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CHAPTER 12

Aggregate Demand and Aggregate Supply

Learning Objectives

- LO12.1** Define aggregate demand (AD) and explain how its downward slope is the result of the real-balances effect, the interest-rate effect, and the foreign purchases effect.
- LO12.2** Explain the factors that cause changes (shifts) in AD.
- LO12.3** Define aggregate supply (AS) and explain how it differs in the immediate short run, the short run, and the long run.
- LO12.4** Explain the factors that cause changes (shifts) in AS.
- LO12.5**

Discuss how AD and AS determine an economy's equilibrium price level and level of real GDP.

LO12.6 Describe how the AD-AS model explains periods of demand-pull inflation, cost-push inflation, and recession.

LO12.7 (Appendix) Identify how the aggregate demand curve relates to the aggregate expenditures model.

During the recession of 2007–2009, the economic terms *aggregate demand* and *aggregate supply* moved from the obscurity of economic journals and textbooks to the spotlight of national newspapers, Web sites, radio, and television.

The media and public asked: Why had *aggregate demand* declined, producing the deepest recession and highest rate of unemployment since 1982? Why hadn't the reductions in interest rates by the Federal Reserve boosted *aggregate demand*? Would

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the federal government's \$787 billion stimulus package increase **Page 264**
aggregate demand and reduce unemployment, as intended? Would a resurgence of oil prices and other energy prices reduce *aggregate supply*, choking off an economic expansion?

Aggregate demand and aggregate supply are the featured elements of the **aggregate demand–aggregate supply model (AD-AS model)**, the focus of this chapter. The aggregate expenditures model of the previous chapter is an immediate-short-run model, in which prices are assumed to be fixed. In contrast, the AD-AS model in this chapter is a “variable price–variable output” model that allows both the price level and level of real GDP to change. It can also show longer time horizons, distinguishing between the immediate short run, the short run, and the long run. Further, in subsequent chapters, we will see that the AD-AS model easily depicts fiscal and monetary policies such as those used in 2008 and 2009 to try to halt the downward slide of the economy and promote its recovery.

Aggregate Demand

LO12.1 Define aggregate demand (AD) and explain how its downward slope is due to the wealth effect, the interest rate effect, and the foreign purchases effect.

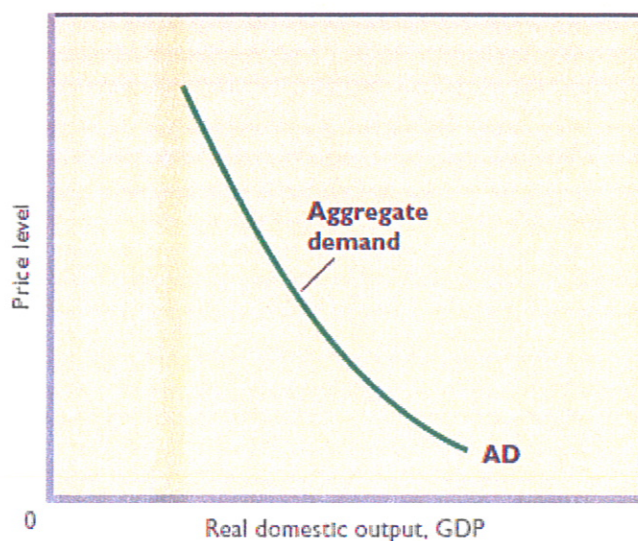
Aggregate demand is a schedule or curve that shows the amount of a nation's output (real GDP) that buyers collectively desire to purchase at each possible price level. These buyers include the nation's households, businesses, and government along with consumers located abroad (households, businesses, and governments in other nations). The relationship between the price level (as measured by the GDP price index) and the amount of real GDP demanded is inverse or negative: When the price level rises, the quantity of real GDP demanded decreases; when the price level falls, the quantity of real GDP demanded increases.

Aggregate Demand Curve

The inverse relationship between the price level and real GDP is shown in Figure 12.1, where the aggregate demand curve AD slopes downward, as does the demand curve for an individual product.

Why the downward slope? The explanation is *not* the same as that for why the demand for a single product slopes downward. That explanation centered on the income effect and the substitution effect. When the price of an *individual* product falls, the consumer's (constant) nominal income allows a larger purchase of the product (the income effect). And, as price falls, the consumer wants to buy more of the product because it becomes relatively less expensive than other goods (the substitution effect).

FIGURE 12.1 The aggregate demand curve. The downsloping aggregate demand curve AD indicates an inverse (or negative) relationship between the price level and the amount of real output purchased.



But these explanations do not work for aggregates. In Figure 12.1, when the economy moves down its aggregate demand curve, it moves to a lower general price level. But our circular flow model tells us that when consumers pay lower prices for goods and services, less nominal income flows to resource suppliers in the form of wages, rents, interest, and profits. As a result, a decline in the price level does not necessarily mean an increase in the nominal income of the economy as a whole. Thus, a decline in the price level need not produce an income effect, where more output is purchased because lower nominal prices leave buyers with greater real income.

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Similarly, in Figure 12.1, prices in general are falling as we move down the aggregate demand curve, so the rationale for the substitution effect (where more of a specific product is purchased because it becomes cheaper relative to all other products) is not applicable. There is no *overall* substitution effect among domestically produced goods when the price level falls.

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If the conventional substitution and income effects do not explain the downward slope of the aggregate demand curve, what does? The explanation rests on three effects of a price-level change.



Real-Balances Effect A change in the price level produces a **real-balances effect**. Here is how it works: A higher price level reduces the real value or purchasing power of the public's accumulated savings balances. In particular, the real value of assets with fixed money values, such as savings accounts or bonds, diminishes. Because a higher price level erodes the purchasing power of such assets, the public is poorer in real terms and will reduce its spending. A household might buy a new car or a plasma TV if the purchasing power of its financial asset balances is, say, \$50,000. But if inflation erodes the purchasing power of its asset balances to \$30,000, the household may defer its purchase. So a higher price level means less consumption spending.

Interest-Rate Effect The aggregate demand curve also slopes downward because of the **interest-rate effect**. When we draw an aggregate demand curve, we assume that the supply of money in the economy is fixed. But when the price level rises, consumers need more money for purchases and businesses need more money to meet their payrolls and to buy other resources. A \$10 bill will do when the price of an item is \$10, but a \$10 bill plus a \$1 bill is needed when the item costs \$11. In short, a higher price level increases the demand for money. So, given a fixed supply of money, an increase in money demand will drive up the price paid for its use. That price is the interest rate.

Higher interest rates curtail investment spending and interest-sensitive consumption spending. Firms that expect a 6 percent rate of return on a potential purchase of capital will find that investment potentially profitable when the interest rate is, say, 5 percent. But the investment will be unprofitable and will not be made when the interest rate has risen to 7 percent. Similarly, consumers may decide not to purchase a new house or new automobile when the interest rate on loans goes up. So, by increasing the demand for money and consequently the interest rate, a higher price level reduces the amount of real output demanded.

Foreign Purchases Effect The final reason why the aggregate demand curve slopes downward is the **foreign purchases effect**. When the U.S. price level rises relative to foreign price levels (and exchange rates do not respond quickly or completely), foreigners buy fewer U.S. goods and Americans buy more foreign goods. Therefore, U.S. exports fall and U.S. imports rise. In short, the rise in the price level reduces the quantity of U.S. goods demanded as net exports.

These three effects, of course, work in the opposite direction for a decline in the price level. A decline in the price level increases consumption through the real-balances effect and interest-rate effect; increases investment through the interest-rate effect; and raises net exports by increasing exports and decreasing imports through the foreign purchases effect.

Changes in Aggregate Demand

LO12.3 Explain the factors that cause changes in aggregate demand

Other things equal, a change in the price level will change the amount of aggregate spending and therefore change the amount of real GDP demanded by the economy. Movements along a fixed aggregate demand curve represent these changes in real GDP. However, if one or more of those “other things” change, the entire aggregate demand curve will shift. We call these other things **determinants of aggregate demand** or, less formally, *aggregate demand shifters*. They are listed in Figure 12.2.

Changes in aggregate demand involve two components:

- A change in one of the determinants of aggregate demand that directly changes the amount of real GDP demanded.
- A multiplier effect that produces a greater ultimate change in aggregate demand than the initiating change in spending.

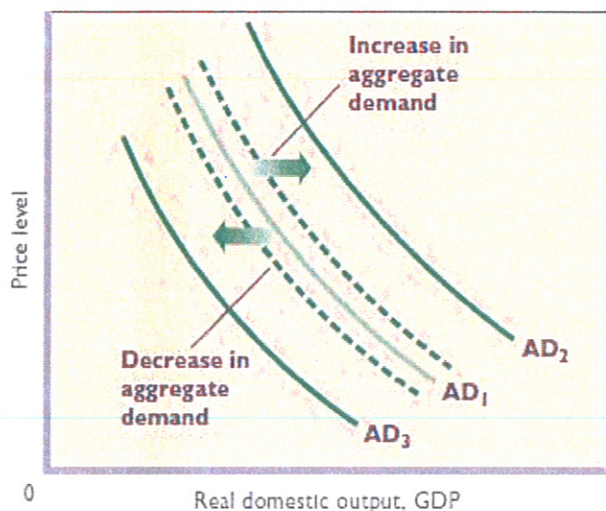
In Figure 12.2, the full rightward shift of the curve from AD_1 to AD_2 shows an increase in aggregate demand, separated into these two components. The horizontal distance between AD_1 and the broken curve to its right illustrates an initial increase in spending, say, \$5 billion of added investment. If the economy's MPC is 0.75, for example, then the simple multiplier is 4. So the aggregate demand curve shifts rightward from AD_1 to AD_2 —four times the distance between AD_1 and the broken line. The multiplier process magnifies the initial change in spending into successive rounds of new consumption spending. After the shift, \$20 billion ($= \5×4) of additional real goods and services are demanded at each price level.

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FIGURE 12.2 Changes in aggregate demand. A change in one or more of the listed determinants of aggregate demand will shift the aggregate demand curve. The rightward shift from AD_1 to AD_2 represents an increase in aggregate demand; the leftward shift from AD_1 to AD_3 shows a decrease in aggregate demand. The vertical distances between AD_1 and the dashed lines represent the initial changes in spending. Through the multiplier effect, that spending produces the full shifts of the curves.



Determinants of Aggregate Demand: Factors That Shift the Aggregate Demand Curve

1. Change in consumer spending
 - a. Consumer wealth
 - b. Consumer expectations
 - c. Household borrowing
 - d. Taxes
2. Change in investment spending
 - a. Interest rates
 - b. Expected returns
 - Expected future business conditions
 - Technology
 - Degree of excess capacity
 - Business taxes
3. Change in government spending
4. Change in net export spending
 - a. National income abroad
 - b. Exchange rates

Similarly, the leftward shift of the curve from AD_1 to AD_3 shows a decrease in aggregate demand, the lesser amount of real GDP demanded at each price level. It also involves the initial decline in spending (shown as the horizontal distance between AD_1 and the dashed line to its left), followed by multiplied declines in consumption spending and the ultimate leftward shift to AD_3 .

Let's examine each of the determinants of aggregate demand listed in Figure 12.2.

Consumer Spending

Even when the U.S. price level is constant, domestic consumers may alter their purchases of U.S.-produced real output. If those consumers decide to buy more output at each price level, the aggregate demand curve will shift to the right, as from AD_1 to AD_2 in Figure 12.2. If they decide to buy less output, the aggregate demand curve will shift to the left, as from AD_1 to AD_3 .

Several factors other than a change in the price level may change consumer spending and therefore shift the aggregate demand curve. As Figure 12.2 shows, those factors are real consumer wealth, consumer expectations, household debt, and taxes. Because our discussion here parallels that of Chapter 10, we will be brief.

Consumer Wealth Consumer wealth is the total dollar value of all assets owned by consumers in the economy less the dollar value of their liabilities (debts). Assets include stocks, bonds, and real estate. Liabilities include mortgages, car loans, and credit card balances.

Consumer wealth sometimes changes suddenly and unexpectedly due to surprising changes in asset values. An unforeseen increase in the stock market is a good example. The increase in wealth prompts pleasantly surprised consumers to save less and buy more out of their current incomes than they had previously been planning. The resulting increase in consumer spending—the so-called *wealth effect*—shifts the aggregate demand curve to the right. In contrast, an unexpected decline in asset values will cause an unanticipated reduction in consumer wealth at each price level. As consumers tighten their belts in response to the bad news, a “reverse wealth effect” sets in. Unpleasantly surprised consumers increase savings and reduce consumption, thereby shifting the aggregate demand curve to the left.

Household Borrowing Consumers can increase their consumption spending by borrowing. Doing so shifts the aggregate demand curve to the right. By contrast, a decrease in borrowing for consumption purposes shifts the aggregate demand curve to the left. The aggregate demand curve will also shift to the left if consumers increase their savings rates to pay off their debts. With more money

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ORIGIN OF THE IDEA

O12.1

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These three effects, of course, work in the opposite direction for a decline in the price level. A decline in the price level increases consumption through the real-balances effect and interest-rate effect; increases investment through the interest-rate effect; and raises net exports by increasing exports and decreasing imports through the foreign purchases effect.

Changes in Aggregate Demand

10.2.2 Factors that Cause Aggregate Demand to Change

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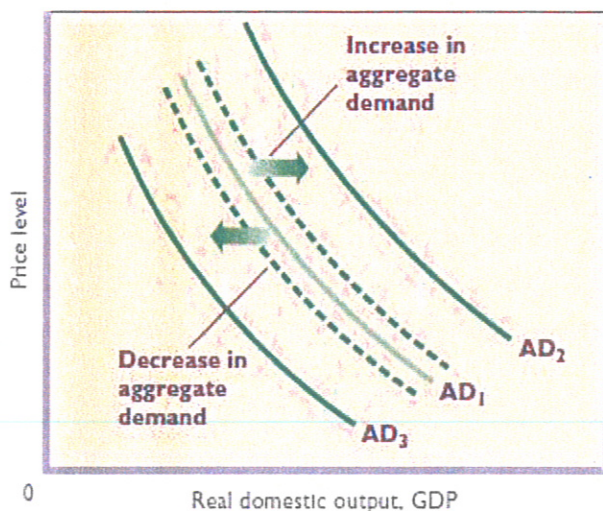
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flowing to debt repayment, consumption expenditures decline and the AD curve shifts left.

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Consumer Expectations Changes in expectations about the future may alter consumer spending. When people expect their future real incomes to rise, they tend to spend more of their current incomes. Thus, current consumption spending increases (current saving falls) and the aggregate demand curve shifts to the right. Similarly, a widely held expectation of surging inflation in the near future may increase aggregate demand today because consumers will want to buy products before their prices escalate. Conversely, expectations of lower future income or lower future prices may reduce current consumption and shift the aggregate demand curve to the left.

Personal Taxes A reduction in personal income tax rates raises take-home income and increases consumer purchases at each possible price level. Tax cuts shift the aggregate demand curve to the right. Tax increases reduce consumption spending and shift the curve to the left.

Investment Spending

Investment spending (the purchase of capital goods) is a second major determinant of aggregate demand. A decline in investment spending at each price level will shift the aggregate demand curve to the left. An increase in investment spending will shift it to the right. In Chapter 10 we saw that investment spending depends on the real interest rate and the expected return from investment.

Real Interest Rates Other things equal, an increase in real interest rates will raise borrowing costs, lower investment spending, and reduce aggregate demand. We are not referring here to the “interest-rate effect” that results from a change in the price level. Instead, we are identifying a change in the real interest rate resulting from, say, a change in a nation's money supply. An increase in the money supply lowers the interest rate, thereby increasing investment and aggregate demand. A decrease in the money supply raises the interest rate, reducing investment and decreasing aggregate demand.

Expected Returns Higher expected returns on investment projects will increase the demand for capital goods and shift the aggregate demand curve to the right. Alternatively, declines in expected returns will decrease investment and shift the curve to the left. Expected returns, in turn, are influenced by several factors:

- **Expectations about future business conditions** If firms are optimistic about future business conditions, they are more likely to forecast high rates of return on current investment and therefore may invest more today. On the other hand, if they think the economy will deteriorate in the future, they will forecast low rates of return and perhaps will invest less today.
- **Technology** New and improved technologies enhance expected returns on investment and thus increase aggregate demand. For example, recent advances in microbiology have motivated pharmaceutical companies to establish new labs and production facilities.
- **Degree of excess capacity** A rise in excess capacity—unused capital—will reduce the expected return on new investment and hence decrease aggregate demand. Other things equal, firms operating factories at well below capacity have little incentive to build new factories. But when

firms discover that their excess capacity is dwindling or has completely disappeared, their expected returns on new investment in factories and capital equipment rise. Thus, they increase their investment spending, and the aggregate demand curve shifts to the right.

- **Business taxes** An increase in business taxes will reduce after-tax profits from capital investment and lower expected returns. So investment and aggregate demand will decline. A decrease in business taxes will have the opposite effects.

The variability of interest rates and expected returns makes investment highly volatile. In contrast to consumption, investment spending rises and falls often, independent of changes in total income. Investment, in fact, is the least stable component of aggregate demand.

Government Spending

Government purchases are the third determinant of aggregate demand. An increase in government purchases (for example, more transportation projects) will shift the aggregate demand curve to the right, as long as tax collections and interest rates do not change as a result. In contrast, a reduction in government spending (for example, less military equipment) will shift the curve to the left.

Net Export Spending

The final determinant of aggregate demand is net export spending. Other things equal, higher U.S. *exports* mean an increased foreign demand for U.S. goods. So a rise in net exports (higher exports relative to imports) shifts the aggregate demand curve to the right. In contrast, a decrease in U.S. net exports shifts the aggregate demand curve leftward. (These changes in net exports are *not* those prompted by a change in the U.S. price level—those associated with the foreign purchases effect. The

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changes here are shifts of the AD curve, not movements along the AD curve.)

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What might cause net exports to change, other than the price level? Two possibilities are changes in national income abroad and changes in exchange rates.

National Income Abroad Rising national income abroad encourages foreigners to buy more products, some of which are made in the United States. U.S. net exports thus rise, and the U.S. aggregate demand curve shifts to the right. Declines in national income abroad do the opposite: They reduce U.S. net exports and shift the U.S. aggregate demand curve to the left.

Exchange Rates Changes in the dollar's exchange rate—the price of foreign currencies in terms of the U.S. dollar—may affect U.S. exports and therefore aggregate demand. Suppose the dollar depreciates in terms of the euro (meaning the euro appreciates in terms of the dollar). The new, relatively lower value of dollars and higher value of euros enables European consumers to obtain more dollars with each euro. From their perspective, U.S. goods are now less expensive; it takes fewer euros to obtain them. So European consumers buy more U.S. goods, and U.S. exports rise. But American consumers can now obtain fewer euros for each dollar. Because they must pay more dollars to buy European goods, Americans reduce their imports. U.S. exports rise and U.S. imports fall. Conclusion: Dollar depreciation increases net exports (imports go down; exports go up) and therefore increases aggregate demand.

Dollar appreciation has the opposite effects: Net exports fall (imports go up; exports go down) and aggregate demand declines.

QUICK REVIEW 12.1

- Aggregate demand reflects an inverse relationship between the price level and the amount of real output demanded.
- Changes in the price level create real-balances, interest-rate, and foreign purchases effects that explain the downward slope of the aggregate demand curve.
- Changes in one or more of the determinants of aggregate demand (Figure 12.2) alter the amounts of real GDP demanded at each price level; they shift the aggregate demand curve. The multiplier effect magnifies initial changes in spending into larger changes in aggregate demand.
- An increase in aggregate demand is shown as a rightward shift of the aggregate demand curve; a decrease, as a leftward shift of the curve.

Aggregate Supply

- In the *immediate short run*, both input prices as well as output prices are fixed.
- In the *short run*, input prices are fixed, but output prices can vary.
- In the *long run*, input prices as well as output prices can vary.

- In Chapter 6, we discussed both the immediate short run and the long run in terms of how an automobile maker named Buzzer Auto responds to changes in the demand for its new car, the Prion. Here we extend the logic of that chapter to the economy as a whole to discuss how total output varies with the price level in the immediate short run, the short run, and the long run. As you will see, the relationship between the price level and total output is different in each of the three time horizons because input prices are stickier than output prices. Although both sets of prices become more flexible as time passes, output prices usually adjust more rapidly.

Depending on the type of firm, the immediate short run can last anywhere from a few days to a few months. It lasts as long as *both* input prices and output prices stay fixed. Input prices are fixed in both the immediate short run and the short run by contractual agreements. In particular, 75 percent of the average firm's costs are wages and salaries—and these are almost always fixed by labor contracts for months or years at a time. As a result, they are usually fixed for a much longer duration than output prices, which can begin to change within a few days or a few months depending on the type of firm.

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Finally, suppose the price level rises from P_2 to P_3 . The value of real balances falls, the interest rate rises, exports fall, and imports rise. Consequently, the consumption, investment, and net export schedules fall, shifting the aggregate expenditures schedule downward from AE_2 to AE_3 , which gives us equilibrium Q_3 at point 3. In Figure 1b, this enables us to locate point 3', where the price level is P_3 and real output is Q_3 .

In summary, increases in the economy's price level will successively shift its aggregate expenditures schedule downward and will reduce real GDP. The resulting price-level–real-GDP combinations will yield various points such as 1', 2', and 3' in Figure 1b. Together, such points locate the downsloping aggregate demand curve for the economy.

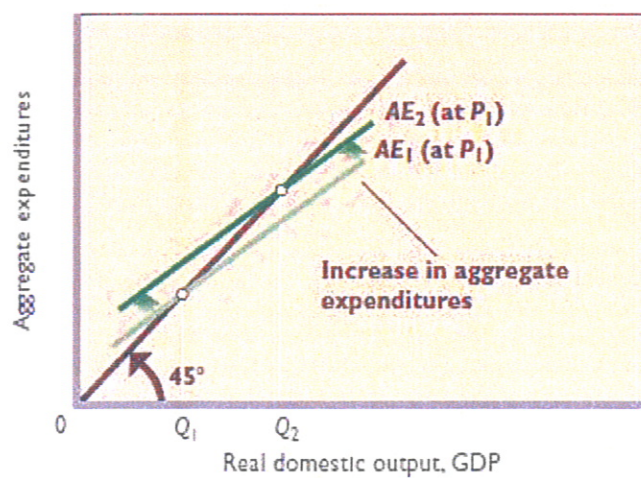
Aggregate Demand Shifts and the Aggregate Expenditures Model

The determinants of aggregate demand listed in Figure 12.2 are the components of the aggregate expenditures model discussed in Chapter 11. When one of the determinants of aggregate demand changes, the aggregate expenditures schedule shifts upward or downward. We can easily link such shifts of the aggregate expenditures schedule to shifts of the aggregate demand curve.

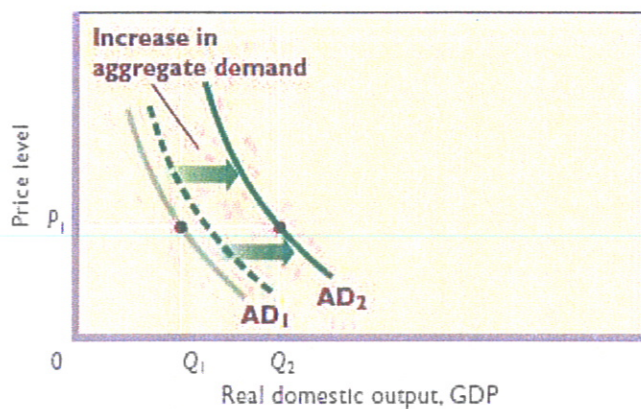
Let's suppose that the price level is constant. In Figure 2 we begin with the aggregate expenditures schedule at AE_1 in the top diagram, yielding equilibrium real output Q_1 . Assume now that investment increases in response to more optimistic business expectations, so the aggregate expenditures schedule rises from AE_1 to AE_2 . (The notation “at P_1 ” reminds us that the price level is assumed constant.) The result will be a multiplied increase in equilibrium real output from Q_1 to Q_2 .

In Figure 2b the increase in investment spending is reflected in the horizontal distance between AD_1 and the broken curve to its right. The immediate effect of the increase in investment is an increase in aggregate demand by the exact amount of the new spending. But then the multiplier process magnifies the initial increase in investment into successive rounds of consumption spending and an ultimate multiplied increase in aggregate demand from AD_1 to AD_2 . Equilibrium real output rises from Q_1 to Q_2 , the same multiplied increase in real GDP as that in the top graph. The initial increase in investment in the top graph has shifted the AD curve in the lower graph by a horizontal distance equal to the change in investment times the multiplier. This particular change in real GDP is still associated with the constant price level P_1 . To generalize,

FIGURE 2 Shifts of the aggregate expenditures schedule and of the aggregate demand curve. (a) A change in some determinant of consumption, investment, or net exports (other than the price level) shifts the aggregate expenditures schedule upward from AE_1 to AE_2 . The multiplier increases real output from Q_1 to Q_2 . (b) The counterpart of this change is an initial rightward shift of the aggregate demand curve by the amount of initial new spending (from AD_1 to the broken curve). This leads to a multiplied rightward shift of the curve to AD_2 , which is just sufficient to show the same increase of real output as that in the aggregate expenditures model.



(a)
Aggregate expenditures model



(b)
Aggregate demand-aggregate supply model

Shift of AD curve = initial change in spending
× multiplier

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APPENDIX SUMMARY

LO12.7 Identify how the aggregate demand curve relates to the aggregate expenditures model.

A change in the price level alters the location of the aggregate expenditures schedule through the real-balances, interest-rate, and foreign purchases effects. The aggregate demand curve is derived from the aggregate expenditures model by allowing the price level to change and observing the effect on the aggregate expenditures schedule and thus on equilibrium GDP.

With the price level held constant, increases in consumption, investment, government, and net export expenditures shift the aggregate expenditures schedule upward and the aggregate demand curve to the right. Decreases in these spending components produce the opposite effects.

The following and additional problems can be found in 

APPENDIX DISCUSSION QUESTIONS

1. Explain carefully: "A change in the price level shifts the aggregate expenditures curve but not the aggregate demand curve." **LO12.7**
2. Suppose that the price level is constant and that investment decreases sharply. How would you show this decrease in the aggregate expenditures model? What would be the outcome for real GDP? How would you show this fall in investment in the aggregate demand–aggregate supply model, assuming the economy is operating in what, in effect, is a horizontal section of the aggregate supply curve? **LO12.7**

APPENDIX REVIEW QUESTIONS

1. True or False: A higher price level increases aggregate expenditures. **LO12.7**
2. If the government decreases expenditures, the AE curve will shift _____ and the AD curve will shift _____. **LO12.7**
 - a. Down; left.
 - b. Down; right.
 - c. Up; left.
 - d. Up; right.

APPENDIX PROBLEMS

1. Refer to Figures 1a and 1b in the Appendix. Assume that Q_1 is 300, Q_2 is 200, Q_3 is 100, P_3 is 120, P_2 is 100, and P_1 is 80. If the price level increases from P_1 to P_3 in graph 1b, in what direction and by how much will real GDP change? If the slopes of the AE lines in Figure 1a are 0.8 and equal to the MPC, in what direction will the aggregate expenditures schedule in Figure 1a need to shift to produce the previously determined change in real GDP? What is the size of the multiplier in this example? **LO12.7**
2. Refer to Figure 2 in the Appendix and assume that Q_1 is \$400 and Q_2 is \$500, the price level is stuck at P_1 , and the slopes of the AE lines in Figure 2a are 0.75 and equal to the MPC. In what direction and by how much does the aggregate expenditures schedule in Figure 2a need to shift to move the aggregate demand

curve in Figure 2b from AD_1 to AD_2 ? What is the multiplier in this example? Given the multiplier, what must be the distance between AD_1 and the broken line to its right at P_1 ? **LO12.7**

*This appendix presumes knowledge of the aggregate expenditures model discussed in Chapter 11 and should be skipped if Chapter 11 was not assigned.