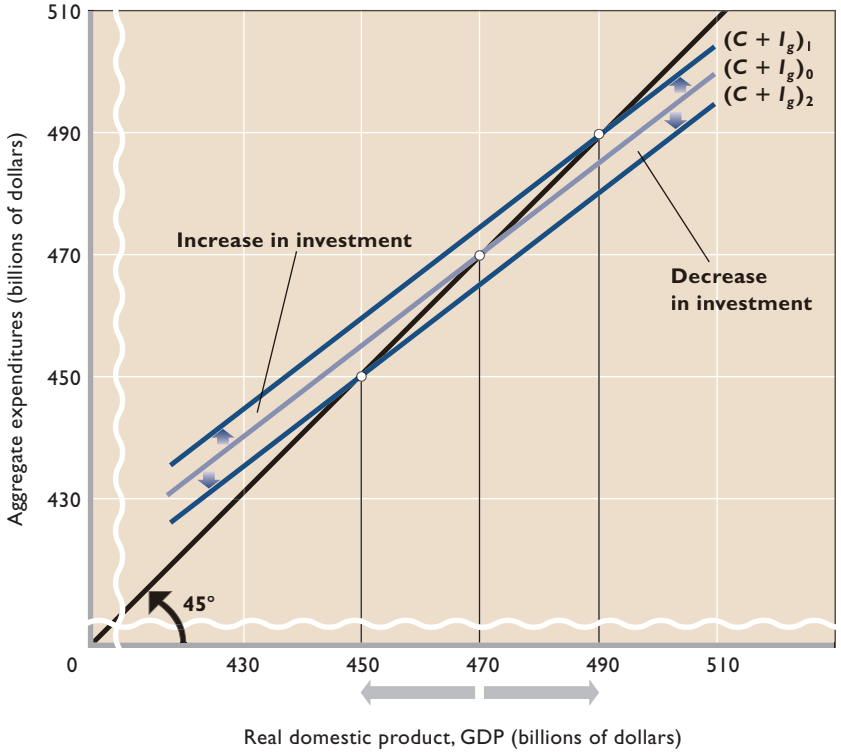


FIGURE 28.3 Changes in the equilibrium GDP caused by shifts in the aggregate expenditures schedule and the investment schedule. An upward shift of the aggregate expenditures schedule from $(C + I_g)_0$ to $(C + I_g)_1$ will increase the equilibrium GDP. Conversely, a downward shift from $(C + I_g)_0$ to $(C + I_g)_2$ will lower the equilibrium GDP. The extent of the changes in equilibrium GDP will depend on the size of the multiplier, which in this case is 4 (=20/5). The multiplier is equal to 1/MPS (here, 4 = 1/.25).

Adding International Trade

We next move from a closed economy to an open economy that incorporates exports (X) and imports (M). Our focus will be on **net exports** (exports minus imports), which may be either positive or negative.

Net Exports and Aggregate Expenditures

Like consumption and investment, exports create domestic production, income, and employment for a nation. Although U.S. goods and services produced for export are sent abroad, foreign spending on those goods and services increases production and creates jobs and incomes in the United States. We must therefore include exports as a component of U.S. aggregate expenditures.

Conversely, when an economy is open to international trade, it will spend part of its income on imports—goods and services produced abroad. To avoid overstating the value of domestic production, we must subtract the amount spent on imported goods because such spending generates production and income abroad rather than at home. So, to correctly measure aggregate expenditures for domestic goods and services, we must subtract expenditures on imports from total spending.

In short, for a private closed economy, aggregate expenditures are $C + I_g$. But for an open economy, aggregate expenditures are $C + I_g + (X - M)$. Or, recalling that net exports (X_n) equal $(X - M)$, we can say that aggregate expenditures for a private open economy are $C + I_g + X_n$.

The Net Export Schedule

A net export schedule lists the amount of net exports that will occur at each level of GDP. Table 28.3 shows two possible net export schedules for the hypothetical economy represented in Table 28.2. In net export schedule X_{n1} (columns 1 and 2), exports exceed imports by $5 billion at each level of GDP. Perhaps exports are $15 billion while imports are $10 billion. In schedule X_{n2} (columns 1 and 3), imports are $5 billion higher than exports. Perhaps imports are $20 billion while exports are $15 billion. To simplify our discussion, we assume in both schedules that net exports are independent of GDP.[1]

[1]In reality, although our exports depend on foreign incomes and are thus independent of U.S. GDP, our imports do vary directly with our own domestic national income. Just as our domestic consumption varies directly with our GDP, so do our purchases of foreign goods. As our GDP rises, U.S. households buy not only more Pontiacs and more Pepsi but also more Porsches and more Perrier. However, for now we will ignore the complications of the positive relationship between imports and U.S. GDP.

TABLE 28.3 Two Net Export Schedules (in Billions)

(1) Level of GDP	(2) Net Exports, X_{n1} ($X > M$)	(3) Net Exports, X_{n2} ($X < M$)
$370	$+5	$−5
390	+5	−5
410	+5	−5
430	+5	−5
450	+5	−5
470	+5	−5
490	+5	−5
510	+5	−5
530	+5	−5
550	+5	−5

Figure 28.4b represents the two net export schedules in Table 28.3. Schedule X_{n1} is above the horizontal axis and depicts positive net exports of $5 billion at all levels of GDP. Schedule X_{n2}, which is below the horizontal axis, shows negative net exports of $5 billion at all levels of GDP.

Net Exports and Equilibrium GDP

The aggregate expenditures schedule labeled $C + I_g$ in Figure 28.4a reflects the private closed economy. It shows the combined consumption and gross investment expenditures occurring at each level of GDP. With no foreign sector, the equilibrium GDP is $470 billion.

But in the private open economy, net exports can be either positive or negative. Let's see how each of the net export schedules in Figure 28.4b affects equilibrium GDP.

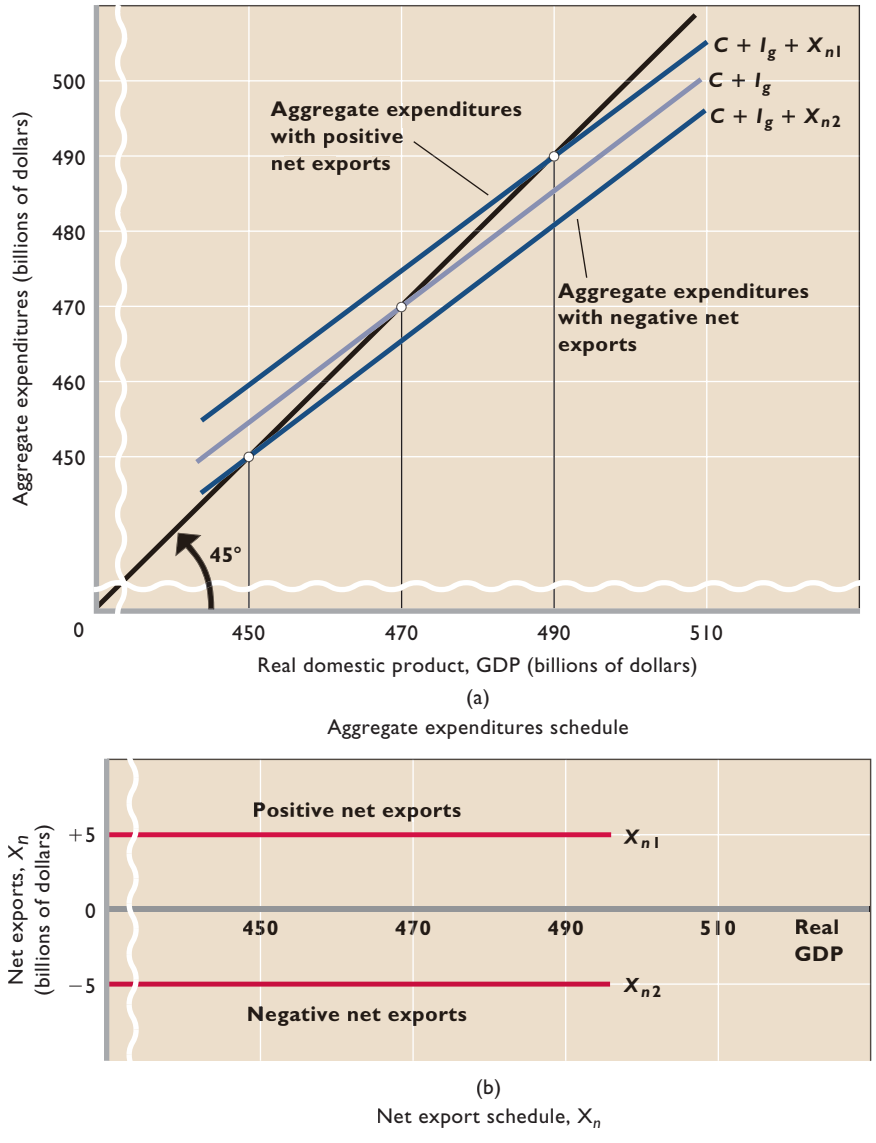


FIGURE 28.4 Net exports and equilibrium GDP. Positive net exports such as shown by the net export schedule X_{n1} in (b) elevate the aggregate expenditures schedule in (a) from the closed-economy level of $C + I_g$ to the open-economy level of $C + I_g + X_{n1}$. Negative net exports such as depicted by the net export schedule X_{n2} in (b) lower the aggregate expenditures schedule in (a) from the closed-economy level of $C + I_g$ to the open-economy level of $C + I_g + X_{n2}$.

Positive Net Exports Suppose the net export schedule is X_{n1}. The $5 billion of additional net export expenditures by the rest of the world is accounted for by adding that $5 billion to the $C + I_g$ schedule in Figure 28.4a. Aggregate expenditures at each level of GDP are then $5 billion higher than $C + I_g$ alone. The aggregate expenditures schedule for the open economy thus becomes $C + I_g + X_{n1}$. In this case, international trade increases equilibrium GDP from $470 billion in the private closed economy to $490 billion in the private open economy. Adding net exports of $5 billion has increased GDP by $20 billion, in this case implying a multiplier of 4.

Generalization: Other things equal, positive net exports increase aggregate expenditures and GDP beyond what they would be in a closed economy. Be careful to notice that this increase is the result of exports being larger than imports. This is true because exports and imports have opposite effects on the measurement of domestically produced output. Exports increase real GDP by increasing expenditures on domestically produced output. Imports, by contrast, must be subtracted when calculating real GDP because they are expenditures directed toward output produced abroad. It is only because net exports are positive in this example—so that the expansionary effect of exports outweighs the reductions caused by imports—that we get the overall increase in real GDP. As the next section shows, if net exports are negative, then the reductions caused by imports will outweigh the expansionary effect of exports so that domestic real GDP will decrease.

Negative Net Exports Suppose that net exports are a negative $5 billion as shown by X_{n2} in Figure 28.4b. This means that our hypothetical economy is importing $5 billion more of goods than it is exporting. The aggregate expenditures schedule shown as $C + I_g$ in Figure 28.4a therefore overstates the expenditures on domestic output at each level of GDP. We must reduce the sum of expenditures by the $5 billion net amount spent on imported goods. We do that by subtracting the $5 billion of net imports from $C + I_g$.

The relevant aggregate expenditures schedule in Figure 28.4a becomes $C + I_g + X_{n2}$ and equilibrium GDP falls from $470 billion to $450 billion. Again, a change in net exports of $5 billion has produced a fourfold change in GDP, reminding us that the multiplier in this example is 4.

This gives us a corollary to our first generalization: Other things equal, negative net exports reduce aggregate expenditures and GDP below what they would be in a closed economy. When imports exceed exports, the contractionary effect of the larger amount of imports outweighs the expansionary effect of the smaller amount of exports, and equilibrium real GDP decreases.

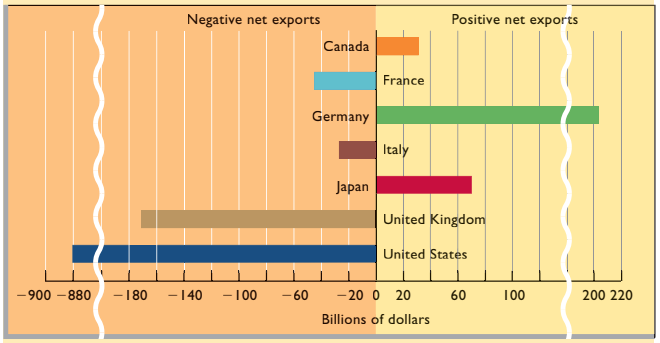
Our generalizations of the effects of net exports on GDP mean that a decline in X_n—a decrease in exports or an increase in imports—reduces aggregate expenditures and contracts a nation's GDP. Conversely, an increase in X_n—the result of either an increase in exports or a decrease in imports—increases aggregate expenditures and expands GDP.

As is shown in Global Perspective 28.1, net exports vary greatly among the major industrial nations. **(Key Question 9)**

GLOBAL PERSPECTIVE 28.1

Net Exports of Goods, Selected Nations, 2006

Some nations, such as Germany and Japan, have positive net exports; other countries, such as the United States and the United Kingdom, have negative net exports.



Source: World Trade Organization. WTO Publications, **www.wto.org.** Used by permission.

International Economic Linkages

Our analysis of net exports and real GDP suggests how circumstances or policies abroad can affect U.S. GDP.

Prosperity Abroad A rising level of real output and income among U.S. foreign trading partners enables the United States to sell more goods abroad, thus raising U.S. net exports and increasing its real GDP (assuming initially there is excess capacity). There is good reason for Americans to be interested in the prosperity of our trading partners. Their good fortune enables them to buy more of our exports, increasing our income and enabling us in turn to buy more foreign imports. These imported goods are the ultimate benefit of international trade. Prosperity abroad transfers some of that prosperity to Americans.

Tariffs Suppose foreign trading partners impose high tariffs on U.S. goods to reduce their imports from the United States and thus increase production in their economies. Their imports, however, are U.S. exports. So when they restrict their imports to stimulate *their* economies, they are reducing U.S. exports and depressing *our* economy. We are likely to retaliate by imposing tariffs on their products. If so, their exports to us will decline and their net exports may

fall. It is not clear, then, whether tariffs increase or decrease a nation's net exports. In the Great Depression of the 1930s various nations, including the United States, imposed trade barriers as a way of reducing domestic unemployment. But rounds of retaliation simply throttled world trade, worsened the Depression, and increased unemployment.

Exchange Rates Depreciation of the dollar relative to other currencies (discussed in Chapter 5) enables people abroad to obtain more dollars with each unit of their own currencies. The price of U.S. goods in terms of those currencies will fall, stimulating purchases of U.S. exports. Also, U.S. customers will find they need more dollars to buy foreign goods and, consequently, will reduce their spending on imports. The increased exports and decreased imports will increase U.S. net exports and thus expand the nation's GDP.

Whether depreciation of the dollar will actually raise real GDP or produce inflation depends on the initial position of the economy relative to its full-employment output. If the economy is operating below its full-employment level, prices are likely to be sticky or even stuck due to a large oversupply of unemployed labor and capital. In such a situation, depreciation of the dollar and the resulting rise in net exports will increase aggregate expenditures and expand real GDP without increasing prices. But if the economy is already fully employed, then there will not be a huge oversupply of unemployed labor and capital keeping prices sticky. In such a situation, prices will be flexible and the increase in net exports and aggregate expenditures will cause demand-pull inflation. Because resources are already fully employed, the increased spending cannot expand real output; but it can and does increase the prices of the existing output. Having said this, however, we need to caution you that evidence from the actual economy suggests that, even at full employment, the inflationary consequences of dollar depreciation are very small.

This last example has been cast only in terms of depreciation of the dollar. You should think through the impact that appreciation of the dollar would have on net exports and equilibrium GDP.

QUICK REVIEW 28.2

- Positive net exports increase aggregate expenditures relative to the closed economy and, other things equal, increase equilibrium GDP.
- Negative net exports decrease aggregate expenditures relative to the closed economy and, other things equal, reduce equilibrium GDP.
- In the open economy changes in (a) prosperity abroad, (b) tariffs, and (c) exchange rates can affect U.S. net exports and therefore U.S. aggregate expenditures and equilibrium GDP.

Adding the Public Sector

Our final step in constructing the full aggregate expenditures model is to move the analysis from a private (no-government) open economy to an economy with a public sector (sometimes called a "mixed economy"). This means adding government purchases and taxes to the model.

For simplicity, we will assume that government purchases are independent of the level of GDP and do not alter the consumption and investment schedules. Also, government's net tax revenues—total tax revenues less "negative taxes" in the form of transfer payments—are derived entirely from personal taxes. Finally, a fixed amount of taxes is collected regardless of the level of GDP.

Government Purchases and Equilibrium GDP

Suppose the government decides to purchase $20 billion of goods and services regardless of the level of GDP and tax collections.

Tabular Example Table 28.4 shows the impact of this purchase on the equilibrium GDP. Columns 1 through 4 are carried over from Table 28.2 for the private closed economy, in which the equilibrium GDP was $470 billion. The only new items are exports and imports in column 5 and government purchases in column 6. (Observe in column 5 that net exports are zero.) As shown in column 7, the addition of government purchases to private spending ($C + I_g + X_n$) yields a new, higher level of aggregate expenditures ($C + I_g + X_n + G$). Comparing columns 1 and 7, we find that aggregate expenditures and real output are equal at a higher level of GDP. Without government purchases, equilibrium GDP was $470 billion (row 6); *with* government purchases, aggregate expenditures and real output are equal at $550 billion (row 10). Increases in public spending, like increases in private spending, shift the aggregate expenditures schedule upward and produce a higher equilibrium GDP.

Note, too, that government spending is subject to the multiplier. A $20 billion increase in government purchases has increased equilibrium GDP by $80 billion (from $470 billion to $550 billion). The multiplier in this example is 4.

This $20 billion increase in government spending is *not* financed by increased taxes. Shortly, we will demonstrate that increased taxes *reduce* equilibrium GDP.

Graphical Analysis In Figure 28.5, we vertically add $20 billion of government purchases, G, to the level of private spending, $C + I_g + X_n$. That added $20 billion raises the aggregate expenditures schedule (private plus

TABLE 28.4 The Impact of Government Purchases on Equilibrium GDP

(1) Real Domestic Output and Income (GDP = DI), Billions	(2) Consumption (C), Billions	(3) Savings (S), Billions	(4) Investment (I_g), Billions	(5) Net Exports (X_n), Billions: Exports (X)	(5) Net Exports (X_n), Billions: Imports (M)	(6) Government Purchases (G), Billions	(7) Aggregate Expenditures ($C + I_g + X_n + G$), Billions (2) + (4) + (5) + (6)
(1) $370	$375	$−5	$20	$10	$10	$20	$415
(2) 390	390	0	20	10	10	20	430
(3) 410	405	5	20	10	10	20	445
(4) 430	420	10	20	10	10	20	460
(5) 450	435	15	20	10	10	20	475
(6) 470	450	20	20	10	10	20	490
(7) 490	465	25	20	10	10	20	505
(8) 510	480	30	20	10	10	20	520
(9) 530	495	35	20	10	10	20	535
(10) ***550***	***510***	***40***	***20***	***10***	***10***	***20***	***550***

public) to $C + I_g + X_n + G$, resulting in an $80 billion increase in equilibrium GDP, from $470 to $550 billion.

A decline in government purchases G will lower the aggregate expenditures schedule in Figure 28.5 and result in a multiplied decline in the equilibrium GDP. Verify in Table 28.4 that if government purchases were to decline from $20 billion to $10 billion, the equilibrium GDP would fall by $40 billion.

Taxation and Equilibrium GDP

The government not only spends but also collects taxes. Suppose it imposes a **lump-sum tax,** which is a tax of a constant amount or, more precisely, a tax yielding the same amount of tax revenue at each level of GDP. Let's assume this tax is $20 billion, so that the government obtains $20 billion of tax revenue at each level of GDP regardless of the level of government purchases.

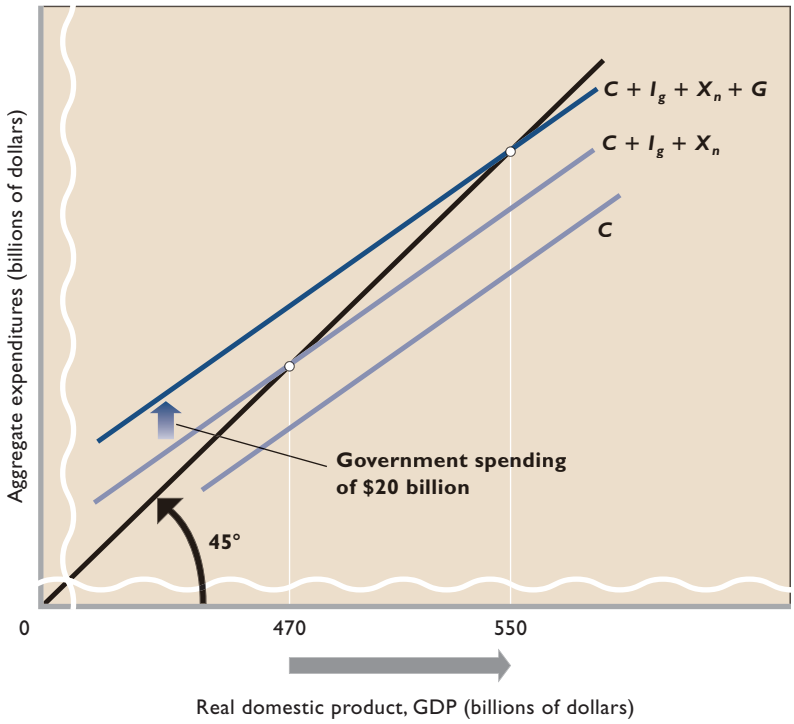


FIGURE 28.5 Government spending and equilibrium GDP. The addition of government expenditures of G to our analysis raises the aggregate expenditures ($C + I_g + X_n + G$) schedule and increases the equilibrium level of GDP, as would an increase in C, I_g, or X_n.

TABLE 28.5 Determination of the Equilibrium Levels of Employment, Output, and Income: Private and Public Sectors

(1) Real Domestic Output and Income (GDP = NI = PI), Billions	(2) Taxes (T), Billions	(3) Disposable Income (DI), Billions, (1) − (2)	(4) Consumption (C_a), Billions	(5) Saving (S_a), Billions (3)−(4)	(6) Investment (I_g), Billions	(7) Net Exports (X_n), Billions: Exports (X)	(7) Net Exports (X_n), Billions: Imports (M)	(8) Government Purchases (G), Billions	(9) Aggregate Expenditures ($C_a + I_g + X_n + G$), Billions, (4) + (6) + (7) + (8)
(1) $370	$20	$350	$360	$−10	$20	$10	$10	$20	$400
(2) 390	20	370	375	−5	20	10	10	20	415
(3) 410	20	390	390	0	20	10	10	20	430
(4) 430	20	410	405	5	20	10	10	20	445
(5) 450	20	430	420	10	20	10	10	20	460
(6) 470	20	450	435	15	20	10	10	20	475
(7) ***490***	***20***	***470***	***450***	***20***	***20***	***10***	***10***	***20***	***490***
(8) 510	20	490	465	25	20	10	10	20	505
(9) 530	20	510	480	30	20	10	10	20	520
(10) 550	20	530	495	35	20	10	10	20	535

Tabular Example In Table 28.5, which continues our example, we find taxes in column 2, and we see in column 3 that disposable (after-tax) income is lower than GDP (column 1) by the $20 billion amount of the tax. Because households use disposable income both to consume and to save, the tax lowers both consumption and saving. The MPC and MPS tell us how much consumption and saving will decline as a result of the $20 billion in taxes. Because the MPC is .75, the government tax collection of $20 billion will reduce consumption by $15 billion (= .75 × $20 billion). Since the MPS is .25, saving will drop by $5 billion (= .25 × $20 billion).

Columns 4 and 5 in Table 28.5 list the amounts of consumption and saving *at each level of GDP*. Note they are $15 billion and $5 billion smaller than those in Table 28.4. Taxes reduce disposable income relative to GDP by the amount of the taxes. This decline in DI reduces both consumption and saving at each level of GDP. The MPC and the MPS determine the declines in C and S.

To find the effect of taxes on equilibrium GDP, we calculate aggregate expenditures again, as shown in column 9, Table 28.5. Aggregate spending is $15 billion less at each level of GDP than it was in Table 28.4. The reason is that after-tax consumption, designated by C_a, is $15 billion less at each level of GDP. A comparison of real output and aggregate expenditures in columns 1 and 9 shows that the aggregate amounts produced and purchased are equal only at $490 billion of GDP (row 7). The $20 billion lump-sum tax has reduced equilibrium GDP by $60 billion, from $550 billion (row 10, Table 28.3) to $490 billion (row 7, Table 28.4).

Graphical Analysis In Figure 28.6 the $20 billion increase in taxes shows up as a $15 (not $20) billion decline in the aggregate expenditures ($C_a + I_g + X_n + G$) schedule. This decline in the schedule results solely from a decline in the consumption C component of aggregate expenditures. The equilibrium GDP falls from $550 billion to $490 billion because of this tax-caused drop in consumption. With no change in government expenditures, tax increases lower the aggregate expenditures schedule relative to the 45° line and reduce the equilibrium GDP.

In contrast to our previous case, a *decrease* in existing taxes will raise the aggregate expenditures schedule in Figure 28.6 as a result of an increase in consumption at all GDP levels. You should confirm that a tax reduction of $10 billion (from the present $20 billion to $10 billion) would increase the equilibrium GDP from $490 billion to $520 billion. **(Key Question 12)**

Differential Impacts You may have noted that equal changes in G and T do not have equivalent impacts on GDP. The $20 billion increase in G in our illustration, subject to the multiplier of 4, produced an $80 billion increase in real GDP. But the $20 billion increase in taxes reduced GDP by only $60 billion. Given an MPC of .75, the tax increase of $20 billion reduced consumption by only $15 billion (not $20 billion) because saving also fell by $5 billion. Subjecting the $15 billion decline in consumption to the multiplier of

WORKED PROBLEMS

W 28.2
Complete aggregate expenditures model