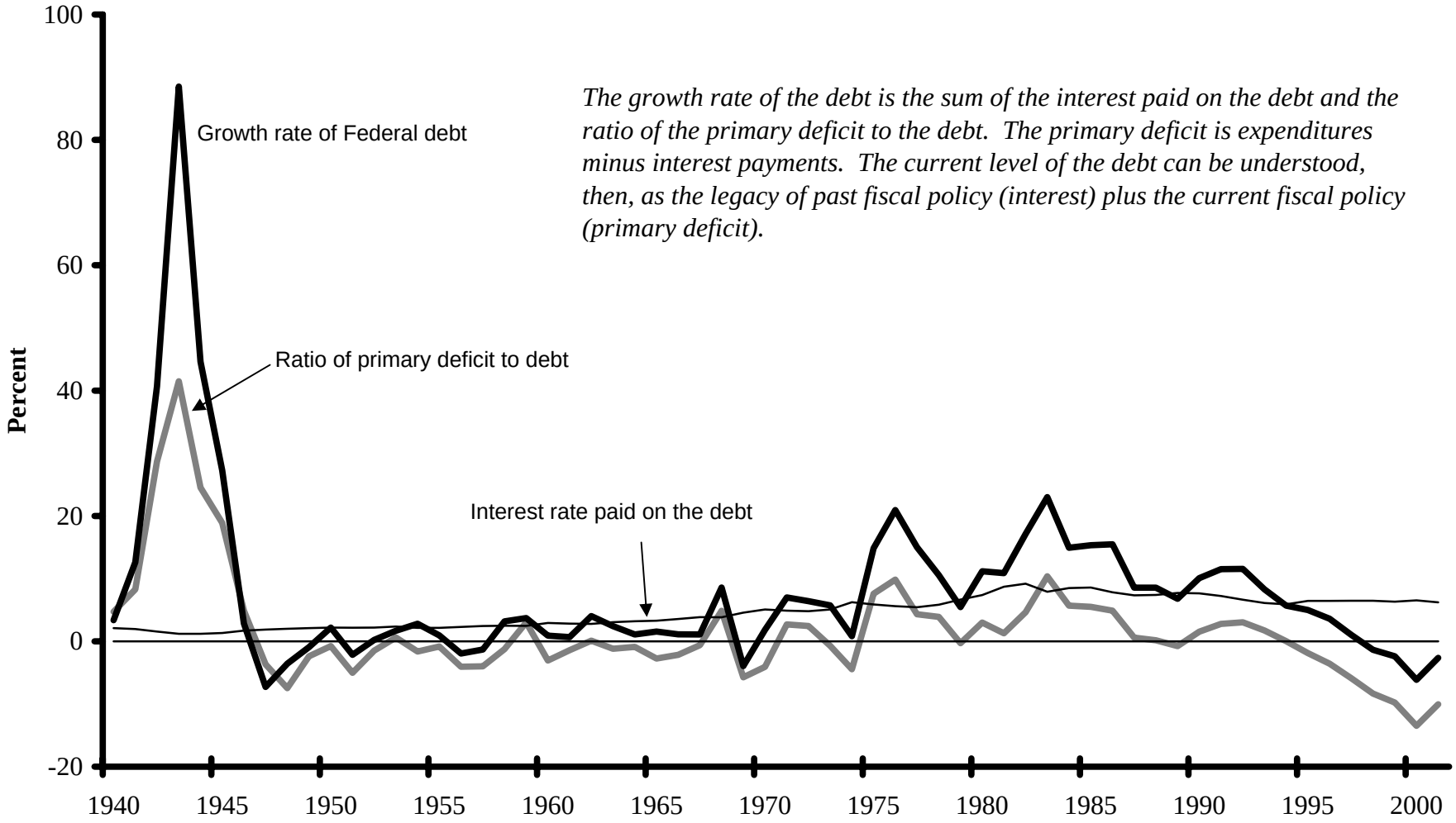
The left-hand side is, of course, the growth rate of the debt, so the equation can be rewritten as

$$\hat{B}_t^G = r_{t-1} + pd_t, \tag{18.3'}$$

where pd_t is the ratio of this period's primary deficit to the previous stock of government debt ($pd_t \equiv \frac{PD_t}{B_{t-1}^G}$) – that is, the ratio of newly incurred to existing obligations. Where the interest rate represents the flow of expenditures related to the old obligations, the primary deficit ratio represents the flow of expenditures related to the new obligations.

Figure 18.6 shows the growth rate of debt, the interest rate paid on the debt and the primary-debt ratio for the post-World War II period. Notice that before 1970, the

Figure 18.6
Growth of the Federal Government Debt



The growth rate of the debt is the sum of the interest paid on the debt and the ratio of the primary deficit to the debt. The primary deficit is expenditures minus interest payments. The current level of the debt can be understood, then, as the legacy of past fiscal policy (interest) plus the current fiscal policy (primary deficit).

primary debt ratio was often negative – that is, the Federal government would have run a surplus except for the need to meet interest payments. In the 1990s, the primary debt ratio became negative in 1994. Over the next three years, an increasing primary surplus acted to counteract relatively steady interest payments, finally offsetting them completely, arresting the growth, and initiating the short-lived reduction in the Federal debt. This reduction, of course, corresponds to the budget surpluses at the end of the Clinton administration.

18.2.3 CROWDING OUT

Functional Finance

The majority of the public, and probably the majority of politicians, believes that balanced budgets (zero deficits) and no public debt represent an economical – and perhaps, moral – ideal. The constitutions of many states require balanced budgets – at least for ordinary operating expenses. Not many years ago, talk of a balanced-budget amendment to the U.S. Constitution was widespread. The strong preference for balanced budgets just seems like common sense. After all, if any of us routinely spent more than we earned, we would be courting financial disaster.

The notion that a balanced personal budget is ideal has deep cultural roots: In Charles Dickens (1812-1870) great novel *David Copperfield*, the eponymous narrator recounts the wisdom of the jovial n'er-do-well, Mr. Micawber:

> He solemnly conjured me, I remember, to take warning by his fate; and to observe that if a man had twenty pounds a-year for his income, and spent nineteen pounds nineteen shillings and sixpence, he would be happy, but that if he spent twenty pounds one he would be miserable.

Many people implicitly agree with Polonious in Shakespeare's *Hamlet*, who tells his son, "Neither a borrower nor a lender be." (It is sometimes forgotten that Polonious is a fool.)

Most of us would doubt the wisdom of borrowing $250,000 to throw a party; few would argue that borrowing the same amount to purchase a house was misguided until we had further information. Similarly, borrowing to go to college may be the smartest thing that many of us have done.

Like personal borrowing, government deficits must be judged according to the circumstances. **FUNCTIONAL FINANCE** is the term that the economist Abba Lerner (1903-1982) gave to the view that government budgets and financing decisions should not be judged by whether or not they balance, but by what effects they have on the economy. Some issues that are relevant from the perspective of functional finance are:

- How does a deficit affect aggregate demand? (A question we addressed in Section 18.1.)
- How does government expenditure interact with private expenditure?
- Do government financing decisions (tax or debt-management decisions) redistribute wealth or income in favorable or unfavorable ways?
- Do government financing decisions alter incentives in favorable or unfavorable ways?

In short, to judge the soundness of fiscal policy we need to look not at the national accounts or the national balance sheet but at the effects of the policy on the real things we care about: output, employment, and the distribution of income and wealth – that is, on

the real economy. We shall consider some of these issues in the remainder of this chapter.

Zero-sum Crowding Out

A persistent fear among the critics of government involvement in the economy is that fiscal policy will *crowd out* the private sector. **CROWDING OUT** has been used to refer to many things. The least controversial is what might be called **ZERO-SUM CROWDING OUT**: *if an economy is fully employed, then any time the government takes more resources, those available to the private sector must fall.*

The point is obvious from the production-expenditure identity (Chapter 2, equation (2.1'')): $Y \equiv C + I + G + NX$. At full employment, Y is constant (the pie has a fixed size). So, any increase in the government's slice (G) must result in smaller slices for consumers (C), investors (I), or foreigners (NX). It is a zero-sum game.

Zero-sum crowding out refers only to the government's outlays on real goods and services (G) and not to its outlays on transfer payments (TR), such as interest, social security, or welfare. Transfer payments only shift the ownership of resources among the members of the private sector, so that their direct effect is to leave the relative size of the private sector unchanged. Transfers may, of course, have indirect effects.

Crowding Out or Crowding In?

Although increases in the government's share necessarily crowd out the private sector's share, the story is more complex if we think, not of shares, but of the actual level of real resources. Shares refer to the division of the pie. But what if government actions can

change the size of the pie? Recall from Chapter 12 that, when the economy is below full employment, an increase in government expenditure increases GDP through a multiplier process.

Even at full employment, government fiscal actions may affect the size of GDP positively or negatively. Imagine a country – much as the United States was in the 19th century – rich in resources but poor in infrastructure. A government that built canals, railroads, and telegraphs would have promoted private industry. GDP would be larger and the absolute resources commanded by the private sector would be larger, even though the government's share itself was larger.

In fact, infrastructural development in the United States, was a mixture of government and private actions. Often the government promoted private development – for example, land grants to railroads. Because of the indirect channels of its policies, the government's role in the economy was understated in the national accounts. In other countries, government policies were more direct, and the government share in the economy higher.

In modern times, government involvement in the development of the internet, in the construction and maintenance of roads, airports, schools, hospitals, and public transportation contribute not only directly to GDP, but indirectly provide services essential to the private sector. Such indirect benefits are referred to as **positive externalities** in contrast to the negative externalities of Chapter 3 (section 3.5.4). In recent years, there has been a lively debate about the level and the importance of the external benefits of government expenditure. Some economists have argued that infrastructural investment increases the rate of economic growth. Far from crowding out,

they argue that such investment offers a case of **CROWDING IN**: the government expenditure increases the resources available to the private sector. The jury is still out on this debate.

While roads, schools, and other infrastructure are typical examples of government investment, the private sector itself sometimes provides virtually every type of infrastructural investment. The government, however, also provides services that are rarely, if it all, provided privately: the police, the courts, and health-and-safety regulation, to name a few. These services too exhibit positive externalities. The questions, which services are best provided by the government and which by the private sector? and how large should the government sector be?, are central to the field of economics known as *public economics* or *public finance*. We cannot address these issues in any detail in this course. It is enough for us to notice that the question of whether additional government expenditure is positive or negative for the economy is not simple and requires further study.

Displacement of Private Expenditure

Another kind of crowding out may occur when government expenditures displace previously private expenditures. For example, before the middle of the 19th century, governments typically did not mandate or provide public schooling for children. Yet, many children attended private schools. When government's assumed the duty of public education, citizens were free to reduce their private expenditures on schools without loss to their children.

Similarly, before Social Security was initiated in 1936, U.S. citizens had to save for their own retirement unless their employer provided a pension (and few did). Of course, private pensions are now common, and many people still have substantial private savings for retirement. Nevertheless, some economists believe that the currently low personal savings rates in the United States are partly the result of the presence of Social Security and that increases in Social Security provisions would result in further reductions in savings rates.

Deficits and Interest Rates

The financial press often mentions another form of zero-sum crowding out. Recall from Chapter 2 the sectoral-deficits identity (2.3) repeated here as

$$[G - (T - TR)] + [I - S] + [X - M] = 0. \tag{18.4}$$

If the government's budget deficit (the leftmost term in square brackets) becomes larger while savings, the foreign deficit or net exports (the third term) remain constant, then investment must be "crowded out."

While, as a matter of accounting, an increase in the budget deficit must be balanced by some other item in the identity, it is by no means clear that investment is the only thing that would adjust, and it is unlikely that it would adjust one-for-one. Fiscal policy cannot be described merely by the size of the deficit. To achieve a particular deficit, the government chooses the levels of discretionary expenditure, predicts the

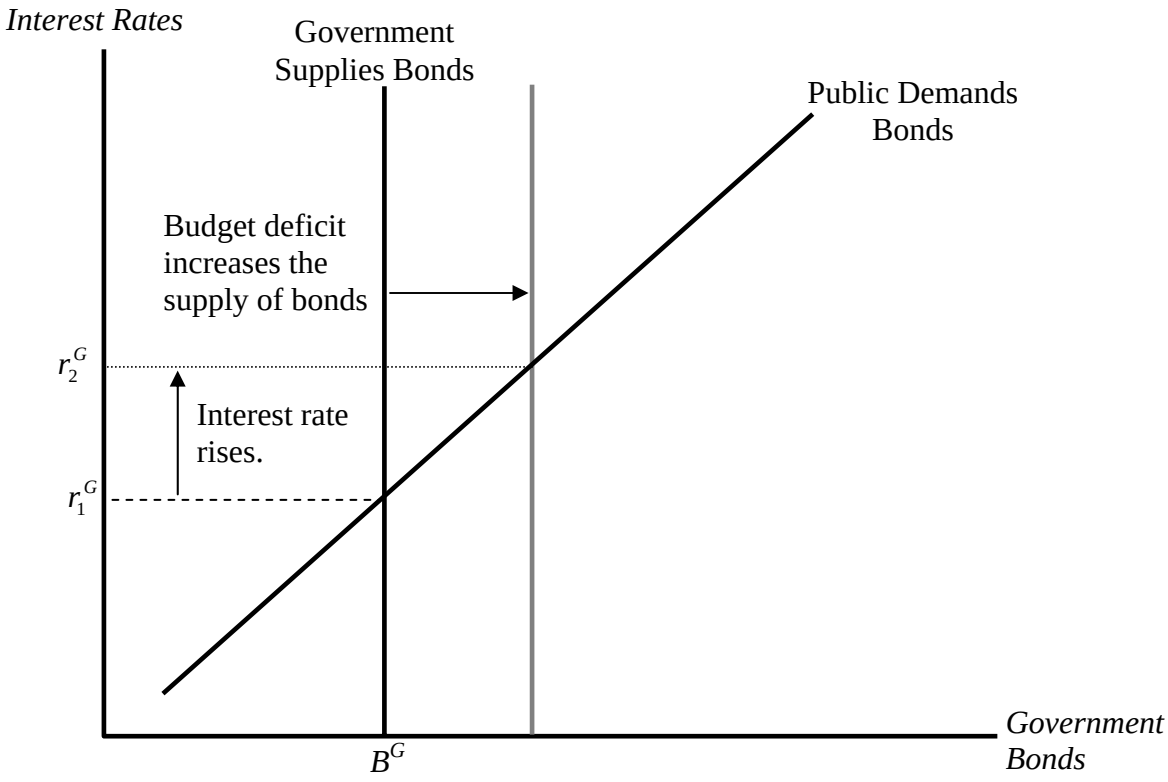
amount of interest it must pay on its debt, and sets the *rates* of entitlement expenditures and taxation.

Tax and transfer rates and interest rates affect economic behavior. These rates, as well as other economic factors such as the level of GDP, the real return on capital, and the exchange rate, affect the public's saving, investment, and import behavior as well as foreigners' demand for domestic exports. The budget deficit may affect them as well, but only indirectly. In particular, investors do not first look at the size of the budget deficit or the pool of savings and then decide how much new capital to install. Instead, each investment decision is based on the expected returns and opportunity costs that the firm faces. There is no direct connection between savings and investment or between the budget deficit and investment.

Interest rates provide one channel through which government fiscal actions are often thought to crowd out private investment. An increase in the deficit is financed through additional debt, shifting the supply of government bonds. In order to sell these additional bonds, their yield must rise (that is, their price must fall) as shown in Figure 18.7 by the movement along the public's demand curve for government bonds. For a given rate of expected inflation, the real interest rate rises, which discourages some investment, and through a multiplier process reduces GDP.

Crowding-out through interest rates has long been the fear of those who demand a balanced budget. Robert Rubin, Secretary of the Treasury under President Clinton, carried the argument further by maintaining that surpluses, which reduce the debt, lowered interest rates enough to account for a significant part of the economic boom of the 1990s.

Figure 18.7
Deficits and Interest Rates



A bond-financed budget deficit, increases the stock of bonds, shifting the bond supply curve to the right. In order to induce the public to demand the additional bonds, the interest rate must rise.

On Rubin's scenario, the move toward a balanced budget "crowded in" private investment. Although a crowding-out mechanism operating through interest rates seems straightforward (more debt implies higher interest rates implies lower investment implies lower GDP), it is incomplete.

As we saw in Chapter 11 (section 11.2.1), the demand for financial assets depends, not only on the direct influence of the own-rate of interest, but also on the yields of other financial assets, and arbitrage tends to push returns towards a stable relationship. In particular, monetary policy tends to determine market interest rates at the short end of the term structure and expected inflation and returns on real capital at the long end of the term structure.

For shorter rates, then, whether or not deficits raise interest rates depends in large part on whether the monetary authorities allow them to do so. For longer rates, arbitrage tends to bring the real return on long bonds back into its usual relationship with real returns on stocks. The returns on stocks are, of course, related to the profitability of firms and, therefore, in a complicated way to investment.

A process of arbitrage that involves investment may be slow, so that, in the short run, deficits may increase market interest rates, but unless deficits affect real returns on capital or inflation rates, these effects should wash out in the long run. How big the short-run effects are is an empirical question on which there is no generally agreed answer.

18.2.4 WEALTH EFFECTS

Are Government Bonds Net Worth?

There is no doubt that fiscal policies affect the real economy. How much and what kinds of real expenditures the government chooses clearly matters, as do (as we shall see again in the next section) various taxes and incentives. But does the size of the deficit in itself matter, independently of the way in which it is financed? One way it might matter is that larger government debt corresponds to larger private wealth.

Recall from Chapter 10 (section 10.1.2), that the private sector as a whole cannot become wealthier through its members borrowing and lending among themselves. If you lend to me, the loan shows up as your asset and as my liability. When we aggregate our balance sheets to obtain the balance sheet for the whole private sector, these entries cancel out. The same is *not* true if either of us holds government debt. A government bond is your asset and the government's liability. When we aggregate the *private* sector only, the government bond remains as an asset on the aggregate private balance sheet. It appears to be wealth. But is it really?

David Ricardo (1772-1823), an important English economist, provided a counterargument. Imagine that the government wants to increase consumption through a tax cut. It does not change any of its other plans for government expenditure or transfer payments. Suppose that your share of the tax cut is $100. To provide you with that $100, the government must increase its debt. Say that it sells a one-year bond for $100 to make up its shortfall. After one-year, it will pay off the bond with interest. If the interest rate is 7 percent, then after one-year it will have to increase taxes by $107 to pay off the

debt created by your share of the bond. Imagine that you anticipated that exactly that amount turned out to be your share of the future taxes, would you then raise your consumption in the face of the current tax cut?

The answer is no. If, in fact, you were happy with your consumption plans before the tax cut, there is no reason to change them after the tax cut. What are your choices? If you spend the entire $100, then you must lower your consumption next year by $107. But you can also save the money. In fact, you could yourself buy the government bond for $100. If you do, the government will pay you $107 next year, which is just the amount of the increase in your tax bill. By buying the bond, your consumption does not change either this year or next.

Since the increase in your holdings of government bonds – apparently increasing your wealth this year – did not result in any change in your consumption, then the bonds failed to act like true wealth. In fact, using the logic of the permanent-income/life-cycle hypothesis (see Chapter 14), it is easy to see that the tax changes do not change life-cycle wealth. The present value of the tax cut and the future tax increase that pays for the bond is: $PV = -T + \frac{T(1+r)}{1+r} = -100 + \frac{107}{1.07} = 0$. The government bonds, which are the positive counterpart to the tax cut, appear to be net wealth only when the future tax consequences of issuing the bonds are ignored.

The proposition that government bonds are not net wealth or that the government's choice between debt finance and tax finance has no real consequences is known as **RICARDIAN EQUIVALENCE**. Ricardian equivalence is sometimes misunderstood. It does not say that the level of government expenditure does not matter.

Rather, it says that the manner in which a *given* level of government expenditure is financed (taxes or debt) does not matter.

The Limits of Ricardian Equivalence

If Ricardian equivalence holds, then it does not matter whether or not the government runs a deficit or balances its budget. Given the assumptions we made in the tax cut scenario, the logic of Ricardian equivalence is unimpeachable. But are the assumptions correct?

Surprisingly, Ricardo himself did not think so. First, he believed that people were myopic, so that even though debt would eventually be paid off, some people would not grasp that this would mean higher taxes and so would fail to save the whole tax cut in order to have funds to pay future taxes. Second, he believed that some people would take the benefits of a tax cut and then emigrate, leaving their compatriots with the tax bill.

Emigration from England in the 19th century was substantial, but that hardly seems relevant to the United States or most developed countries in the 21st century. There is, however, another kind of emigration. In the illustration, we have assumed that bonds must be paid off after a year. But, of course, the debt may be financed with long-term (say, 30-year) bonds. And, even then, when these bonds come due, new bonds may be issued to pay off the old, so that the repayment of the debt is pushed far into the future. In the meantime, the original beneficiaries of the tax cuts may die. In effect, they have emigrated into the past. If they had anticipated that taxes would not be raised to repay the bonds until after they are dead, they could take the tax cut as a definite gain and regard the corresponding government bonds as net wealth.

One reply to this argument is that people who care about their heirs will not chose to leave them with the tax burden. Instead, when bonds are issued in their lifetime, they will save enough to cover the implied future taxes on their heirs. Economists (especially Robert Barro of Harvard University) have shown that Ricardian equivalence continues to hold – even when debt survives the initial tax beneficiaries of the tax cut– but only if people foresee having heirs and systematically account for the way inheritance and taxes affect the behavior of those heirs. It pushes the assumption of rationality too far to assume that they do this with the necessary precision. What is more, the assumption that the debt must be paid off at any horizon is suspect. What is to keep the government from issuing new debt to repay the old forever?

Like the permanent-income/life-cycle hypothesis of Chapter 14, Ricardian equivalence assumes that people can borrow or lend at, in this case, the government's rate of interest to any degree necessary. This is a strong assumption. As we saw in Chapter 14, a significant number of people are *liquidity constrained* – that is, unable to borrow or lend at favorable rates – and so live more or less hand to mouth. A tax cut eases this constraint and is likely to be spent, despite its future tax consequences. Similarly, even those who do borrow face higher rates of interest than the government pays. A tax cut allows them to reduce their high-interest borrowing and to repay the benefit at the lower government rate of interest sometime in the future. A tax cut, therefore, provides a net benefit and at least a portion of the corresponding government bonds ought to be regarded as net wealth.

In summary, while consumers may take some account of the future taxes implied by new government debt, they are not likely to take complete account. They are,

therefore, not likely to save the entire amount of a tax cut, and they are likely to regard the bonds that are issued to finance any tax cut as an addition to their net worth. What fraction of the market value of the bonds should be regarded as net wealth is a much debated, empirical question.[3]

18.2.5 TAXES AND INCENTIVES

What if Ricardian equivalence held completely? Would that imply that fiscal policy was unimportant in the long run? Absolutely not!

First, Ricardian equivalence addresses only the government's choice between tax and debt finance. The level of government expenditure on goods and services as a share of GDP, which measures the government's share of national resources, remains important. Equally important is just what the government does with those resources. Similarly, even though transfer payments do not represent direct pressure of the government on national resources, transfer programs such as Social Security or Medicare may confer substantial benefits (and possible costs) not only on the recipients but, indirectly, on the economy as a whole. Second, fiscal policy works not only through the levels of taxation and spending but also through the rates.

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[3] John J. Seater, "Ricardian Equivalence," *Journal of Economic Literature*, vol. 31, no. 1 (March 1993), pp. 142-190, provides a pro-Ricardian survey. T.D. Stanley, "New Wine in Old Bottles: A Meta-Analysis of Ricardian Equivalence," *Southern Economic Journal*, vol. 64, no. 3 (January 1998), pp. 713-727, provides a statistical reevaluation of 27 separate studies, and concludes that Ricardian equivalence does not hold.

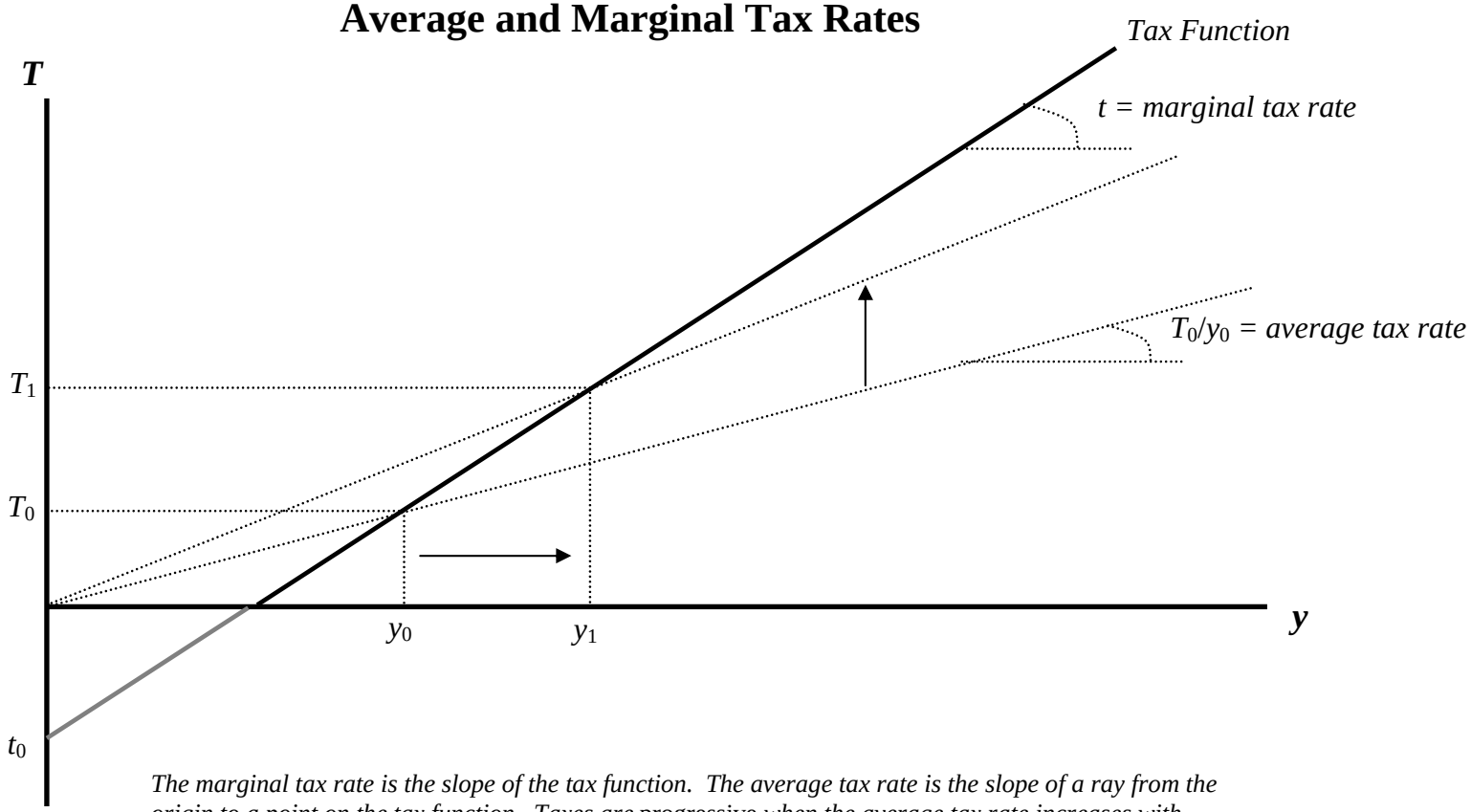
Average and Marginal Tax Rates

In earlier chapters we have emphasized that important economic decisions are made "at the margin." On the simple tax function in Chapter 12 (Figure 12.4), the slope of the function represents the *marginal tax rate* and the slope of a ray from the origin to the function represents the *average tax rate*. Figure 18.8 is essentially the same diagram, except that now it refers to an individual taxpayer – personal income rather than GDP is shown on the horizontal axis. The figure depicts a **flat tax** – that is, one with a constant marginal rate. Since the function intersects the income axis to the right of the origin, rays to the function become steeper as income rises: the higher the income, the higher the average tax rate. *A tax code in which average tax rates rise with income* is called **PROGRESSIVE**; one in which *average tax rates are constant* is called **NEUTRAL**; and one in which *average tax rates fall with income* is called **REGRESSIVE**.

Figure 18.9 shows the actual income-tax schedule (marginal tax rates) for a single taxpayer in 2000. It is clearly not a flat tax. The average tax rate, which is systematically lower (as we would expect from Figure 18.8), shows that the tax schedule is progressive. Is the tax code progressive across all taxpayers? That turns out to be a complex question, because the tax rates are calculated for adjusted gross income, which includes many deductions and adjustments to actual income (such as mortgage interest and medical deductions) that alter the actual tax bill. The tax code is further complicated by different tax schedules for married couples filing together or separately. In all, it is extremely complex.

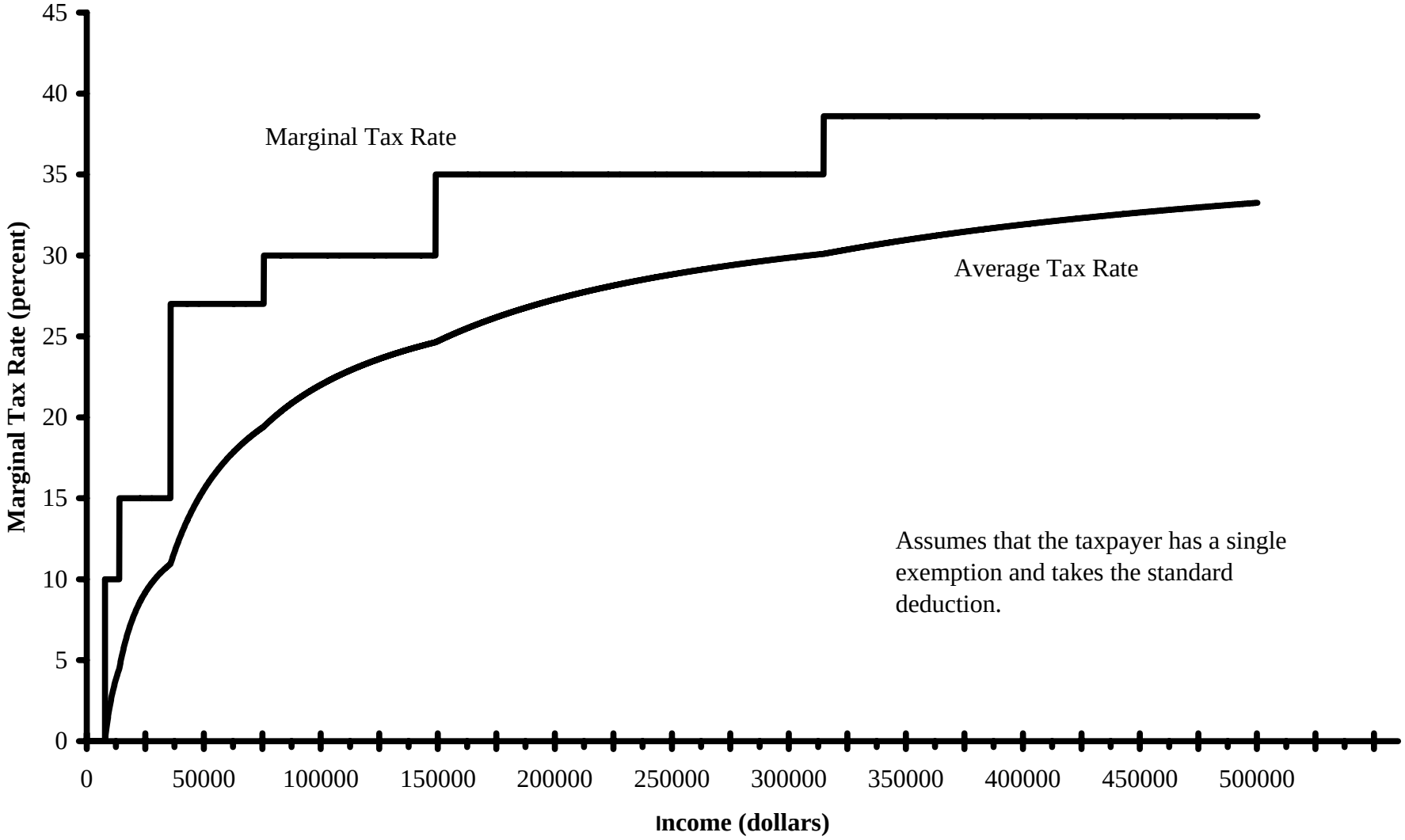
Income taxes are not, of course, the only relevant taxes. People pay a variety of indirect taxes (e.g., sales taxes or excise taxes on alcohol or gasoline). And, for many

18.8
Average and Marginal Tax Rates



The marginal tax rate is the slope of the tax function. The average tax rate is the slope of a ray from the origin to a point on the tax function. Taxes are progressive *when the average tax rate increases with income.*

Figure 18.9
Federal Tax Rates for a Single Taxpayer



lower income workers in the United States, the most significant tax is not the income tax but the payroll taxes that fund Social Security and Medicare. These are truly flat taxes – although, in the case of Social Security, only up to a ceiling level of income.

When asking questions about the distribution of taxes, the average tax rate is important: when taxes are progressive, the rich pay a greater proportion of their incomes in taxes than the do the poor. In contrast, when asking questions about the efficient allocation of resources it is the marginal tax rate that matters. In Chapter 8 (section 8.2.1) we saw that, to a worker, an income tax act reduces the effective real-wage rate. In principle, we would expect a decrease in the tax rate (raising the effective real-wage rate) to increase the supply of labor somewhat.

Transfers act like negative taxes. A decrease in the marginal transfer rate should act much like an increase in the marginal tax rate. Since many transfers fall with increasing income, recipients (e.g., welfare recipients) may face extremely high *net* marginal tax rates. When a welfare recipient takes a job not only does she face taxes on the income, she also may lose all or most of her welfare payments, so that the net marginal tax rate for the first dollar earned may actually be higher than 100 percent. Recognizing the problem, governments sometime introduce further complications into the tax code (such as the earned income credit in the United States) that try to mitigate disincentives to work.

As we saw in Chapter 13, corporate income tax rates matter as well. They can be regarded as a tax on the returns to investment. The lower the tax, the higher the return, and the more likely a firm is to invest.

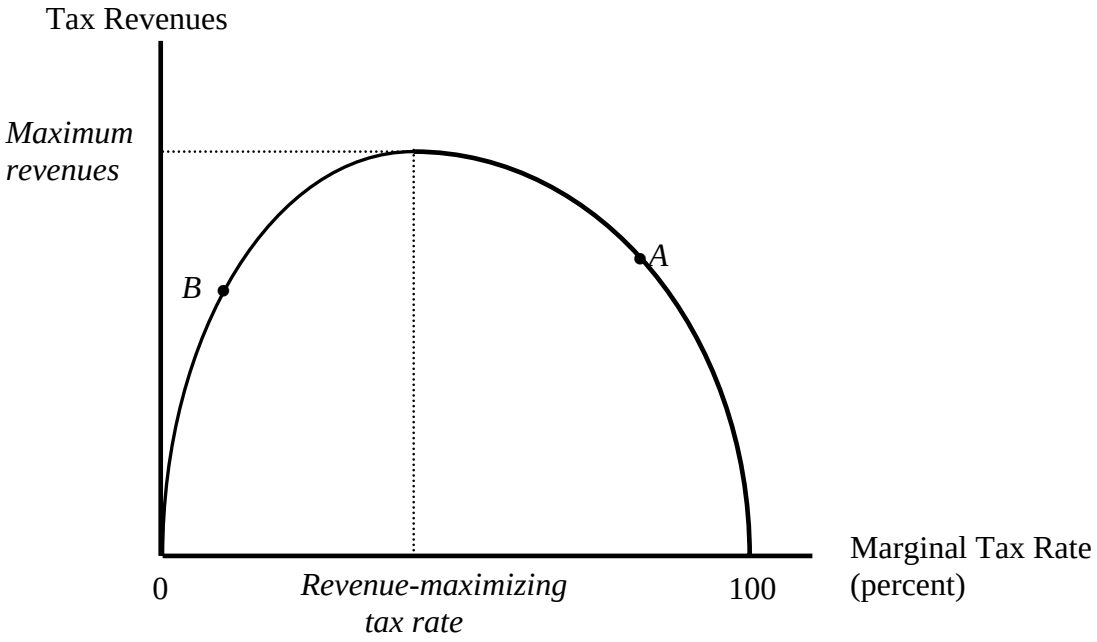
Supply-side Economics

Generally, lower marginal tax rates encourage people to supply labor and firms to invest. Increasing factors of production of course raise potential output and the rate of economic growth. **SUPPLY-SIDE ECONOMICS** is *the economic doctrine that lower tax rates promote growth substantially*. Supply-side economics was popularized during the Reagan Administration (1980-1988). Rightly or wrongly, it is often seen as a conservative political ideology. As a matter of apolitical economics, there is no question that *qualitatively* its key idea is sound. The real question – which remain important for economic research – is whether tax-incentive effects are *quantitatively* large and whether they are associated with politically unacceptable distributional consequences.

The most zealous advocates of supply-side economics went further and argued that large cuts in tax rates would be self-financing, because the growth in taxable income would be more than proportional to the cut in tax rates. The government would get less on each dollar, but make it up in volume. This optimistic supply-side scenario was buttressed by an commonsense observation. At a tax rate of zero, the government gets no revenue. At a tax rate of 100 percent, the government also gets no revenue: who would produce knowing that the government would take everything? Therefore, somewhere between 0 and 100 percent, there is a tax rate that maximizes government revenue.

Figure 18.10 displays this observation in the form of a graph of tax rates against revenue. This graph is named the **LAFFER CURVE**, after its popularizer, economist Arthur Laffer. The high point of the graph shows the revenue-maximizing tax rate. Suppose that the economy were at point A. A tax cut would then actually raise revenue. But if the economy were at point B, a tax cut would decrease revenue.

Figure 18.10
The Laffer Curve



The Laffer Curve *shows the relationship between marginal tax rates and revenues. Since a tax rate of zero would generate no revenue and a tax rate of 100 percent would also generate no revenue (since no one would work for no gain), there must be an intermediate rate that maximizes revenue. If the economy were on the Laffer curve at point A, a cut in tax rates would raise revenue. At point B an increase of tax rates would raise revenues.*

Unfortunately, the commonsense observation that there is *some* revenue-maximizing tax rate, cannot tell us whether the economy is actually at a point like A or like B. For that, we would need a Laffer curve that accurately represented the economy. Or we can – as the Reagan Administration did in the 1980s – conduct the experiment of cutting taxes. The economy boomed, which is consistent with supply-side economics. (Of course, it is also consistent with a tax multiplier in an economy well below full employment.) Yet, revenues did not keep up with government expenditure, and deficits widened substantially.

Most economists agree that fiscal policy has supply-side effects, but there is considerable disagreement on how important they are. One study concludes that the tax cuts of the 1980s probably raised GDP through higher labor supply by less than 1½ percent.[4] Of course, there are supply-effects on capital as well as labor. Whether or not, this number should be higher, it is clear that the most zealous supply-siders were too optimistic in thinking that tax cuts would be self-financing – at least in the short run.

Costs of Complexity

In addition to the indirect incentive effects of taxation, fiscal policy imposes a direct cost on the economy – the cost of compliance. Clearly, taxes have to be collected, the Internal Revenue Service, and various state tax boards are not free. What is more, the tax code is exceedingly complex and becomes more complex over time. The Tax Foundation, a

[4] M.A. Akhtar and Ethan S. Harris, "The Supply-side Consequences of U.S. Fiscal Policy in the 1980s," *Federal Reserve Bank of New York Quarterly Review*, Spring 1992, p.16.

think tank, estimates that the number of words in the U.S. Internal Revenue Code nearly quadrupled between 1955 and 2000, growing on average at more than 3 percent per year.[5] And complexity imposes costs of its own.

First, a large industry of specialized tax accountants and tax preparers, tax software, tax lawyers, and financial advisers has grown up around the tax code. While this provides employment, expenditures of this type fall under the heading of *regrettables* (Chapter 3, section 3.5.4). Specialized tax services are not primary sources of good in anyone's eyes, but are necessary given the structure of the tax code.

Second, the complexity of the tax code not only forces individuals and firms to turn to experts for help in filing tax returns, it encourages them to find ways to alter their behavior to limit their tax exposure. Sometimes this is exactly what fiscal policy intends. For example, Congress may offer a tax break for solar power generation with the hope of reducing pollution. Such policies are always debatable, but such debates are the stuff of political discourse.

Sometimes, however, the tax code has unintended consequences and encourages people and firms to make economic choices that use resources unwisely, lowering productivity. There are legitimate arguments over how complex a fair and efficient tax code should be. The current Federal tax code in the United States, however, is gerry-rigged and so complex that even the agents of the IRS are at a loss to know just what it

[5] Data tax complexity and compliance in this section are taken from Scott Moody, "The Cost of Tax Compliance," Tax Foundation, February 2002; downloaded from http://www.taxfoundation.org/compliance2002.html on 24 February 2005.

requires. Compliance with Federal taxes is estimated to have cost $194 billion dollars in 2002 or a little less than 2 percent of GDP.

18.3 The Burden of the Debt

Among politicians and the popular press, the government debt is persistently characterized as a burden – a burden on the public, because taxes must service the interest payments, and a burden on future generations, because our children and our children's children must pay off the principal. Obviously, if Ricardian equivalence held, the debt would be no burden in itself. Government expenditure may be a burden, but how it is financed would be quite irrelevant. In previous sections, however, we have given reason to doubt that Ricardian equivalence holds. And, so, we must ask, is government debt a burden?

18.3.1 Debt and Growth

Debt and Income

The dollar amount of a debt is a poor measure of its burdensomeness. A new high-school graduate, earning $20,000 a year would find a $15,000 car loan to be a serious burden. A corporate manager earning $125,000 a year would find it manageable. Similarly, a country with a GDP of $10 trillion can bear a debt of $3 trillion more easily than a country with a GDP of $500 billion could bear a debt of $700 billion. The debt must be measured relative to the size of the economy.

A simple measure is the ratio of debt to GDP (B^G/pY). (The price level (p) in this last expression can be thought of as converting real GDP (Y) to nominal GDP, so that it is the ratio of nominal debt to nominal GDP (pY) or as converting nominal bonds to real bonds (B^G/p), so that it is the ratio of real debt to real GDP.)

How can we judge whether debt is large or small relative to income? What should we compare it to? One possibility is to compare it the experience of other countries. Table 18.1 shows the ratios of debt to GDP for a selection of OECD countries. U.S. debt is about one-third U.S. GDP. This is a lower ratio than any G-7 country, and lower than most of the selection of non-G-7 countries in the table. It is only one-third the rate of Italy, and less than one-quarter the rate of Japan. Another obvious comparison is between current and past levels of debt. This is addressed in Problem

Problem 18.17.

Outgrowing Debt

Such simple comparisons, however, do not present the full picture. A medical resident may earn $45,000 and have student loan debts of $120,000 and yet not be worried, since she knows that in a few years she will be earning $170,000 per year. As with the doctor, sometimes, the economy can outgrow the public debt. The growth rate of the debt ratio can be expressed as

$$\left(\frac{\overset{\Delta}{B_t^G}}{p_t Y_t}\right) = \hat{B}_t^G - \hat{p}_t - \hat{Y}_t. \tag{18.5}$$

Table 18.1
Debt Ratios for Selected Countries

	Ratio of Central Government Debt to GDP (percent)
The G-7	
United States	33.7
Japan	134.7
Germany	36.6
France	50.9
United Kingdom	40.4
Italy	100.2
Canada	38.6
Other Countries	
China	12.7
India	57.7
Russia	48.8
South Korea	21.2
Mexico	24.5
Turkey	54.3
Thailand	29.8
South Africa	46.8
Singapore	99.4
Ethiopia	101.4
Luxembourg	2.9
Burundi	183.9

Source:
[1]OECD Central Government Debt: Statistical Yearbook 1993-2002 for the United States, Japan, Germany, France, United Kingdom, Italy, Canada, South Korea, Mexico, Turkey, and Luxembourg, data refer to 2002.
[2]World Bank World Development Indicators 2004: China, India, South Africa, Singapore, Ethiopia, Burundi, Russia and Thailand, data refer to 2001.

Substituting from equation (18.3'), this can be rewritten as

$$\left(\frac{\Delta B_t^G}{p_t Y_t}\right) = r_{t-1} + pd_t - \hat{p}_t - \hat{Y}_t = (r_{t-1} - \hat{p}_t) + pd_t - \hat{Y}_t. \tag{18.6}$$

If the primary deficit (PD_t) is constant (or even grows sufficiently slowly), then the primary debt ratio ($pd_t = PD_t / B_t^G$) will fall toward zero as the economy grows. In that case, the growth rate of government debt is the difference between the *ex post* real rate of interest $(r_{t-1} - \hat{p}_t)$ and the rate of real GDP growth. On the one hand, if the real rate of interest is low relative to the overall economic growth, then debt will become less burdensome over time, even if it never falls in its dollar value. On the other hand, if economic growth is slow, only a surplus on the primary deficit could reduce the debt as a share of GDP.

Inflation and the Debt

What is the effect of inflation on the debt? Notice that if there is a Fisher effect (see Chapter 11, Section 11.5.2) and if the inflation were anticipated, then any increase in the inflation rate would be matched point for point by an increase in the interest rate. The real rate $(r_{t-1} - \hat{p}_t)$ would be unchanged and the debt ratio would be unaffected.

However, if the Fisher effect were incomplete or the inflation were unanticipated, then the real rate would fall and reduce the debt ratio, easing the government's financial

burden. Unanticipated inflation, in effect, provides the government with a hidden source of revenue, closely related to the inflation tax discussed in section 18.2.1.

18.3.2 GENERATIONAL ACCOUNTS

The Intertemporal Balance Sheet

If the number one cliché of long-term public finance is "the public debt is a burden on future generations," number two is surely the cheerful, but equally hackneyed, thought, "the debt is really no burden at all, because we owe it to ourselves." Like most clichés, this one contains an element of truth. Repayment of the interest and principal on the government debt are transfer payments that do not affect real GDP directly. They may, of course, raise distributional issues: if the benefits of the expenditure financed by the debt accrue to different people than those who pay the taxes to service it, there is a net real transfer among them, which may or may not be desirable.

To understand the distribution of the debt burden between ourselves and our children and children's children, we must look at the government's financing problem not at a single time but over all future time. If the debt is to be paid off eventually then the cost of all future government expenditure must be offset by future taxes. If the taxes are not levied today, then the government goes deeper into debt and higher taxes must be levied in future. The **GOVERNMENT'S INTERTEMPORAL BALANCE SHEET** (or **INTERTEMPORAL BUDGET CONSTRAINT**) is shown in Table 18.2.

On the asset side is the discounted present value of all its future net tax revenue (= taxes minus transfer payments). These are divided into payments made by people now

Table 18.2
The Government's Intertemporal Budget Constraint

Assets	Liabilities
Present value of the net taxes to be paid by generations now living	Present value of government expenditures on goods and services
Present value of net taxes to be paid by generations yet unborn	Value of government debt (government's net worth)

alive ("current generations") and people yet to be born ("future generations"). On the liabilities side are two items. The first is the present value of all current and future government expenditure on goods and services. Transfer payments are ignored since they have already been accounted for in net taxes. The second is the net current wealth of the government, which is its net worth. Net wealth includes any tangible and financial assets of the government less its liabilities (that is, the government debt).

Calculating Lifetime Taxes and Earnings

To understand the distribution of the burden of debt, we consider how much of the assets of the government must be paid by each generation. This can be expressed as the average lifetime tax rate. Consider all the people born in, say, 1986 as a generation and, for convenience, assume that they are all born on the same day (just as race horses are always treated as if they were born on January 1st). Define lifetime earnings of this generation (LE_{1986}) as the present value of all the earnings of that generation starting with the year of its birth (year $j = 0$). If the maximum number of years anyone might live is D, then lifetime earnings is

$$LE_{1986} = \sum_{j=0}^{D} \frac{earnings_j^{1986}}{(1+r)^j}. \tag{18.7}$$

This is just a present-value calculation like those in Chapter 10 (section 10.2.1). The variable j measures not calendar time, but the number of years from the beginning of the generation – here 1986. For example, when the 1986 generation is 21 years old in 2007,

its discounted earnings for that year (one term of the summation) will be $\frac{earnings_{21}^{1986}}{(1+r)^{21}}$.

(The superscript 1986 merely indicates to which generation the earnings belong.)

Similarly, lifetime taxes (LT_{1986}) for the 1986 generation are the present value of all the net taxes (NT_j^{1986}) paid by from its birth to its death:

(18.8) $$LT_{1986} = \sum_{j=0}^{D} \frac{NT_j^{1986}}{(1+r)^j}.$$

Of course, similar formulae apply for each generation. These calculations are the basis for a set of **GENERATIONAL ACCOUNTS**.

The average lifetime tax rate (*LTR*) is, then, just the ratio of lifetime net taxes to lifetime earnings:

(18.9) $$LTR_{1986} = \frac{LT_{1986}}{LE_{1986}}.$$

If we calculate the present values of each generation's net taxes not at its date of birth, but at the present; so that, instead of the old and the young each having a lifespan of *D* years, the old have fewer years left to live than the young, then we can add them up to determine the present value of the tax payments of current generations on the asset side of Table 18.2. With this and the present value of government liabilities (the right-hand side of the balance sheet), we can then calculate present value of the tax payments of

future generations. And if we can estimate the present value of their future incomes, we can calculate their average net tax liability.

The Distribution of Taxes Across Generations

Table 18.3 presents lifetime net tax rates for the generations born each decade starting in 1900 through 1990, for the generation born in 1991, and for future generations (born after 1991). Both taxes and transfers have risen for successive generations, so that the lifetime net tax rate for the generation born in 1991 is just over 33 percent. The most striking element in the table is the estimate of the lifetime net tax rate for future generations: over 70 percent! This is an estimate of the degree to which the cost of governmental expenditures of the current generations have been shifted to the future generations. If the debt is a burden, over two-thirds will be borne by future generations.

These calculations have been made with great care, but it is worth remembering that many assumptions are embedded in them. First, an interest rate had to be chosen to calculate the present values. Legitimate arguments can be made for different rates. Then estimates had to be made of the future course of government expenditures, future taxes and transfers, future earnings (based on estimates of future GDP), and demographic trends, including changing birth and mortality rates.

Once again, economists lack a crystal ball, so we cannot say that the lifetime tax rate for future generations measures the burden of the debt as it will actually be experienced. Different assumptions lead to different estimates of lifetime net tax rates. Generational accounts are best thought of as tools that help us to understand the distributional consequences of fiscal policy decisions. If current policies work out as we

Table 18.3
Lifetime Tax Rates Based on Generational Accounts

Year	Net Tax Rate*	Tax Rate	Transfer Rate
1900	21.5	24.8	3.3
1910	24.7	29.8	5.2
1920	26.3	32.5	6.2
1930	28.1	35.3	7.2
1940	29.3	37.3	8.0
1950	30.6	39.9	9.3
1960	32.1	42.3	10.2
1970	33.2	45.5	11.3
1980	33.8	44.5	11.7
1990	33.6	45.7	12.2
1991	33.5	45.8	12.2
Future Generations	71.1		

**net tax rate = tax rate – transfer rate*

Source: Alan J. Auerbach, Jagadeesh Gokhale, and Laurence J. Kotlikoff. "Generational Accounting: A Meaningful Way to Evaluate Fiscal Policy," *Journal of Economic Perspectives*, vol. 8, no. 1 (Winter 1994), Table 3, p. 86.

expect them to do, then we are planning for future generations to bear a certain cost. If the data and assumptions that went into Table 18.3 turn out to be correct, then cost would be a steep one.

18.3.3 Capital and Consumption Spending

The generational accounts may be misleading, because they treat government expenditure as a pure loss. Imagine that a family purchases a house for $400,000 financed by a $320,000 mortgage. Is the mortgage debt a burden? The transaction, in itself, does not alter the family's net worth – equal entries appear on both sides of its balance sheet. The real question is whether the net return on the house (the implicit rental services it provides) are higher or lower than the cost of servicing the debt, and whether purchasing those services is a good idea in itself, taking account of the family's income.

The same considerations arise with respect to government debt. The Interstate Highway System was a massively expensive capital investment – mostly in the 1950s and '60's. It continues to be a valuable asset returning important services. Equally, airports, hospitals, schools, college campuses, public libraries, public parks, and other government financed amenities are public capital that offset the debt. The right questions to ask are: How does the real rate of return on these public investments compare to the interest paid on the debt that financed them? And, do these investments generate the services that are the most beneficial to the citizenry? If such investments were made prudently, the corresponding debt should hardly be thought of as burden on future generations. Far from it; having failed to make such investments would have been far more burdensome.

Even debt incurred for non-capital expenditure may be well justified. Sometimes present needs are so important for public welfare that they must be met, even if it means borrowing. As we saw in Figure 18.5, America's wars have all been debt financed. Clearly, it was better to borrow to win World War II, than not to have fought it. The risk, of course, is that politicians will be tempted to claim that all manner of current expenditure fall into the same category as wars.

18.3.4 Domestic and Foreign Debt

The cliché mentioned earlier that the government debt is not a burden because "we owe it to ourselves" assumes that government debt is purchased only by citizens of our own country. The assumption is false: in 2001, 35 percent of the national debt ($1,175.3 billion) was held by foreigners. The interest on their holdings transfers a substantial part of U.S. GDP to foreigners. In fact, "we owe it to them."

Is indebtedness to foreigners necessarily bad? For one thing, it is a two-way street. The United States holds the public and private assets of foreign countries as well, generating largely offsetting income flows. (Recall that these net flows are the difference between GNP and GDP; see Chapter 3, section 3.3).

Borrowing frequently contributes to good economic outcomes. It is easier to see with private debt. American railroads in the 19th century were largely built with foreign finance. True, we had to repay the debt with real transfers of income, but we also got the railroads, the jobs they produced, and the services they provided. Today, states go out of

their way to attract foreign investment in car factories or hotel complexes or other industries. It is not a zero-sum game.

It is harder to see, but the same point applies to foreign holdings of government debt. One way or another, if expenditures exceed revenues, the debt will be sold. If it is not sold abroad, interest rates must rise until it is attractive enough to be sold at home. If it is sold abroad, the domestic funds that might have purchased the government debt are turned toward private financial markets, where they help to finance domestic investment. The profits and labor incomes connected with this investment are taxed in part to service the government debt. The flow of funds to foreigners arises just as much from productive investment in the U.S. economy when the foreigners own government debt as when they own private debt.

18.4 Summing Up: Functional Finance Again

The main message of this chapter is that the simple ideas that government budgets should always be balanced, that government debt is a burden on future generations, or that debt is costless after all because we owe it to ourselves are useless as sensible guides to fiscal policy. Instead, we have adopted the perspective of functional finance. The key notion behind functional finance is that we must look past the accounts to the effects of fiscal actions on the economy. We must look to the way that particular fiscal actions affect the level of unemployment and capacity utilization, incentives to produce or to supply factors of production, and the distribution of income and wealth. These aspects of fiscal policy

do not bear any simple relationship to either the size of the government's current budget deficit or to the size of its debt.

Summary

1. *Fiscal policy* concerns government tax and spending decisions. It is more politicized than monetary policy.
2. Short-run or *countercyclical fiscal policy* can be passive (automatic stabilizer's, such as countercyclical tax and transfer rates, are built into the existing law and regulations) or active (the government alters tax or spending plans in light of economic developments).
3. Generally, to maintain full employment and stable prices, fiscal policy should stimulate in the face of negative aggregate-demand shocks and contract in the face of positive demand shocks. Fiscal policy has little ability in the short run to alter the real effects of supply shocks. However, an aggregate-supply shock that reduces potential output – *at the same level of aggregate demand* – acts on prices effectively like a positive aggregate-demand shock and can be offset through a contractionary policy. Fiscal stimulus in that situation would only accelerate prices.
4. A disadvantage of discretionary fiscal policy is that there are often long lags between recognizing the need, making appropriate political decisions, and taking the fiscal actions with the result that the implementation of the policy can be badly mistimed.
5. If consumers are fully rational, temporary fiscal policies would have little effect as they do little to alter permanent income. *Temporary* fiscal policies should have large

current effects on investment, because firms can often easily alter the timing of investment. *Permanent* policies work in the opposite way. In practice, consumers appear to form a mixture from fully rational to highly myopic or liquidity constrained, so that temporary policies have greater effects on consumption than theory might predict.

6. Balanced-budget requirements in state constitutions often force states to adjust spending procyclically and taxes countercyclically – in effect creating *automatic destabilizers*.

7. Monetary and fiscal policy are connected through the *government's budget constraint*. Deficits may be partly or completely *monetized*. Countries with inadequate institutions for levying taxes may instead "print money," levying an inflation tax. Such a fiscal strategy is often associated with particularly high inflation – sometimes *hyperinflation*.

8. The growth of the debt depends on the legacy of past fiscal policy, reflected in *interest payments*, and current fiscal policy, reflected in the *primary deficit* (the difference between current non-interest spending and current receipts). Reducing or eliminating the current primary deficit generally slows the growth rate of the debt.

9. *Functional finance* is the view that deficits and debts should not be evaluated by their size in an accounting sense, but by their effects on the real economy.

10. *Crowding out* refers to a number of phenomena in which government spending reduces private economic activity. Zero-sum crowding out occurs at full employment, when any increase in the government's share of GDP must be met with a reduction of some private party's share. Government may also displace particular expenditures, as

when private school spending falls, as the result of the creation or expansion of public schools. Government spending financed by borrowing may raise real interest rates and, therefore, reduce private investment.

11. *Ricardian equivalence* is the claim that a debt-financed tax cut does not increase current private wealth, since the present value of the future taxes needed to pay off those bonds exactly offsets the current addition to wealth. Ricardian equivalence may fail to hold if taxpayers are myopic and fail to understand the implications for future taxes or if the burden of those taxes can be shifted away from the current beneficiaries towards either other current parties or future generations. Whether Ricardian equivalence holds in fact is still hotly debated.
12. Taxes have both distributional and incentive effects. The distributional effects of tax systems are classified *progressive* if average tax rates rise with income; *neutral* if they are constant; and *regressive* if they fall. Marginal tax rates modify effective real prices or yields. For instance, higher marginal income-tax rates reduce effective real wages, typically lowering labor supply; while higher corporate income-tax rates reduce the yield on capital, typically lowering investment.
13. *Supply-side economics* is the doctrine that lower tax rates substantially raise growth rates by encouraging greater supplies of labor and capital. The *Laffer curve* relates tax rates to the level of tax revenue. The Laffer curve must have a maximum value between a zero and 100 percent tax rate. Some supply-side advocates argue that the economy is past the maximum, so that a cut in tax rates would actually increase tax revenues. Evidence for the United States does not support this view. Evidence does support the existence of genuine supply-side effects of tax rates on real GDP.

14. The ratio of the debt to GDP is one measure of its *burden*. The change in this ratio depends on the real interest rate, the ratio of the primary deficit to the existing debt and the growth rate of the economy. Typically, if the rate of growth of GDP is greater than the than the real interest rate, a low primary deficit results in a falling burden of the debt.
15. *Generational accounts* show the present value of the lifetime earnings and tax payments of each generation and can be used to compute a lifetime tax rate that shows what fraction of the debt is paid by each generation. On reasonable assumptions, current generations in the United States appear to have shifted a significant share of the debt to future generations.
16. In assessing the burden of debt to future generations, the benefits of public capital investment, financed through that debt to those generations should also be counted.
17. A substantial share of U.S. public debt is held by foreigners. In assessing its cost, however, the benefits of the real expenditure it financed must also be counted.

Key Concepts

automatic fiscal policy
discretionary fiscal
monetization of the deficit
inflation tax
seigniorage
primary deficit
functional finance
crowding out
zero-sum crowding out
crowding in
Ricardian equivalence
progressive tax
neutral tax
regressive tax
supply-side economics
Laffer curve
government's intertemporal balance sheet (or intertemporal budget constraint)
generational accounts

Suggested Readings

Alan J. Auerbach, Jagadeesh Gokhale, and Laurence J. Kotlikoff. "Generational Accounting: A Meaningful Way to Evaluate Fiscal Policy," *Journal of Economic Perspectives*, vol. 8, no. 1 (Winter 1994), pp. 73-94.

Robert Barro . "The Ricardian Approach to Budget Deficits," *Journal of Economic Perspectives*, vol. 3, no. 2 (Spring 1989), pp. 37-54.

Kevin D. Hoover, *The New Classical Macroeconomics*. Oxford: Blackwell, ch. 7.

Abba Lerner. "Functional Finance and the Federal Debt," *Social Research*, vol. 10, no. 1 (1943), pp. 38-51.

John Taylor. "Reassessing Discretionary Fiscal Policy," *Journal of Economic Perspectives*, vol. 14, no. 3 (Summer 2000), pp. 21-36.

Problems

Data for this exercise are available on the course website under the link for Chapter 18 (**insert web link here**). Before starting these exercises, the student should review the relevant portions of the *Guide to Working with Economic Data*: sections G.5, G.14, and G.15.

Problem 18.1. The distinction between *aggregate-supply factors* and *aggregate-demand factors* was already made in Chapter 12. Aggregate-supply and aggregate-demand *shocks* suggest a special case in which the factor changes by a large and unexpected amount. Give some particular examples of recent events that might be classified as aggregate-demand or aggregate-supply shocks. Try to think of both positive and negative shocks. Explain your reasoning. If an event is a mixed shock, explain which aspects of it contributes to aggregate-supply and aggregate-demand.

Problem 18.2. Figure 18.1 uses the IS curve with a market real rate of interest to show the effect of a fiscal-policy action: an increase in government expenditure. Use the same apparatus to show the effect of other fiscal-policy actions:
(a) an increase in marginal tax rates;
(b) an increase in marginal transfer rates.

Problem 18.3. Figure 18.2 analyzes a negative aggregate-demand shock. Using a similar diagram, analyze a positive aggregate demand shock, noting its effect on output, employment, unemployment, and inflation. Describe particular fiscal policy actions that would maintain (or restore) NAIRU in the face of the shock. (Be specific about the policymakers'actions; do not just describe the shifting of curves.) What assumptions have you made about the conduct of monetary policy?

Problem 18.4. An unexpected rise in productivity would count as an aggregate-supply shock: positive or negative? Using a diagram or other analysis, how would you expect such a shock to affect output (relative to potential) and inflation. How should fiscal policy respond? What happens if they fail to perceive the true nature of the shock? Look at the data for the mid-1990s up to the recession in 2001. Do productivity, inflation, and scaled output behave in a way consistent with your analysis?

Problem 18.5. For the U.S. Federal government, plot total expenditures, expenditures on goods and services, expenditures on transfer payments, and interest payments, all as a percentage of GDP for the post-World War II period. How have these shares changed over time? Write a brief essay discussing these changes in relationship to the political, economic, and social history of the United States. (Chapter 1 is relevant to your answer, but further research may be necessary.)

Problem 18.6. For the U.S. Federal government, plot capital and current expenditures as a share of GDP for the post-World War II period. On a separate graph, plot military and non-military expenditures as a share of GDP. Relate any large changes in the series on either graph to particular presidential administrations. Write a brief essay on the changing role of the Federal government in the economy. (Additional research may be helpful.)

Problem 18.7. For the U.S. Federal government, plot total revenues and revenues due to each of the main tax sources (personal, corporate, social insurance) as a share of GDP for the post-World War II period. Write a brief descriptive note on the changing importance of different revenue sources.

Problem 18.8. For the post-World War II period, plot U.S. Federal government revenues and state and local revenues as a share of GDP. Compare to Figure 12.5. How has the level and composition of taxes in the changed in the U.S. economy during this period?

Problem 18.9. For the post-World War II period, plot U.S. Federal government expenditure, total state and local expenditure, and each of the categories of state and local expenditure (goods and services, transfer payments, and interest) as shares of GDP. Write a brief essay commenting on any changes in the economic role of the Federal versus the state and local governments suggested by these data. (If you have done Problems 18.6 or 18.7, incorporate your findings into the essay.)

Problem 18.10. Are state and local fiscal actions stabilizing or destabilizing? To investigate:

(a) Use state and local expenditure data as in Problem 18.9 and plot the four series against the NBER business cycle dates.

(b) Plot state and local taxes as a share of potential output against the NBER business cycle dates.

(c) Write a brief note summarizing the evidence about the stabilizing or destabilizing effects of state and local fiscal actions.

Problem 18.11. How might a strict balance-budget amendment to the U.S. Constitution affect the actions of the automatic stabilizers in the economy?

Problem 18.12. In 2004, the Social Security payroll tax in the United States was 6.20 percent on income up to $87,900 and zero thereafter; while the Medicare payroll tax was 1.45 percent on income with no limit. Make two (quantitatively accurate graphs): one of the payroll tax function (i.e., the combined taxes as a function of income analogous to Figure 18.8) and one showing the marginal and average tax rates (analogous to Figure 18.9). Are the combined payroll taxes progressive, regressive, or neutral?

Problem 18.13. High deficits are sometimes blamed for high real interest rates.
(a) Explain why.
(b) Plot the U.S. Federal government budget deficit (scaled by potential output) and the *ex post* real interest rate (10-year government bond rate less the inflation rate for the following year). Does your graph suggest a connection?
(c) Do the time series in (b) appear to be stationary? (See the *Guide*, sections G.5, G.14) If so, then make a scatterplot of the real interest rate against the scaled deficit; add a regression line, displaying the equation and R^2. If not, transform the series by taking differences where appropriate and then make the scatterplot.
(d) Write a brief note summarizing the evidence in your graphs for and against deficits causing high real interest rates. (Be as specific and quantitative as possible.) How compelling is the evidence? What pitfalls might you face in drawing such inferences?

Problem 18.14. High deficits are also sometimes blamed for high inflation rates.
(a) Explain why.
(b) Plot the U.S. Federal government budget deficit scaled by potential output and CPI inflation rate. Does your graph suggest a connection?
(c) Do the time series in (b) appear to be stationary? (See the *Guide*, sections G.5.2 and G.14) If so, then make a scatterplot of the real interest rate against the scaled deficit; add a regression line, displaying the equation and R^2. If not, transform the series by taking differences where appropriate and then make the scatterplot.
(d) Write a brief note summarizing the evidence in your graphs for and against deficits causing inflation. (Be as specific and quantitative as possible.) How compelling is the evidence? What pitfalls might you face in drawing such inferences?

Problem 18.15. Think of examples currently under discussions in political circles (whether or not they have any realistic chance of being implemented) of government expenditures that might displace particular private expenditures. (See section 18.2.3 in the main text.) Can you think of examples of proposals to eliminate government expenditures that might have the opposite effect?

Problem 18.16. The U.S. Social Security Trust Fund is underfunded in the sense that the present value of it current and expected revenues falls short of the present value of its current and future commitments to retirees. Compare three policies to address this question: (i) raise the Social Security payroll tax by enough to bring the present value of revenues up to that of commitments; (ii) sell enough government bonds to build up the trust fund to a level meet expected needs; (iii) do nothing right now. Under all three policies, assume that the government remains committed to paying benefits as

currently scheduled and that no one doubts that they will do so. Write a brief essay on the economic effects of these policies on interest rates, inflation, and output assuming, first that Ricardian equivalence holds and, second, that it does not hold.

Problem 18.17. With the return of U.S. Federal budget deficits in 2001 after a brief period of surpluses, political discussion turned again to the growth of the Federal debt. To put it perspective:

(a) Of course, nominal quantities are usually misleading, so convert the Federal debt to real terms (explain your conversion) and plot from 1900 to the present.

(b) The burden of the debt is probably better measured by its size relative to national income, so express the debt as a share of GDP and plot from 1900 to the present.

(c) Write a brief essay relating the main features of your two plots to the economic and political history of the United States. What light does this history shed on the current situation with regard to the debt?

Problem 18.18. The theory of financial markets suggests that it is the *level* of the debt (relative to the size of the economy), rather than the deficit that ought to be related to real interest rates. Using whatever data and statistical techniques you believe to be appropriate, investigate this question. Write a note describing your data, your procedures, and your answer to the question: does a larger debt imply higher real interest rates?