AFC

CHAPTER

24 NATIONAL INCOME AND THE CURRENT ACCOUNT

INTRODUCTION

How Does GDP Growth Cause Trade Deficits?

In March 2000, economist Catherine Mann of the Institute for International Economics, a think tank in Washington, DC, wrote the following:[1]

> The United States is enjoying an economic boom that is fueling the growth of its trade deficit. At current exchange rates, the strength of the U.S. economy, combined with slow growth in demand in many other parts of the world, will lead to further widening of the U.S. trade deficit . . . A change in the value of the dollar alone would narrow the trade gap for a while, but the deficit would soon begin to widen again. To put the U.S. current account and trade deficits back on a sustainable path will require structural reforms in the United States and its trading partners that encourage faster global growth, boost U.S. household savings rates, better prepare U.S. workers for technological changes in the global economy, and open up markets for U.S. exports.

This chapter is devoted to providing the analytical structure to interpret easily a statement such as this one by Catherine Mann. We examine the manner in which the macroeconomy influences and is influenced by changes in exports and imports. Thus, we move away from price relationships linking the external and internal sectors of the economy to the interrelationships between the two sectors that involve real national income. To accomplish this task, we develop the macroeconomics of an open economy—an economy with foreign trade—in the context of Keynesian income analysis. The basics of Keynesian income analysis, named after the British economist John Maynard Keynes (see Box 1), were likely presented in your principles course. The traditional single-country focus is supplemented here by examining the real income response to exogenous factors when countries are linked through international trade. The last section of the chapter is a synthesis of price and income effects.

[1]Catherine L. Mann, "Is the U.S. Current Account Deficit Sustainable?" *Finance and Development* 37, no. 1 (March 2000), pp. 42–43.

BOX 1 JOHN MAYNARD KEYNES (1883–1946)

John Maynard Keynes was born in Cambridge, England, on June 5, 1883. The son of an economist (John Neville Keynes), he attended Eton and then King's College, Cambridge, where he received a degree in mathematics in 1905. He then studied under the neoclassical economist Alfred Marshall, who pleaded with him to become an economist. Keynes entered the British Civil Service in the India Office, and his first book, *Indian Currency and Finance* (1913), assessed the Indian currency system as an example of a gold/pegged exchange rate system. He attained widespread fame in 1919 when he wrote *The Economic Consequences of the Peace.* This book, as well as later famous journal articles, castigated the Treaty of Versailles for the heavy burdens it placed on Germany in connection with reparations payments after World War I. Keynes's view was that the price adjustments required for Germany to earn the foreign exchange to make the payments (that is, the price changes needed to increase exports and decrease imports sufficiently that the current account surplus would match the required capital outflow associated with the payments) would be excessive. They would deteriorate Germany's terms of trade and welfare greatly, and the payments might never be accomplished because of their harshness.

Keynes then published the influential *A Treatise on Probability* in 1921. However, his most important academic contributions occurred in the 1930s—A *Treatise on Money* (1930) and, especially, *The General Theory of Employment, Interest and Money* (1936). *The General Theory* was a broadside attack on the apparatus of Classical economics with its view that the economy would settle automatically at the full-employment level of income. (The Classical view was very hard to sell to anyone during the Great Depression!) He emphasized the role of aggregate demand and the possibility of attaining national income equilibrium at less than full employment. The demand for money and its relationship to the interest rate also received revolutionary treatment and played a major role in his aggregate demand formulation. Keynesian analysis assigned a prominent role to fiscal policy in affecting national income and employment—which had been denied in the Classical model. Keynes also met with Franklin D. Roosevelt, who was later to use public works expenditures as a measure for attempting to get out of the Depression. Although Keynes is reported not to have been impressed with FDR's economic knowledge, FDR wrote in a letter to Felix Frankfurter (later a long-time U.S. Supreme Court Justice), "I had a grand talk with K and liked him immensely" (quoted in Harrod 1951, p. 448).

Keynes's life was a whirlwind of activity. Aside from his roles as policy advisor to the British government and Cambridge don, he was a patron of the arts, a collector of rare books, editor of *The Economic Journal,* first bursar of King's College, and chairman of the board of the National Mutual Life Insurance Company. He also amassed a personal fortune through shrewd financial investments. In addition, Keynes was a member of the Bloomsbury circle, a group of artists, intellectuals, and writers that included Lytton Strachey and Virginia Woolf. Further, and most impressively to some, he married a premier Russian ballerina in 1925, giving rise to the ditty, "There ne'er was such union of beauty and brains, as when Lydia Lopokova wed John Maynard Keynes."

Keynes's final years were spent successfully negotiating a large war loan for Britain from the United States during World War II and hammering out the Bretton Woods agreement for the formation of the International Monetary Fund. With his usual persuasive powers, personal charm, and magnetism, he forcefully presented and fought for his proposals for the post-war international monetary system. In the end, the new Bretton Woods system (see the last chapter in this book) resembled more closely the American plan than the British plan, but he had been the dominant figure at the extended conference. John Maynard Keynes died on Easter Sunday, 1946.

Sources: R. F. Harrod, *The Life of John Maynard Keynes* (New York: Harcourt, Brace, 1951); Robert L. Heilbroner, *The Worldly Philosophers: The Lives, Times, and Ideas of the Great Economic Thinkers,* 3rd ed. (New York: Simon and Schuster, 1967), chap. 9; Don Patinkin, "John Maynard Keynes," in John Eatwell, Murray Milgate, and Peter Newman, eds., *The New Palgrave: A Dictionary of Economics,* vol. 3 (London: Macmillan, 1987), pp. 19–41.

THE CURRENT ACCOUNT AND NATIONAL INCOME

The Keynesian Income Model

In a **Keynesian income model,** the focus is on aggregate spending in the entire economy. Aggregate spending consists of the desired expenditures on the economy's goods and services. An assumption is made that prices are constant, so the focus is on real income movements and not on price changes. In addition, monetary considerations such as the interest rate are assumed to be constant. It is also generally assumed that the economy is not at full

employment, usually because of downward money wage rigidity. For example, because of institutional features such as unions or a desire by employers to keep the best workers from leaving due to wage decreases during slack times, the wage rate does not fall to clear the labor market during such periods.

In the simple open-economy Keynesian model, **desired aggregate expenditures** (E) during a time period consist of consumption spending by the economy's households on goods and services (C), investment spending by firms (I), government spending on goods and services (G), and export spending by foreign citizens on the country's products (X). In addition, because some of the domestic spending is on imports (M), these must be subtracted to obtain the demand for home goods and services. Hence, desired expenditures or aggregate demand can be written as

$$E = C + I + G + X - M \quad [1]$$

What determines the amount of C? Keynes hypothesized that the most important determinant of a country's current consumption spending is the amount of current income (Y) in the economy. In general terms, then, consumption depends on or is a function of disposable income of households; that is,

$$C = f(Y_d) \quad [2]$$

where disposable income (Y_d) is income in the economy (Y) minus taxes (T); that is,

$$Y_d = Y - T \quad [3]$$

The general expression [2] is usually written in a more precise way:

$$C = a + bY_d \quad [4]$$

This equation is a standard Keynesian **consumption function.** To put numerical content to it, suppose we specify

$$C = 100 + 0.80Y_d$$

This equation indicates that if disposable income is \$600 (in billions, for example), then consumption spending is equal to \$100 plus (0.80 × \$600), or \$100 plus \$480, or \$580. If disposable income rises to \$700, then consumption spending is equal to \$100 plus (0.80 × \$700) = \$100 + \$560 = \$660.

In this consumption function, the a term (or \$100 in the example) is designated as **autonomous consumption spending,** meaning that this amount of consumption spending is determined by *other things besides income.* These "other things" can consist of the level of interest rates, the size of the population, attitudes toward thrift, the level of accumulated wealth, expectations of future income, and so forth. The part of consumption that does depend on current income is labeled bY_d, or $0.80Y_d$, and is known as **induced consumption spending.** Within the induced consumption component bY_d, a key feature is the term b, or 0.80 in our example. The b is known as the **marginal propensity to consume,** or **MPC.** The MPC is defined as the change in consumption divided by the change in disposable income, that is, the fraction of additional Y_d spent on consumption goods. Therefore, designating "change in" by Δ,

$$\text{MPC} = \Delta C/\Delta Y_d \quad [5]$$

In addition to this consumption propensity, the **marginal propensity to save,** or **MPS,** is defined as the change in saving (S) divided by the change in disposable income, that is, the fraction of any additional Y_d allocated to saving:

$$\text{MPS} = \Delta S/\Delta Y_d \quad [6]$$

Because any change in income can be allocated only to consumption and saving, it follows that

$$\text{MPC} + \text{MPS} = 1.0 \qquad [7]$$

In our sample consumption function, where MPC = 0.80, the MPS must equal 0.20.

Finally, the consumption function $C = a + bY_d$ immediately tells us the nature of the **saving function** for households in the economy. Remembering that by definition disposable income can be allocated only to consumption and saving, the saving function can be easily obtained:

$$\begin{aligned} Y_d &= C + S \\ &= a + bY_d + S \\ S &= Y_d - (a + bY_d) \\ &= -a + (1 - b)Y_d \end{aligned}$$

or

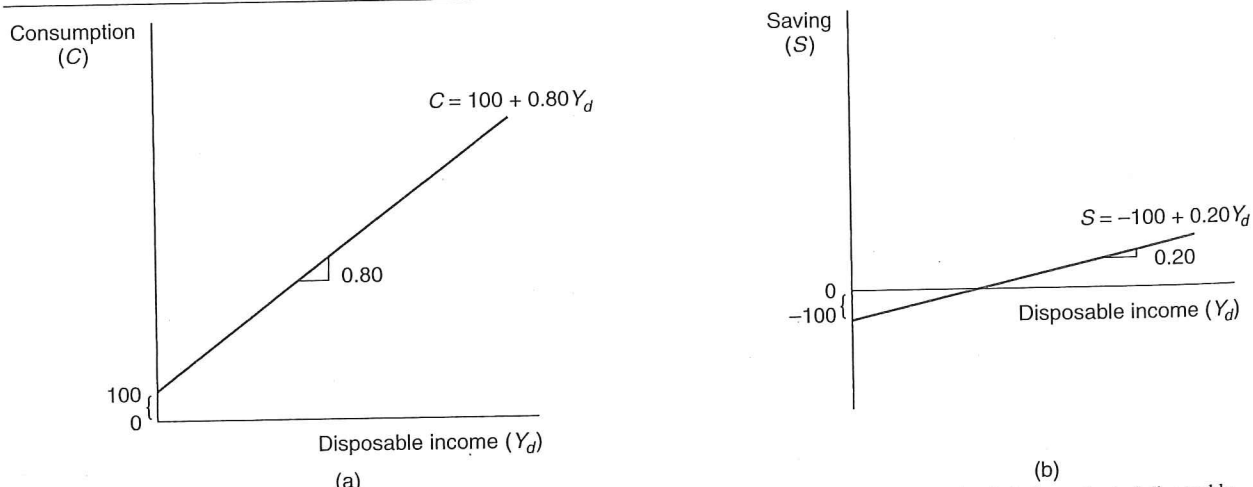
$$S = -a + sY_d \qquad [8]$$

where s $(= 1 - b)$ is the marginal propensity to save.

The consumption and saving functions are illustrated in Figure 1. Panel (a) portrays the consumption function for $C = 100 + 0.80Y_d$ and panel (b) shows the associated saving function $S = -100 + 0.20Y_d$. Relating Figure 1(a) to the consumption function equation, the a term (or 100) is the height of the intercept on the vertical axis, while the slope of the consumption schedule is b, that is, the MPC (or 0.80). Because the MPC is constant, the slope is constant, meaning that the consumption function is a straight line. Similarly, the intercept in Figure 1(b) is *minus* a (or -100), and the slope is s, the MPS (or 0.20).

We now turn to investment spending. Remember that investment decisions (in the sense of *real* investment spending on plant and equipment, residential construction, and changes

FIGURE 1 **Consumption and Saving Functions**



Panel (a) shows a typical Keynesian consumption function. The autonomous component (100) is consumption that is independent of disposable income. The induced component of consumption is 0.80 times the disposable income level, with 0.80 being the marginal propensity to consume (MPC). Because the MPC is constant in this example at 0.80, the consumption function is a straight line. Panel (b) shows the associated saving function by households. Because $Y_d = C + S$, therefore $S = Y_d - C = Y_d - (100 + 0.80Y_d) = -100 + 0.20Y_d$. This function is a straight line with a slope of 0.20, which is the marginal propensity to save (MPS).

in inventories, not in the sense of financial investment in stocks, bonds, etc.) are made by business firms and not by households. Thus there is no necessary direct link between consumption spending and investment spending. In this simple income model, investment is usually assumed to be entirely autonomous or independent of current national income in the economy, meaning that investment spending is determined by factors other than income (for example, interest rates, wage rates, and the expectations of firms concerning the future). When investment is assumed to be independent of current income, the investment equation is written as

$$I = \bar{I} \qquad [9]$$

where the bar means that investment is fixed at a given amount for all levels of income. Thus, the equation $I = 180$ would indicate that investment spending by firms is \$180 no matter what the level of income in the economy. The assumption that I is independent of income is clearly unrealistic in a strict sense. However, it may well be the case that interest rates, wage rates, technological change, and so forth, are more important for the investment decision than is the current level of national income. The graphical depiction of the autonomous investment function is given as the line $I = 180$ in Figure 2.

Government spending on goods and services in the simple Keynesian open-economy model (G) is also assumed to be independent of current income. This means that G is treated as being dependent on government priorities with respect to items such as national defense, highways, and education and on policy measures, and not on the level of national income. This is also a simplification:

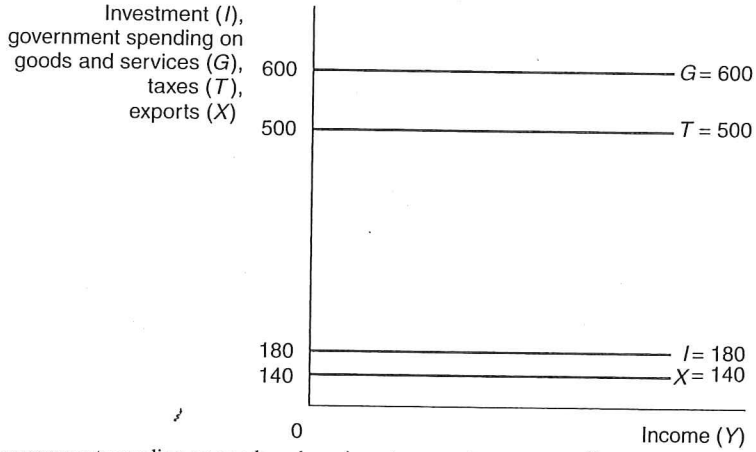
$$G = \bar{G} \qquad [10]$$

In terms of our numerical example, assume that $G = 600$. This autonomous government spending on goods and services is represented by the $G = 600$ line in Figure 2.

Along with government spending, of course, we must also introduce taxes. In the simplest tax case, we assume that taxes are independent of income; that is,

$$T = \bar{T} \qquad [11]$$

FIGURE 2 **Autonomous Investment, Government Spending, Tax, and Export Schedules**



Investment, government spending on goods and services, taxes, and exports are all assumed to be autonomous or independent of current income in the simple Keynesian model (that is, they depend on factors other than income). Thus, in our numerical example, $I = 180$, $G = 600$, $T = 500$, and $X = 140$ no matter what the level of national income.

In this formulation, taxes are autonomous and are, for example, levied on something other than current income such as wealth or property. Clearly, it is unrealistic to assume that taxes are not a function of income in the economy. However, in the body of this chapter, we will utilize that assumption both because it makes the analysis simpler and because the focus of the chapter is on the foreign sector's interactions with national income and not on the government sector's interactions with national income. (A Keynesian model where taxes depend on income is presented in Appendix A.) For our continuing numerical example, we hence assume $T = 500$, and this fixed amount of taxes is indicated in Figure 2. (Note in the figure that government spending does not have to equal taxes in any given year, and this is obviously realistic!)

Finally, turning to the external sector of the Keynesian open-economy income model, exports are also specified as being autonomous or independent of the country's current level of national income. The export equation is thus

$$X = \overline{X} \qquad [12]$$

where $\overline{X}$ indicates the autonomous exports. To continue our numerical example, let us say that

$$X = 140$$

Exports are constant at \$140. This is also represented graphically in Figure 2. Home-country exports are more likely to depend on other countries' incomes than upon home income, because domestic exports are dependent on the buying power of other countries as determined by their incomes. In addition, home exports depend on nonincome factors such as relative prices of domestic goods compared with foreign goods, the exchange rate (assumed to be fixed in the Keynesian model), innovation in home export industries, and foreign tastes and preferences. If any of these factors change so that more domestic exports are demanded, then the export function will shift vertically upward in parallel fashion; if other countries decreased their demand for the home country's goods, the export line would shift vertically downward in a parallel manner.

In the simple Keynesian macro model, imports (M) are generally made to depend on only one variable—the level of home-country income. The relationship between imports and national income is expressed by the **import function.** Its general form is

$$M = f(Y) \qquad [13]$$

A specific form is

$$M = \overline{M} + mY \qquad [14]$$

Here, $\overline{M}$ represents **autonomous imports,** the amount of spending on imports that is independent of income. This spending on imports depends on factors such as tastes and preferences for foreign goods as opposed to home goods, and relative prices of foreign goods compared with home goods. The term mY refers to **induced imports,** the spending on foreign goods that is dependent on the level of income. As the income of a country rises, more spending occurs on goods and services, and some of this additional spending is on imported goods and services. If imports consisted only of consumption goods and services, disposable income (Y_d) would appear in expression [14] rather than national income (Y). However, we assume here (and it is true in practice) that imports contain not only consumption goods and services but also inputs into the domestic production process (which depend on total income). Hence we use Y in the import equation rather than Y_d. Continuing with our numerical example, suppose

$$M = 20 + 0.10Y$$

This equation states the value of autonomous imports as $20 and the value of induced imports as 0.10 times the income level. The figure 0.10 (or the letter m in expression [14]) is the **marginal propensity to import,** or **MPM.** This concept is defined as the change in imports divided by the change in income:

$$\text{MPM} = \Delta M/\Delta Y \qquad [15]$$

If income rises by $100 and the MPM is 0.10, an additional $10 will be spent on imports. The MPM is to be distinguished from the **average propensity to import,** or **APM,** which is the total spending on imports divided by total income:

$$\text{APM} = M/Y \qquad [16]$$

Another term emerges from this analysis: the **income elasticity of demand for imports** or **YEM,** which is the percentage change in the demand for imports divided by the percentage change in income and was also noted in Chapter 11. The term has useful applications because it indicates the percentage growth in imports that will occur as a country's national income grows over time. It can be shown that the YEM is related in simple fashion to the APM and the MPM:

$$\begin{aligned} \text{YEM} &= (\%\Delta M)/(\%\Delta Y) \\ &= (\Delta M/M)/(\Delta Y/Y) \\ &= (\Delta M/\Delta Y)/(M/Y) \\ &= \text{MPM/APM} \end{aligned} \qquad [17]$$

Thus, if a country's MPM exceeds its APM, imports relative to income will rise as the country's income grows (YEM is elastic). If MPM is less than APM, the YEM is inelastic and imports will fall as a fraction of income as income rises. Finally, if MPM equals APM, the YEM is unit elastic and imports as a fraction of national income stay the same as income rises. In the past several decades, trade as a fraction of national income in the United States has been rising, indicating the MPM of the United States is larger than the APM. For examples of APMs of selected countries see Box 2.

The import function is shown in Figure 3, plotting the specific function given earlier, namely, $M = 20 + 0.10Y$. The intercept of the import function is located at the value of autonomous imports, $\overline{M}$. The slope of the (straight-line) import function is the MPM, or 0.10 in our example.

Determining the Equilibrium Level of National Income

The next step in the analysis involves the actual determination of the **equilibrium level of national income** in this type of model. The equilibrium income level is the level at which there is no tendency for the income level to rise or to fall (that is, the economy is "at rest"). This level of income occurs when desired spending exactly matches the production level of the economy. If such is the case, then there is no net tendency for economic activity to change. However, if spending exceeds production (which equals income), then firms have not produced enough output to meet demand and their inventories of goods will fall. Output will consequently rise in order to prevent this unintended depletion of inventories. On the other hand, if production exceeds spending, there will be unintended inventory accumulation. This accumulation will be a signal to producers to reduce their output, and production will decline until it equals the level of demand. Thus, at income levels both above and below the equilibrium level, forces are at work to return the economy to the equilibrium income level.

BOX 2 AVERAGE PROPENSITIES TO IMPORT, SELECTED COUNTRIES

Table 1 presents the average propensities to import for five major industrialized countries from 1973 through 2003. As can be seen, there has been a major increase in openness for the United States. In addition, there appears to have been some increase in the APM for Canada (especially in recent years) and some slight increase for France. For the United Kingdom, inspection of the data suggests little change for most of the period. Japan's average propensity to import may well have declined, likely because the price of imported oil (very important for the Japanese economy) fell throughout the 1980s and 1990s. The results for Canada, Japan, and the United States are in a general way broadly consistent with careful estimates of income elasticities of demand made by Peter Hooper, Karen Johnson, and Jaime Marquez*, who estimated the YEM to be 1.4 for Canada, 0.9 for Japan, and 1.8 for the United States. However, these economists estimated the YEM to be 1.6 for France, which is larger than would be inferred from looking at Table 1, and the YEM for the United Kingdom to be 2.2, which is not suggested by the relative stability of the United Kingdom's APM data in Table 1. Clearly, while looking at APMs such as in Table 1 can offer tentative suggestions, more detailed work is necessary for precise conclusions regarding the trend in the degree of openness of a country.

*Peter Hooper, Karen Johnson, and Jaime Marquez, "Trade Elasticities for G-7 Countries," Board of Governors of the Federal Reserve System, International Finance Discussion Papers no. 609, April 1998, p. 7, available at www.federalreserve.gov/pubs/ifdp/1998/ifdp609.pdf.

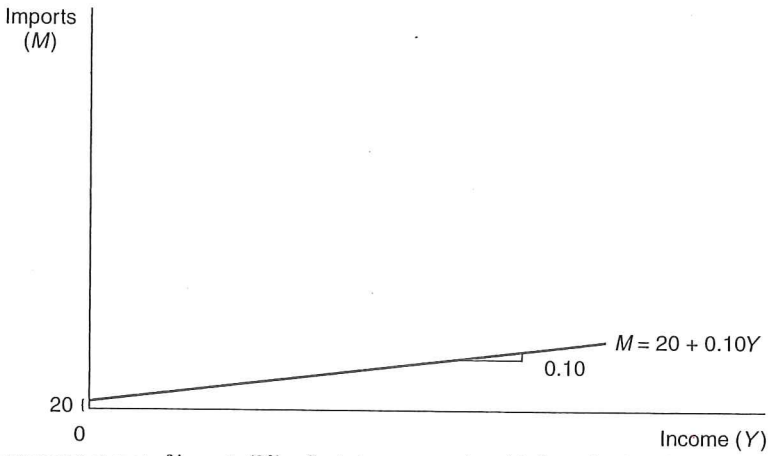
TABLE 1 **Average Propensities to Import, Selected Countries, 1973–2003**

Year	*Canada*	*France*	*Japan*	*United Kingdom*	*United States*
1973	.220	.167	.100	.254	.066
1974	.246	.217	.143	.322	.085
1975	.241	.179	.128	.271	.075
1976	.229	.203	.128	.291	.083
1977	.235	.204	.115	.290	.090
1978	.249	.191	.094	.269	.092
1979	.265	.206	.125	.274	.098
1980	.264	.228	.144	.249	.105
1981	.261	.238	.138	.238	.101
1982	.221	.240	.136	.244	.093
1983	.221	.228	.120	.256	.093
1984	.249	.239	.121	.286	.103
1985	.258	.239	.108	.278	.099
1986	.264	.206	.073	.265	.102
1987	.255	.207	.072	.266	.107
1988	.258	.212	.077	.266	.108
1989	.255	.226	.088	.278	.107
1990	.256	.223	.094	.266	.108
1991	.256	.219	.083	.242	.104
1992	.274	.209	.077	.248	.105
1993	.301	.192	.069	.265	.108
1994	.327	.202	.070	.272	.115
1995	.340	.211	.077	.288	.122
1996	.343	.214	.092	.298	.123
1997	.374	.225	.096	.285	.127
1998	.393	.235	.088	.277	.127
1999	.396	.237	.085	.282	.134
2000	.399	.273	.094	.301	.150
2001	.378	.264	.098	.301	.139
2002	.367	.251	.099	.292	.137
2003	NA	.247	NA	.280	.141
Average for period	.287	.220	.101	.274	.108

NA = not available. Note: Figures are imports of goods and services in the GDP accounts divided by GDP.

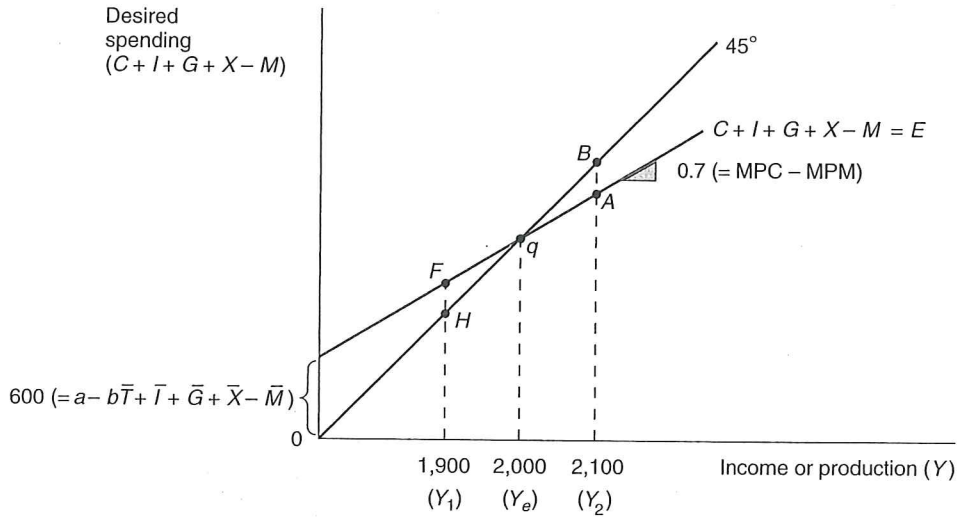
Sources: Calculated from data in International Monetary Fund, *International Financial Statistics Yearbook 2002* (Washington, DC: IMF, 2002), pp. 334–35, 482–83, 608–09, 1032–33, 1040–41; International Monetary Fund, *International Financial Statistics,* May 2003, pp. 248, 412, 534, 992, 1000 and August 2004, pp. 254, 424, 556, 1030, 1038.

FIGURE 3 **A Keynesian Import Function**



The autonomous component of imports (20) reflects imports purchased independently of income. The induced component of imports is 0.10 times the income level, with 0.10 indicating the marginal propensity to import (MPM). With a constant MPM, the import function is a straight line.

FIGURE 4 **The Equilibrium Level of Income**



Total desired spending on domestic goods in relation to income is indicated by the $C + I + G + X - M$ line, with a slope of [MPC − MPM]. Equilibrium income level $0Y_e$ (or 2,000 in our example) occurs where desired spending equals production. At lower income level $0Y_1$ (or 1,900), spending ($= Y_1F$) is greater than production ($= 0Y_1 = Y_1H$), so inventories are being depleted and production expands to $0Y_e$. At income level $0Y_2$ (or 2,100) above $0Y_e$, spending ($= Y_2A$) is less than production ($= 0Y_2 = Y_2B$), so inventories are accumulating and production contracts to $0Y_e$ (2,000).

The determination of the equilibrium level of income is shown graphically in Figure 4, utilizing our numerical example. Remembering that, in our example,

$$C = 100 + 0.8Y_d \qquad G = 600$$
$$Y_d = Y - T \qquad X = 140$$
$$T = 500 \qquad M = 20 + 0.1Y$$
$$I = 180$$

Then the E (desired expenditures or spending line) is

$$\begin{aligned} E &= C + I + G + X - M \\ &= 100 + 0.8Y_d + 180 + 600 + 140 - (20 + 0.1Y) \\ &= 100 + 0.8(Y - 500) + 180 + 600 + 140 - (20 + 0.1Y) \\ &= 1{,}000 + 0.8Y - 400 - 0.1Y \\ &= 600 + 0.7Y \end{aligned}$$

This equation indicates that the intercept of the expenditures or spending line in Figure 4 is 600 [= the sum of all autonomous items = $(a - b\bar{T} + \bar{I} + \bar{G} + \bar{X} - \bar{M})$] and the slope is 0.7 [= the marginal propensity to consume minus the marginal propensity to import = $(0.8 - 0.1) = 0.7 = (b - m)$]. Another important line in the diagram is the 45-degree line. Because a 45-degree line has the property that each point on it is equidistant from the vertical axis (spending) and the horizontal axis (production), it is clear that, for the economy to be in equilibrium, the economy must be located somewhere on this line. The equilibrium point q occurs where the $C + I + G + X - M$, or spending, line intersects the 45-degree line, and the equilibrium level of income associated with point q is income level $0Y_e$. Because $C + I + G + X - M$ shows desired spending and the 45-degree line illustrates points that are equidistant from both axes, the intersection of the E line with the 45-degree line gives us the single point where production equals spending.

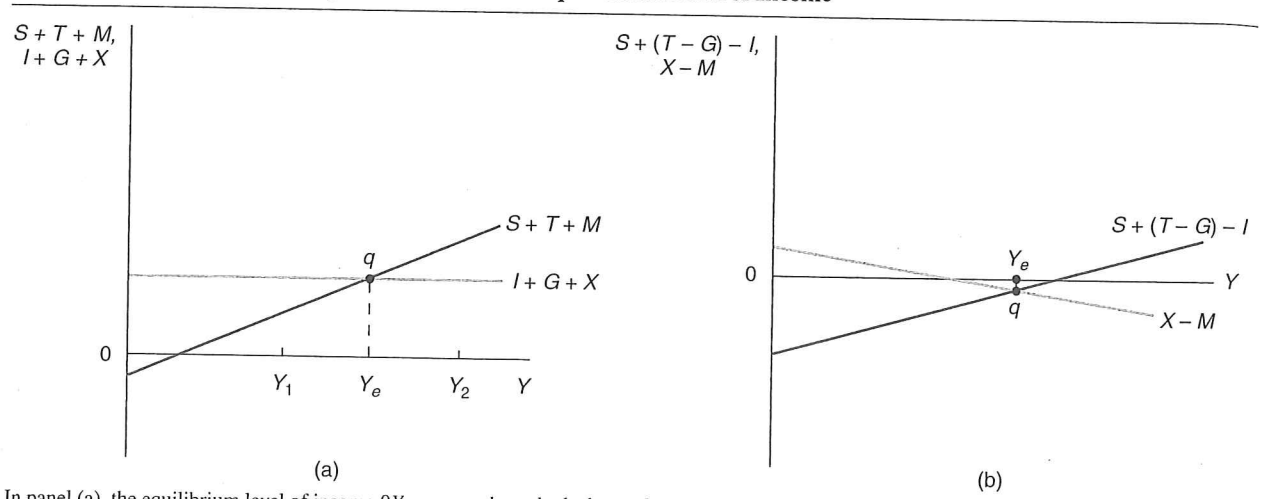
In terms of our numerical example, the equilibrium where $E = Y$ or spending = production is found in straightforward fashion. We have established earlier that $E = 600 + 0.7Y$, so, for equilibrium,

$$\begin{aligned} E &= Y \\ 600 + 0.7Y &= Y \\ 600 &= Y - 0.7Y \\ 600 &= 0.3Y \\ Y &= 600/0.3 = 2{,}000 \end{aligned}$$

To see that 2,000 is indeed the equilibrium level, let us check the sum of the spending items to determine if they add up to 2,000. First, look at consumption. With an income level of 2,000 and taxes of 500, this means that disposable income is 1,500 (= 2,000 − 500). Because the consumption function is $C = 100 + 0.8Y_d$, this means that consumption is 100 + (0.8)(1,500) = 100 + 1,200 = 1,300. Investment is constant at 180, government spending is constant at 600, and exports are constant at 140. Finally, imports, which must be subtracted, are equal to $20 + 0.1Y = 20 + (0.1)(2{,}000) = 20 + 200 = 220$. Thus, at the national income level of 2,000, spending = $C + I + G + X - M = 1{,}300 + 180 + 600 + 140 - 220 = 2{,}000$. Thus, at the equilibrium level of income, desired spending equals production and there is no unintended change in inventories of firms.

Let us consider briefly what happens if national income is not at the equilibrium level $0Y_e$ or 2,000. In Figure 4, consider the lower income level $0Y_1$ or 1,900. At $0Y_1$, spending is indicated by the height of the E line (distance Y_1F) and production is $0Y_1$, which because of the nature of the 45-degree line, is equal to distance Y_1H. In numbers, spending (E or distance Y_1F) is 600 + (0.7)(1,900) = 600 + 1,330 = 1,930 and production (Y or Y_1H) is 1,900. Because spending of 1,930 is thus greater than production of 1,900 at income level $0Y_1$ by 30 (or distance HF), inventories of firms will decline; as firms then step up their production to eliminate this inventory depletion, income in the economy will rise until $0Y_e$ is reached and spending equals production. A similar analysis applies to income level $0Y_2$ (or 2,100), which is above the equilibrium level of income. At $0Y_2$, households and firms want to spend the amount Y_2A, which in numbers is equal to 600 + (0.7)(2,100) = 600 + 1,470 = 2,070. However, production equals distance Y_2B (= $0Y_2$ by the construction of the 45-

FIGURE 5 **Alternative Representations of the Equilibrium Level of Income**



In panel (a), the equilibrium level of income $0Y_e$ occurs where the leakages from the domestic spending stream ($S + T + M$) are equal to the injections into the spending stream ($I + G + X$). At income levels below (above) $0Y_e$, injections are greater (less) than leakages, so there is pressure to expand (contract) income. Panel (b) shows an alternative representation using the relationship that, since $S + T + M = I + G + X$, then $S + (T - G) - I = X - M$. In this graph, equilibrium income level $0Y_e$ occurs simultaneously with a current account deficit (that is, $X - M < 0$).

degree line) or 2,100. Hence, production exceeds spending (by AB or 30), and unintended inventory accumulation will lead to cutbacks in production. The cutbacks will continue until the income level reaches $0Y_e$ or 2,000.

Leakages and injections

An alternative method of determining the equilibrium level of income is to represent the equilibrium income level as that level that equates desired or planned saving, imports, and taxes with desired investment, government spending, and exports. In this approach, saving, imports, and taxes are thought of as **leakages** from the spending stream, in that they represent actions that reduce spending on domestic products. Investment, government spending, and exports are **injections** into the spending stream and therefore lead to home production. If the leakages exceed the injections, then there is downward pressure on spending and hence on income. If the injections exceed the leakages, there is pressure for expansion in the economy.

This approach is illustrated in Figure 5, panel (a), which shows the saving, tax, and import functions combined into an $S + T + M$ function and the autonomous investment, government spending, and export schedules combined into an $I + G + X$ schedule. The equilibrium level of income is situated immediately below point q where the two schedules intersect, at income level $0Y_e$. This $0Y_e$ is the same $0Y_e$ as in Figure 4 because the two figures employ the same basic information but in a different form.[2] If the economy is at an

[2]In the equilibrium expression $Y = C + I + G + X - M$, the right-hand side consists of expenditures that generate income, or it can be thought of as sources of income. Now consider the expression $Y = C + S + T$. The right-hand side of this equation indicates the uses of the income generated in the economy (for consumption, for saving, and for taxes). Because uses of income must equal sources of income,

$$C + S + T = C + I + G + X - M$$
$$S + T = I + G + X - M$$
$$S + T + M = I + G + X \qquad [18]$$

Expression [18] is another way of writing the equilibrium condition, and the intersection of the two schedules in panel (a) of Figure 5 thus also yields the equilibrium level of income.

income level below $0Y_e$, such as $0Y_1$, $(I + G + X)$ exceeds $(S + T + M)$. That the equilibrium level is the same as previously in terms of our numerical example can be shown by calculating the leakages at the income level 2,000 and then comparing their sum with the injections. Because consumption in our example was $100 + 0.8Y_d$, and because saving = disposable income minus consumption, saving equals $= Y_d - (100 + 0.8Y_d) = -100 + (1 - 0.8)Y_d = -100 + 0.2Y_d$. With income of 2,000 and taxes of 500, $Y_d = 1{,}500$ and saving $= -100 + (0.2)(1{,}500) = -100 + 300 = 200$. The import leakage is $M = 20 + 0.1Y = 20 + (0.1)(2{,}000) = 20 + 200 = 220$. Hence, with $S = 200$, $T = 500$, and $M = 220$, total leakages are $200 + 500 + 220 = 920$. Injections in our example were $I = 180$, $G = 600$, and $X = 140$, for total injections of $180 + 600 + 140 = 920$. Clearly, at the income level of 2,000, leakages equal injections.

Again, if the economy is at an income level below $0Y_e$ or 2,000, the economy will expand because injections into the spending stream exceed leakages or withdrawals from that stream. For example, if $0Y_1$ in Figure 5(a) is 1,900, with $T = 500$, then $S = -100 + (0.2)(1{,}900 - 500) = -100 + (0.2)(1{,}400) = -100 + 280 = 180$. At the income level of 1,900, $M = 20 + (0.1)(1{,}900) = 20 + 190 = 210$. Hence, while injections have remained at 920, total leakages are now $180 + 500 + 210 = 890$ and are 30 short of the injections. Inventories decline by 30 and income rises toward the equilibrium level of 2,000 or $0Y_e$. At income level $0Y_2$ (say, 2,100), the opposite is the case. Leakages will exceed injections (by 30 in our example), inventories will accumulate (by 30), and production will be cut back (to 2,000).

Income equilibrium and the current account balance

A second alternative representation of equilibrium focuses on the current account balance for the economy. (In our model, $X - M$ embraces exports and imports of all goods and services; since we have no unilateral transfers in the model, $X - M$ is thus the current account balance.) In this approach, we take the equilibrium condition of

$$S + T + M = I + G + X$$

and rearrange it to obtain

$$S + (T - G) - I = X - M \qquad [19]$$

In expression [19], S is private saving and $(T - G)$ is government saving (which can be negative). Thus, the expression makes the important point that, in an open economy, the difference between a country's total saving (private + government) and the country's investment equals the current account balance. If $X < M$, the country is saving domestically less in total than it is investing; the shortfall is being made up by a net in flow of foreign saving. This has been the case for the United States for most of the past 25 years. If $X > M$, the country is saving more than it is investing domestically (and hence it is investing abroad via a capital outflow, with the capital/financial account outflow being equal to the current account surplus). The expression also helps us understand Catherine Mann's point at the start of this chapter that an increase in U.S. household saving rates could reduce the U.S. trade and current account deficits.

Utilizing expression [19], we can then plot two new schedules as in Figure 5, panel (b). The upward-sloping $S + (T - G) - I$ line subtracts the *fixed* autonomous amount of investment and the *fixed* autonomous amount of government spending from private saving and taxes. Because S depends positively on Y, the line is clearly upward sloping. The $X - M$ line slopes downward because, at higher levels of Y, rising amounts of imports are being subtracted from a *fixed* amount of autonomous exports. As should be evident, the intersection of these two lines (at q) will also yield the equilibrium level of income $0Y_e$.

The virtue of this approach is that the state of the current account balance that exists at the equilibrium level of income can be observed. (In our numerical example, $X = 140$ and $M = 220$ at equilibrium, so the current account is in deficit by 80.) Further, an important point that emerges from this discussion is that, even though the economy is in income equilibrium, it is not necessary that the current account balance be zero. In Figure 5(b), the existence of the current account deficit when the economy is at its equilibrium income is reflected in the fact that the equilibrium position q is below the horizontal axis. If q occurs at a point above the horizontal axis, there would be a current account surplus; if q lies on the horizontal axis, $X = M$, which indicates balance in the current account.

CONCEPT CHECK

1. Explain why an income level below the equilibrium level of income cannot persist.
2. Suppose that imports are entirely induced, that is, that the import function is $M = mY$ (with m being the marginal propensity to import). What is the APM in this case? What is the value of the YEM?
3. If the economy is at its equilibrium level of income and has a current account deficit, what must be true of the total amount of saving (private plus government) in the economy relative to the amount of investment? How is the excess of investment over saving being financed?

The Autonomous Spending Multiplier

A familiar concept contained in Keynesian income models is the **autonomous spending multiplier.** The autonomous spending multiplier is used to answer the following question: If autonomous spending on C, I, G, or X is changed, by how much will equilibrium income be changed? Graphically, as in Figure 4 earlier, this question is simply, if $(C + I + G + X - M)$ shifts in parallel fashion, what will be the ΔY as the economy responds to the change in autonomous spending?

Changes in autonomous consumption, investment, government spending, and exports

To answer this question, suppose that autonomous investment in our numerical example rises to 210 from its original level of 180. (This could be to \$210 billion from \$180 billion for example.) The best way to think of the multiplier concept is in terms of **rounds of spending in the multiplier process.** The autonomous increase of 30 in investment (assumed to be spent on domestic goods) generates production (and income) of 30 as firms produce the new machinery, for example, that is now in demand. The workers and owners of the firms producing the machinery receive 30 in income. Because taxes do not depend on income in this simplified model with which we are working, the 30 of new income will translate into 30 of new disposable income.[3] But what happens to this 30 of new disposable income? *Some* of it will be spent as indicated by the MPC. So a second round of spending will occur; in our example with MPC = 0.8, 24 will be spent [= (0.8)(30)]. However, some of this new spending will be on imports and will not lead to increased domestic production. In addition, remember that in our model, imports are a function of total income and not just disposable income because, besides consumption goods, some imports are also inputs for the new production being generated in this round. With our MPM of 0.1, imports go up by the MPM times the change in total income, or 3 [= (0.1)(30)]. This 3 amount must be subtracted from the 24 of second-round spending because the 3 does not generate domestic production and income, resulting in a net effect of 21 (= 24 − 3) in this second round of the multiplier process. In sum, the 30 of production in the first round has led to 21 of new domestic spending and income in the second round; 70 percent gets "re-spent."

[3] For a model that has taxes that depend on income, see Appendix A of this chapter.

The process continues into a third round. The 21 of spending from the second round leads to 21 of new income for the workers and firms producing the goods purchased in that second round. Of the 21 of new income (and new disposable income) thus generated, with the MPC of 0.8, 16.8 [= (0.8)(21)] will be spent. However, spending on imports will increase by the MPM times the 21 change in total income, and this 2.1 of imports [= (0.1)(21)], when subtracted from the 16.8 of spending, leaves a net increase in spending on domestic goods in the third round of 14.7. Thus, 70 percent of the second-round amount of 21 has been re-spent in the third round. This 14.7 of spending leads to new income, and a fourth round is started. Theoretically, this process goes on through an infinite number of rounds, although the amount of new income generated in each cycle rapidly gets smaller.

What is the ultimate change in income occurring because of the original 30 of new investment? The total change in income after all the rounds have been completed equals the sum of the following geometric series:

$$\begin{aligned}\Delta Y &= 30 + 21 + 14.7 + \ldots \\ &= 30 + (0.7)(30) + (0.7)^2(30) + \ldots\end{aligned}$$

which, mathematically, can be shown to be

$$\begin{aligned}\Delta Y &= [1/(1 - \text{fraction re-spent in each round})](\text{initial } \Delta I) \\ &= [1/(1 - 0.7)](30) \\ &= (1/0.3)(30) = (3\ 1/3)(30) = 100\end{aligned}$$

The 0.7 in the $(1 - 0.7)$ denominator term derives from the 70 percent re-spent in each round; in symbols, this 70 percent is [MPC − MPM] or $(0.8 - 0.1) = 0.7$. Thus, the initial increase in autonomous investment spending of 30 has led to a total change in income of 100. An initial change in autonomous consumption spending[4] or in autonomous government or export spending of 30 would have had the same 100 impact on income as the 30 change in autonomous investment. The "multiplier" is simply the total change in income divided by the initial change in autonomous spending, or \$100/\$30 = 3⅓. The formula for calculating the autonomous spending multiplier in the open economy (k_o) is

$$k_o = \frac{1}{1 - (\text{MPC} - \text{MPM})}$$

or

$$k_o = \frac{1}{1 - (\text{MPC} - \text{MPM})} = \frac{1}{\text{MPS} + \text{MPM}} \qquad [20]$$

or, in our example,

$$k_o = \frac{1}{1 - 0.8 + 0.1} = \frac{1}{0.2 + 0.1} = 3\tfrac{1}{3}$$

Expression [20] is the basic **open-economy multiplier.** If the economy were a closed economy, there would be no imports (or exports). Hence, the MPM would be zero and the closed economy multiplier would be $1/(1 - \text{MPC})$. This multiplier would be larger than the open-economy multiplier (for any given MPC) because there is no leakage of spending out of the domestic economy into imports. For one set of estimates of a country's open-economy multiplier, see Box 3.

[4] It is assumed in all cases that the first round of spending is entirely on domestic goods.

BOX 3 MULTIPLIER ESTIMATES FOR INDIA

There have been many, many estimates of open-economy multipliers for different countries over different time periods, usually for high-income or developed countries. However, attempts have also been made to estimate the multiplier for some developing countries, especially as comprehensive and more reliable data have become available. For example, in 1994, D. P. Bhatia published calculations of various multipliers for the Indian economy.* He approached the estimations from two perspectives—at the aggregate level directly (such as we have done in this chapter) and at the sectoral level, whereby multipliers were estimated for each sector of the economy and then aggregated to get an economywide figure. The direct aggregate-level estimates are most relevant for this chapter, and he obtained the following results with this procedure (given on his p. 46):†

1973–1974: marginal propensity to save = 0.30967
marginal propensity to import = 0.05449
multiplier = 1/(0.30967 + 0.05449) = 1/(0.36426)
= 2.74605

1978–1979: marginal propensity to save = 0.42487
marginal propensity to import = 0.06206
multiplier = 1/(0.42487 + 0.06206) = 1/(0.48693)
= 2.05368

1983–1984: marginal propensity to save = 0.18092
marginal propensity to import = 0.14323
multiplier = 1/(0.18092 + 0.14323) = 1/(0.32415)
= 3.08499

Hence, during the period from 1973–1974 through 1983–1984, the multiplier fell and then rose. Bhatia notes (and this is evident from the numbers given) that the marginal propensity to save (MPS) and the marginal propensity to import (MPM) both increased between 1973–1974 and 1978–1979. Clearly these increases would cause a drop in the value of the multiplier as the leakages from the spending stream increased, and the multiplier decreased from its 1973–1974 value of 2.75 to a value of 2.05 in 1978–1979. Between 1978–1979 and 1983–1984, the MPS fell dramatically, which would increase the size of the multiplier, and the MPM rose sharply (partly reflecting greater spending on imports due to increases in oil prices), which would decrease the multiplier. On balance, the multiplier rose to 3.08 in 1983–1984.

With any estimates of this sort, though, it is useful to keep in mind that data problems do exist and that there are numerous different estimating techniques. (Bhatia's estimates from his sectoral procedure yielded higher multipliers than those given here, although the pattern of a decrease from 1973–1974 to 1978–1979 and then an increase to 1983–1984 remained intact.) In addition, we must always ask ourselves whether there are economic explanations that are consistent with the statistical results (such as the large increase in the Indian MPS from 1973–1974 to 1978–1979). Bhatia's paper does not pursue such explanations.

* D. P. Bhatia, "Estimates of Income Multipliers in the Indian Economy," *Indian Economic Journal* 42, no. 1 (July–September 1994), pp. 39–56.

† The Indian fiscal year ends in March; hence, 1973–1974, for example, runs from April 1973 through March 1974.

Changes in autonomous imports

A further multiplier exists in the open economy. We have dealt previously with autonomous increases in consumption, investment, government spending on goods and services, and exports. But autonomous imports $\overline{M}$ constitute another type of autonomous spending in the open economy. What happens if $\overline{M}$ increases? This one is tricky. If the demand for imports increases autonomously, this is equivalent to an autonomous *decrease* in the demand for domestic goods. Therefore, in national income models, an autonomous increase in imports will lead to a *decrease* in the level of income. The autonomous increase in imports reflects a decrease in spending on domestic goods, which leads to lower income. Because the multiplier process for an autonomous increase in imports operates in a *downward* direction, the multiplier for a change in autonomous imports is equal to *minus* k_o; that is,

$$\Delta Y/\Delta M = -k_o = -\frac{1}{1 - \text{MPC} + \text{MPM}} \qquad [21]$$

There is no conflict between this negative effect of an increase in imports in macro models and the positive effect of imports on national well-being in international trade theory. Trade theory assumes that the country is always at full employment and on its production-possibilities frontier both before and after the change in imports. In the macro models, we are making no such assumption that the economy is always at its maximum output.

With this import multiplier in mind, what will happen if exports and imports both increase autonomously by the same amount? The net effect of an autonomous balanced change in the size of the foreign trade sector (that is, an equal autonomous change in exports and imports) is *zero*. This occurs because the export change has a multiplier of k_o while the autonomous import change has a multiplier of minus k_o. The two changes cancel each other out with respect to their impact on national income.

The Current Account and the Multiplier

Having examined the multiplier in the Keynesian income model, let us now look at relationships between national income, the current account balance, and the multiplier. First, recall the earlier point that national income equilibrium can coexist with a deficit in the current account. Suppose that, as a policy objective, we wish to eliminate the current account deficit by reducing imports, with the reduction in imports to be accomplished by reducing national income (through contractionary macroeconomic policy). *By how much would national income have to be reduced to eliminate the current account deficit*? The answer is easy to obtain. For instance, in our earlier numerical example, there was a deficit of 80 (X was 140, M was 220); we must contract income enough so that imports fall by 80. Remembering the MPM, this means that income must fall enough so that the change in income multiplied by the MPM equals -80. Thus, if the ΔM target is -80,

$$\begin{aligned} \Delta M &= \text{MPM} \times \Delta Y \\ -80 &= 0.10 \times \Delta Y \\ \Delta Y &= -800 \end{aligned}$$

The level of income must fall by 800 to reduce imports by an amount that will restore balance in the current account. If the economy is at less than full employment, this might be a large contraction in income that would not be welcomed. There is a conflict between an "internal" target for the economy, such as full employment, and an "external" target, such as balance in the current account.

Second, suppose that we want to take policy measures to expand *exports* (for example, by depreciating the value of our currency relative to other currencies and assuming that the Marshall-Lerner condition holds) as a way of eliminating the current account deficit. If exports increase by 80, will this eliminate the current account deficit? The answer is no. If exports increase by 80, then the open-economy multiplier of 3⅓ is applied to this autonomous increase in exports. The level of Y will rise by (80)(3⅓), or 266.67, to 2,266.67 from the original 2,000. But because Y has risen by 266.67, there will be induced imports of the MPM (= 0.10) times 266.67, or 26.67. The expansion of exports (by 80) has cut the deficit by 53.33 (= 80 − 26.67) but has not eliminated it. It can also be noted that this analytical result of the export increase leading to a reduction in the deficit is what lies behind Catherine Mann's indication in the statement at the beginning of this chapter that faster global growth would reduce the U.S. trade and current account deficits. The reductions would occur because faster income growth in other countries would lead to increased exports from the United States since other countries have a positive marginal propensity to import from the United States.

This relationship between an increase in exports and the resulting increase in imports, though a smaller import increase than the initial increase in exports, is an important one. It is important because it shows that, given a disturbance in the foreign sector of the economy such as a rise in exports (it could also be a fall in exports or an autonomous rise or fall in

imports), forces are set in motion to dampen the effect of that disturbance on the current account balance. Thus, in our example, when exports increased by 80, the current account balance didn't improve by the full 80 because imports increased by 26.67. The current account balance *did* improve, but by less than the initial disturbance. Because the initial export increase was partly offset by induced imports, there was at least *some* adjustment to the initial disturbance, but there was not full adjustment because imports did not rise by 80 and eliminate the effect of the export increase on the current account balance. This phenomenon of a current-account disturbance not leading to a full offset of the disturbance is called **partial current account adjustment** to any initial disturbance.

Foreign Repercussions and the Multiplier Process

A final matter to consider in our treatment of Keynesian income models is **foreign repercussions.** In the real world, when spending and income change in a home country, changes are transmitted to other countries through changes in imports of the home country. As reactions to the changes in trade occur in the other countries, there will be feedback upon the original home country. While full-scale econometric models of the world economy with hundreds of equations have been used to trace through foreign repercussions, we are less ambitious in this chapter. We give one limited example of how such repercussions can be taken account of in relatively simple macroeconomic models. This example concerns the multiplier process.

In the traditional (no-repercussions) open-economy multiplier process, an autonomous investment increase in the United States, for example, will cause a rise in U.S. income by the change in investment times the standard open-economy multiplier. This multiplied change in income will generate an induced rise in imports (by the MPM times the change in income). Thus, in the following schematic diagram:

$$\uparrow I_{US} \longrightarrow \uparrow Y_{US} \longrightarrow \uparrow M_{US}$$

The process stops here in the model we have been using so far. However, when foreign repercussions are permitted in the model, the process continues. The rise in imports into the United States constitutes a rise in exports of the rest of the world (ROW). When exports in ROW increase, this initiates a multiplier process in ROW and a rise in ROW income. This rise in income causes ROW to import more goods based on its marginal propensity to import. Finally, at least some of the increased imports into ROW will be exports of the United States! These increased exports will then set in motion additional spending and income generation in the United States. Further, this additional U.S. income will cause more U.S. imports, and so on. The process continues in ever-diminishing amounts. The multiplier mechanism when foreign repercussions exist can be represented by the following flow diagram:

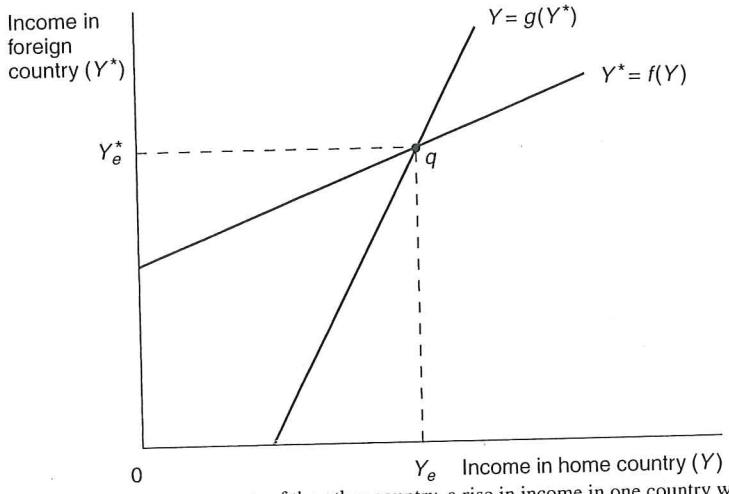
$$\begin{array}{l} \uparrow I_{US} \rightarrow \uparrow Y_{US} \rightarrow \uparrow M_{US} = \uparrow X_{ROW} \rightarrow \uparrow Y_{ROW} \rightarrow \uparrow M_{ROW} \rightarrow \uparrow X_{US} \\ \qquad\qquad\quad \uparrow \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad \downarrow \\ \qquad\qquad\quad \leftarrow\leftarrow\leftarrow\leftarrow\leftarrow\leftarrow\leftarrow\leftarrow\leftarrow\leftarrow\leftarrow\leftarrow\leftarrow\leftarrow\leftarrow \end{array}$$

As you can see, we continue going through the loop until the marginal changes in income approach zero.

When all of these repercussions have occurred, the total change in income in the United States that results from the initial increase in investment will be *larger* than was the case when repercussions were not considered because of the additional feedback on U.S. income from the rest of the world. The expression for this repercussions multiplier, the **open-economy multiplier with foreign repercussions,** is complicated and is explored further in Appendix B of this chapter.

The "foreign repercussions process" emphasizes that countries of the world are interdependent with respect to macroeconomic activity. When a boom (or recession) occurs in one

FIGURE 6 **Income Interdependence between Countries**



Because imports of one country are exports of the other country, a rise in income in one country will stimulate exports and therefore income in the other country. Thus, income in the foreign country (Y^*) is dependent on income in the home country (Y), and vice versa. There is simultaneous national income equilibrium in the two countries where the two lines intersect (that is, at Y_e and Y^*_e).

country, it will be transmitted to other countries and will then feed back upon the originating country. We can therefore graph one country's income level as being positively related to other countries' income levels, and likewise can graph other countries' income levels as being positively related to the first country's income level, as in Figure 6. This graph demonstrates the simultaneous determination of equilibrium income in the two countries. Consequently, both levels of income are altered whenever autonomous spending in any one country changes (which would be a shift in one of the income lines) and macroeconomic variables can move together across countries. (See Box 4.)

CONCEPT CHECK

1. What happens to the size of the open-economy multiplier (without foreign repercussions) if, other things being equal, the marginal propensity to import increases? Explain in economic terms, not just in algebraic terms.
2. Explain why an autonomous increase in investment spending in a country will lead to a greater increase in national income in that country if foreign repercussions are important than it would if foreign repercussions are unimportant.

AN OVERVIEW OF PRICE AND INCOME ADJUSTMENTS AND SIMULTANEOUS EXTERNAL AND INTERNAL BALANCE

This and the preceding chapter have been concerned with how the exchange rate and the state of the balance of payments lead to effects on the current account and the internal sector of the economy. In the previous chapter, we examined the manner by which a change in the exchange rate affects export receipts and import outlays and the current account balance through altering the relative prices of home and foreign goods. In a context of fixed exchange rates, we discussed how a disequilibrium in the balance of pay-

BOX 4 CORRELATIONS OF MACROECONOMIC VARIABLES ACROSS COUNTRIES

As is evident from the discussion of foreign repercussions in the text, macroeconomic activity in one country "spills over" into other countries through the multiplier process. Hence, upward (downward) movement in one economy can lead to upward (downward) movement in another economy. Of course, each country in the world is also subject to its own independent shocks and economic idiosyncracies, so countries' economies will not keep perfectly in line with each other. Nevertheless, macroeconomic theory leads us to expect that there should be some positive relationship across countries with respect to aggregate economic variables.

Table 2 presents information (obtained from a sample running from 1970 to 1990) on the correlation or co-movement of various macroeconomic variables in nine industrial countries with comparable variables in the United States. To interpret the table, consider the correlation coefficient in the upper-left-hand corner of the table. The 0.60 coefficient for Australian output (real GDP) with U.S. output indicates a fairly strong relationship of the two outputs over time. (Two variables that are perfectly correlated with each other, meaning that their movements are identical, would have a correlation coefficient of 1.0; if there is absolutely no relationship between the variables, the correlation coefficient would be 0.0; and if the variables are perfectly oppositely correlated, the coefficient would be −1.0.) In the table, real GDP movements in all nine countries are fairly well correlated with the movement of U.S. real GDP, with the strongest relations being between Germany and the United States (0.85) and between Canada and the United States (0.81). Movements in consumption are also reasonably strongly correlated (except for Australia and Italy) with U.S. consumption movements, as are movements in employment (again, except for Australia and Italy). Aggregate investment movements seem less closely linked. The negative correlations for net exports reflect the fact that U.S. negative net exports imply positive net exports for trading partners of the United States. All in all, macro aggregates of these other industrial countries do tend to move with the U.S. aggregates, indicating that economic activity does get transmitted across country borders.

TABLE 2 **Correlations of Macroeconomic Variables in Several Industrial Countries with U.S. Variables**

	Output (real GDP)	*Consumption*	*Investment*	*Employment*	*Net Exports*
Australia	0.60	−0.13	0.21	−0.17	0.03
Austria	0.54	0.45	0.57	0.58	0.29
Canada	0.81	0.46	0.00	0.50	−0.10
France	0.46	0.42	0.22	0.36	−0.25
Germany	0.85	0.64	0.66	0.60	−0.23
Italy	0.49	0.04	0.39	0.11	−0.28
Japan	0.66	0.49	0.59	0.48	−0.59
Switzerland	0.48	0.48	0.38	0.43	−0.10
United Kingdom	0.64	0.42	0.46	0.68	−0.11

Source: Marianne Baxter, "International Trade and Business Cycles," in Gene M. Grossman and Kenneth Rogoff, eds., *Handbook of International Economics,* vol. III (Amsterdam: Elsevier-Science, 1995), p. 1806.

ments (a deficit or surplus) sets into motion money supply changes and internal price changes so as to improve (deteriorate) the current account in the case of a BOP deficit (surplus). In this chapter, we noted that a disturbance in the current account (such as an autonomous increase in exports) leads to national income changes, which in turn partly (but not completely) offset the initial current account disturbance through induced changes in imports.

An important feature of the interrelationships between the current account and the internal economy, and one that will be examined in more detail in subsequent chapters, is the possible conflict between the macroeconomic goals of "external balance" and "internal

balance." **External balance** in this context refers to balance in the current account ($X = M$), while **internal balance** refers to the desirable state of the economy where there is a low level of unemployment together with reasonable price stability. There are clearly four possible combinations of departures from external and internal balance:

Case I: Deficit in the current account; unacceptably high unemployment.

Case II: Deficit in the current account; unacceptably rapid inflation.

Case III: Surplus in the current account; unacceptably rapid inflation.

Case IV: Surplus in the current account; unacceptably high unemployment.[5]

If policymakers are confronted with any one of these four combinations in a situation of fixed exchange rates, what should the macroeconomic policy stance be? We first discuss the straightforward Cases II and IV and then turn to the more complicated Cases I and III.

Case II: Current account deficit and inflation

In this case restrictive or contractionary aggregate demand–oriented monetary and fiscal policy (that is, a reduction in the money supply, a decrease in government spending, an increase in taxes) is in order. With the adoption of such policies, the price level and the level of national income will fall. The falling prices—or at least prices that are rising less rapidly than prices in other countries—will expand exports and reduce imports, and the fall in income will also reduce imports via the MPM. Thus the restrictive policies will improve the current account and move the economy toward external balance, as well as dampen the inflation and move the economy toward internal balance. However, the degree of restriction needed to attain external balance may differ from the degree of restriction needed to attain internal balance, and thus policymakers may not be able to attain both targets simultaneously. Nevertheless, the direction of policy will be correct.

Case IV: Current account surplus and unemployment

In this case, of course, policy is moving in the opposite direction from case II. Expansionary monetary and fiscal policy—an increase in the money supply, an increase in government spending, a reduction in taxes—will stimulate national income and also induce more imports. In addition, any price pressures generated by the expansion will reduce exports and increase imports. Thus, the direction of policy works to reduce the current account surplus and to reduce the amount of unemployment, although of course the degree of necessary expansion may differ with respect to attainment of each particular goal.

Case I: Current account deficit and unemployment

In this case, even the *direction* of the appropriate policy stance is unclear. Expansionary monetary and fiscal policy to decrease unemployment will worsen the current account through induced imports by the MPM times the rise in income. In addition, if the price level rises due to the expansionary policy, exports will fall and imports will rise, thus worsening the already existing current account deficit. On the other hand, contractionary policy to reduce the current account deficit will drive national income downward and worsen the unemployment situation.

Case III: Current account surplus and inflation

In this case, expansionary policy will reduce the current account surplus but worsen the inflation. However, contractionary policy to alleviate the inflation will enlarge the current account surplus.

[5]Of course, as the experience of the 1970s particularly indicated, it is also possible to have unacceptably high unemployment and unacceptably rapid inflation at the same time. We deal here only with the traditional macroeconomic analysis that treats the economy as having one of these internal problems but not the other simultaneously. The "stagflation" situation of high unemployment and rapid inflation at the same time is discussed more thoroughly in Chapter 27, "Prices and Output in the Open Economy: Aggregate Supply and Demand."

Hence, the attainment of one "balance" in either of these last two cases will worsen the situation with respect to the other "balance." There is thus a conflict between the attainment of external balance and internal balance in these two cases. The policymakers may have to decide which goal is more important.

In the conflict cases, however, as well as in cases II and IV, where the degree of needed policy restriction or expansion was in doubt, it *is* possible to have the relative price effects and the income effects work together to attain both goals simultaneously. This can be accomplished by using a *change in the exchange rate* as an instrument of policy. This change in the exchange rate can be interpreted as a change in the official parity rate in a fixed-but-adjustable-rate system (for example, the Bretton Woods system from 1947 to 1971, discussed in the last chapter of the book) or as government intervention to influence the exchange rate in a more flexible exchange rate system, such as the system that currently exists. Hence, in a model such as that of Swan (1963), a country with unemployment and a current account deficit could devalue (depreciate) its currency in order to alleviate the current account problem as well as to provide economic stimulus from enhanced exports and reduced imports. In the other previous conflict situation of inflation and a current account surplus, an upward revaluation (appreciation) of the country's currency would work, through a decrease in exports and an increase in imports, to remove the surplus as well as to dampen the inflation.

SUMMARY

This chapter considered the interrelationships between the current account and national income in the context of an open-economy Keynesian model. The equilibrium level of income occurs when desired aggregate expenditures equal production or, alternatively, when desired $S + T + M$ equals desired $I + G + X$ or $S + (T - G) - I$ equals the current account balance. In this model, increases in autonomous spending on consumption, investment, government spending, or exports lead to multiplied increases in national income through the multiplier of $1/(1 - \text{MPC} - \text{MPM})$ or $1/(\text{MPS} + \text{MPM})$. The presence of "foreign repercussions" introduces additional features into the multiplier process, with these repercussions embodying the role of interdependence among economies in national income determination. In Keynesian income models in general, if the current account is in equilibrium, a disturbance to that equilibrium will set forces in motion to restore current account balance. However, only partial adjustment rather than a full restoration of current account balance will occur.

An important point emerging from the Keynesian income model is that, with a fixed exchange rate, equilibrium in national income need not occur with simultaneous equilibrium in the current account. Policymakers confront targets of both external and internal balance, and it may be difficult to attain both targets even if explicit changes in the exchange rate are permitted. Further policy considerations are explored in the next three chapters.

KEY TERMS

autonomous consumption spending
autonomous imports
autonomous spending multiplier
average propensity to import (APM)
consumption function
desired aggregate expenditures
equilibrium level of national income
external balance
foreign repercussions
import function
income elasticity of demand for imports (YEM)
induced consumption spending
induced imports
injections
internal balance
Keynesian income model
leakages
marginal propensity to consume (MPC)
marginal propensity to import (MPM)
marginal propensity to save (MPS)
open-economy multiplier
open-economy multiplier with foreign repercussions
partial current account adjustment
rounds of spending in the multiplier process
saving function

QUESTIONS AND PROBLEMS

1. Using the Keynesian model, explain the effect on national income of an autonomous increase in saving.
2. Given the following simple Keynesian model:

$$E = C + I + G + X - M \qquad I = 150$$
$$C = 50 + 0.85Y_d \qquad G = 300$$
$$Y_d = Y - T \qquad X = 80$$
$$T = 400 \qquad M = 10 + 0.05Y$$
$$Y = E \text{ in equilibrium}$$

   (*a*) Determine the equilibrium level of income.

   (*b*) When the equilibrium income level is attained, is there a surplus or a deficit in the current account? Of how much?

   (*c*) What is the size of the autonomous spending multiplier?

3. In the model of Question 2, by how much would income have to change in order to make $X = M$ (with no change in X)? How much change in autonomous investment would be necessary to generate this change in income?
4. Explain why a country with a current account surplus (such as Japan) can be said to be saving more than it invests.
5. Germany has consistently pursued an anti-inflationary domestic policy that has resulted in sizable unemployment and a lower rate of economic growth than would otherwise have been the case. Why might Germany's trading partners have reacted adversely to such a German policy stance?
6. In trade negotiations with the Japanese over the large U.S. trade deficit with Japan, the Clinton administration urged the Japanese government to undertake a more expansionary fiscal policy. If the Japanese government did so, how might the U.S. trade deficit with Japan be reduced? Could U.S. imports from Japan rise because of the expansionary policy? Explain.
7. You are given the following four-sector Keynesian income model:

$$E = C + I + G + (X - M) \qquad I = 230$$
$$C = 120 + 0.75Y_d \qquad G = 560$$
$$Y_d = Y - T \qquad X = 350$$
$$T = 40 + 0.20Y \qquad M = 30 + 0.10Y$$
$$Y = E \text{ in equilibrium}$$

   (*a*) Calculate the equilibrium income level (Y_e).

   (*b*) Calculate the amount of taxes collected when the economy is at Y_e. Then indicate whether the government has a surplus or deficit at Y_e and calculate the value of the surplus or deficit.

   (*c*) Calculate the value of net exports when the economy is at Y_e.

   (Note: To answer this question, you need to read Appendix A of this chapter.)
8. Suppose that there are two countries in the world economy, countries I and II. The countries possess the following marginal propensities: $MPC_I = 0.7$; $MPM_I = 0.1$; $MPC_{II} = 0.8$; $MPM_{II} = 0.2$. There is no government sector. Using the formula for the open-economy multiplier with foreign repercussions, calculate the effect on country I's income of a rise in autonomous investment in country I of $35 billion. (Note: To answer this question, you need to read Appendix B of this chapter.)

Appendix A THE MULTIPLIER WHEN TAXES DEPEND ON INCOME

The open-economy multiplier when taxes depend on income is smaller than the open-economy multiplier when taxes are entirely autonomous or lump sum in nature (as was the case in the body of this chapter). To illustrate, building on the numerical example in the chapter, suppose that, as before,

$$C = 100 + 0.8Y_d \qquad G = 600$$
$$Y_d = Y - T \qquad X = 140$$
$$I = 180 \qquad M = 20 + 0.1Y$$

However, suppose that the tax function, instead of $T = 500$, is now

$$T = 40 + 0.25Y$$

This expression indicates that, besides an autonomous or lump-sum component of taxes (40), there is also a component that depends on income (0.25Y). The 0.25 in this example is the *marginal tax rate*, or t in general form. The marginal tax rate is the fraction of an additional unit (dollar) of income that must be paid in taxes—25 percent in this example. With this tax function, the equation for disposable income becomes

$$Y_d = Y - (40 + 0.25Y)$$
$$= -40 + 0.75Y$$

To examine the effect of this change in the tax structure on the multiplier and the rounds of spending in the multiplier process, let us now suppose that, as in the body of the chapter, investment increases by 30. In the first round of the multiplier process, producers of the new capital goods increase their output by 30. (We again assume that the first round of spending is entirely on domestic goods.) This output increase of 30 increases income of the workers in the capital goods industries by 30. How much spending will take place in the second round of the multiplier process? The second-round spending will be less than the MPC (0.8) times the change in income (30) because taxes now have to be paid before any more spending takes place. With the marginal tax rate of 25 percent, the recipients of the 30 in income must pay (0.25)(30) = 7.5 in taxes. Hence, although income increased by 30, *disposable* income increased by only 22.5 (= 30 − 7.5). Applying the MPC of 0.8 to the 22.5 increase in disposable income, households in the second round thus spend 18 [= (0.8)(22.5)] more on goods and services. However, remember that some of the new spending in the economy is on imports and, in our example, this is 0.1 of the new *total* income (not the new disposable income). Hence, with the total income increase of 30, imports will increase by 3 [= (0.1)(30)]. Thus, in the second round, the amount of spending on domestic goods is 15 (= 18 − 3). This "second-round" result is 50 percent of the first-round spending (unlike in our earlier example where it had been 70 percent of first-round spending).

Let us trace this multiplier process through one more round. Of the new domestic production and income of 15 generated in the second round, 25 percent must be paid in taxes—an amount of (0.25)(15) = 3.75. Thus, disposable income rises in the third round by 11.25 (= 15 − 3.75). To the 11.25, the MPC of 0.8 applies, and consumption increases by 9 [= (0.8)(11.25)]. With imports increasing by 1.5 (= 10 percent of the 15 total new income coming from the second round), spending on domestic goods hence rises by 7.5 (= 9 − 1.5) or 50 percent of the second-round figure of 15.

To cut to the chase, the many rounds of spending yield a series of income changes

$$\Delta Y = 30 + 15 + 7.5 + \ldots$$

As noted earlier in the chapter, such a series sums to

$$\Delta Y = [1/(1 - \text{fraction re-spent in each round})]\ (\text{initial } \Delta I)$$

or, in this case since 50 percent is re-spent in each round,

$$\begin{aligned}\Delta Y &= [1/(1 - 0.5)](30) \\ &= (1/0.5)(30) = 60\end{aligned}$$

The multiplier is thus 2.0 (= 60/30 or 1/0.5). It has been reduced from the 3 1/3 of the earlier example in the chapter because taxes are now an additional leakage in each round of the spending process after the first round.

In conceptual terms, the open-economy multiplier when taxes depend on income (k^*_o) is given by the expression

$$k^*_o = \frac{1}{1 - \text{MPC}(1 - t) + \text{MPM}} \qquad [22]$$

or, alternatively,

$$= \frac{1}{1 - \text{MPC} + \text{MPC} \times t + \text{MPM}} \qquad [22']$$

If $t = 0$, we are back at the original multiplier. With the current numbers in this appendix, you can plug in MPC = 0.8, $t = 0.25$, and MPM = 0.1 to verify that the multiplier = 2.0.

One final note: If, unlike in our analysis in this chapter and this appendix, imports are made to depend on *disposable* income rather than on total income, the open-economy multiplier becomes

$$k^{**}_o = \frac{1}{1 - \text{MPC}(1 - t) + \text{MPM}(1 - t)} \qquad [23]$$

which is slightly smaller than the multiplier in expressions [22] and [22′].

Appendix B DERIVATION OF THE MULTIPLIER WITH FOREIGN REPERCUSSIONS

This appendix derives the autonomous spending multiplier when foreign repercussions are taken into account. To simplify to some extent the complicated algebra, we assume that there is no government sector (in either country), and hence $G = 0$ and $t = 0$. Note that the standard open-economy multiplier in this case is 1/(1 − MPC + MPM) or 1/(MPS + MPM).

In the derivation, we designate foreign country variables with a *; unstarred variables refer to the home country. Consumption contains the usual autonomous component and induced component in both countries, as does the import function. Investment and exports are autonomous. The equations for the two economies are thus

$$\begin{aligned} E &= C + I + X - M & E^* &= C^* + I^* + X^* - M^* \\ C &= a + bY & C^* &= a^* + b^*Y^* \\ I &= \bar{I} & I^* &= \bar{I}^* \\ X &= \bar{X} & X^* &= \bar{X}^* \\ M &= \bar{M} + mY & M^* &= \bar{M}^* + m^*Y^* \end{aligned}$$

$$Y = E \text{ and } Y^* = E^* \text{ in equilibrium}$$

The equilibrium level of income for the home country is found by substitution into the $Y = C + I + X - M$ equilibrium expression:

$$\begin{aligned} Y &= a + bY + \bar{I} + \bar{X} - (\bar{M} + mY) \\ Y - bY + mY &= a + \bar{I} + \bar{X} - \bar{M} \\ Y &= \frac{a + \bar{I} + \bar{X} - \bar{M}}{(1 - b + m)} \end{aligned} \qquad [24]$$

However, in this two-country model, the exports of the home country are equal to the imports of the foreign country, so [24] can be written

$$Y = \frac{a + \bar{I} + \bar{M}^* + m^*Y^* - \bar{M}}{(1 - b + m)}$$

For simplification, we substitute s (the marginal propensity to save in the home country) for $(1 - b)$, because b is the home country's marginal propensity to consume:

$$Y = \frac{a + \bar{I} + \bar{M}^* + m^*Y^* - \bar{M}}{s + m} \qquad [25]$$

A similar procedure for obtaining equilibrium income in the foreign country yields the equation for Y^* as

$$Y^* = \frac{a^* + \bar{I}^* + \bar{M} + mY - \bar{M}^*}{s^* + m^*} \qquad [26]$$

where s^* is the foreign country's marginal propensity to save.

To obtain multipliers for the home country, expression [26] is substituted into expression [25]:

$$Y = \frac{a + \bar{I} + \bar{M}^* - \bar{M} + m^*\left(\dfrac{a^* + \bar{I}^* + \bar{M} + mY - \bar{M}^*}{s^* + m^*}\right)}{s + m}$$

$$Y = \frac{(s^* + m^*)(a + \bar{I} + \bar{M}^* - \bar{M}) + m^*(a^* + \bar{I}^* + \bar{M} + mY - \bar{M}^*)}{(s^* + m^*)(s + m)}$$

$$(s + m)Y = \left(\frac{(s^* + m^*)(a + \bar{I} + \overline{M}^* - \overline{M}) + m^*(a^* + \bar{I}^* + \overline{M} - \overline{M}^*)}{s^* + m^*}\right) + \frac{m^*mY}{s^* + m^*}$$

$$(s^* + m^*)(s + m)Y - m^*mY = (s^* + m^*)(a + \bar{I} + \overline{M}^* - \overline{M}) + m^*(a^* + \bar{I}^* + \overline{M} - \overline{M}^*)$$

Therefore equilibrium income Y can be expressed as

$$Y = \left(\frac{s^* + m^*}{ss^* + ms^* + sm^*}\right)(a + \bar{I} + \overline{M}^* - \overline{M}) + \left(\frac{m^*}{ss^* + ms^* + sm^*}\right)(a^* + \bar{I}^* + \overline{M} - \overline{M}^*) \quad [27]$$

Expression [27] can be used to obtain a variety of multipliers. The autonomous investment multiplier in the home country simply involves looking at the ΔY associated with a ΔI:

$$\frac{\Delta Y}{\Delta I} = \frac{s^* + m^*}{ss^* + ms^* + sm^*}$$

or

$$= \frac{1 + \dfrac{m^*}{s^*}}{s + m + m^*(s/s^*)} \quad [28]$$

Inspection of this multiplier indicates that it is larger than it would be if there were no foreign repercussions. The standard no-repercussions open-economy multiplier (that is, expression [20] in the chapter) is

$$\frac{1}{1 - \text{MPC} + \text{MPM}} = \frac{1}{\text{MPS} + \text{MPM}}$$

or, in the symbols of this appendix, $1/(s + m)$. Expression [28] is larger than this multiplier because the percentage increase in the numerator in [28] from that in [20] is larger than the percentage increase in the denominator.

The investment multiplier in [28] applies also to a change in autonomous consumption (that is, to a change in "a"). However, note that, unlike the case where foreign repercussions are absent, the foreign repercussions multiplier for an autonomous change in *exports* of the home country will differ from the foreign repercussions multiplier for a change in autonomous investment (or consumption). Looking at expression [27], an autonomous change in exports for the home country is a change in autonomous *imports* ($\overline{M}^*$) for the foreign country. Thus,

$$\frac{\Delta Y}{\Delta X} = \frac{\Delta Y}{\Delta M^*} = \frac{s^* + m^*}{ss^* + ms^* + sm^*} - \frac{m^*}{ss^* + ms^* + sm^*}$$

$$= \frac{s^*}{ss^* + ms^* + sm^*}$$

$$= \frac{1}{s + m + m^*(s/s^*)} \quad [29]$$

The multiplier in [29] is smaller than the multiplier in [28] because of the absence of the m^*/s^* term in the numerator of [29]. Expression [29] is also *smaller than* the $[1/(s + m)]$ multiplier *when there are no foreign repercussions.* The economic reason is that an autonomous increase in home exports, while it stimulates home production and generates an expansion in home income, is also an autonomous increase in foreign country imports. The increase in autonomous foreign imports is at the expense of foreign consumption of goods produced in the foreign country, and it thus initiates a downward movement of income abroad. The decrease in foreign income in turn induces a decrease in purchases of home-country exports through the operation of the marginal propensity to

import in the foreign country, and it generates a downward movement in *home-country* income that partly offsets the upward income effects of the original autonomous export increase in the home country.

Another multiplier of interest is the effect of a change in autonomous investment in the *foreign country* upon *home-country* income. If I^* is changed in expression [27], the effect upon Y is

$$\frac{\Delta Y}{\Delta I^*} = \frac{m^*}{ss^* + ms^* + sm^*} = \frac{\frac{m^*}{s^*}}{s + m + m^*(s/s^*)} \qquad [30]$$

Obviously, the introduction of foreign repercussions makes multiplier analysis more complex!