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Growth, Employment & the Price Level

INTERMEDIATE MACROECONOMIC MEASUREMENT, THEORY & POLICY

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To Jeannette

Preface

This book is designed for use in a college semester course covering macroeconomic measurement, theory and policy. Highlights of the book are:

1. An introductory chapter providing a brief review of U. S. economic growth, business fluctuations, and trends in the price level, to emphasize the importance of these subjects.

2. Comprehensive review of the concepts and contents of the U. S. national income and product accounts, including the sectoral accounts and deflation procedures for the constant-dollar product series. This is followed by a description of the flow-of-funds summary table and other national accounting systems. (The flow-of-funds and following accounts may be omitted from reading assignments without loss of continuity, if the instructor wishes.)

3. Emphasis on the need for a theory of aggregate demand, by using a circular-flow model to illustrate Keynes' rejection of Say's Law.

4. In addition to formulating the theoretical consumption function and the multiplier, the three chapters on consumption show how the long run and short run consumption functions may be reconciled and discuss non-income variables affecting the propensity to consume, including a modern restatement of the Pigou effect.

5. When government and foreign transactions are added to aggregate demand particular emphasis is placed on the built-in stabilizers as well as discretionary public policy.

6. Investment demand determination is traced from capitalization of prospective investment projects by the individual firm through to the objective and psychological determinants of aggregate investment demand. In addition, there is modern treatment of the cost of capital and financial constraints on investment, an evaluation of the responsiveness of various types of investment to changes in the rate of interest, and both presentation and critique of the acceleration principle.

7. The liquidity preference approach to interest rate determination reflects recent suggestions of Tobin and others. This is followed by the Hicksian LM-IS statement of Keynes' general equilibrium, an apparatus which is employed to discuss causes of both depression and inflation, together with evaluation of appropriate policy measures to deal with each case.

8. The analysis of economic growth is integrated with the preceding discussion, so that the transition from static to dynamic analysis seems logical and inevitable when the focus of attention shifts from fluctuations to growth. Drawing on contributions by Fellner, Solow, and Tobin, the analysis considers why growth equilibrium, though "ultimately" unstable, shows considerable resiliency in the face of temporary departures from steady expansion in investment.

9. The concluding chapter reviews monetary, fiscal, and other government policies designed to foster growth, preserve full employment, and prevent inflation.

10. Throughout the book, statistical and historical illustrations are

frequently provided to support the validity and relevance of theory and policy measures. Diagrams are kept as simple as possible and are carefully explained in the text. Linear algebra is employed to summarize and demonstrate functional relationships, but formulas are always preceded or accompanied by explanations of the effects they represent.

I am grateful to Edward Budd, of Pennsylvania State University, for his careful consideration and detailed suggestions for revision of the manuscript in its early forms. Peter Kenen, of Columbia University, Robert Strotz, of Northwestern University, and Philip Cartwright, of the University of Washington, read portions of the manuscript in its early stages and made many valuable suggestions for revision. None of these reviewers saw the final draft and should not share in the author's responsibility for errors in the book.

My wife, Jean, did yeoman service in reading galleys and page proofs to catch the many errors I missed. However, my greatest debt to her is for her patience and understanding through all the months of my revisions and indecisions. I have dedicated this book to my infant daughter, Jeannette, whose birth a year ago made this work both necessary and possible—necessary for reasons any young college teacher will appreciate, possible for reasons I shall share with her when she is old enough to understand.

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Claremont, California

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1 Growth, Employment & Prices

Economic growth or stagnation, prosperity or depression, price stability or inflation — these are alternatives facing us in a free capitalistic economy. Americans have experienced all of them since World War I. The progress and prosperity of the Twenties gave way in the Thirties to the stagnation of the Great Depression. In the first decade after World War II consumer prices rose 50 percent. Then there set in a slow creeping inflation, which many came to view as the price of prosperity in the modern world.

This book is about economic growth, employment, and the value of money. We shall set forth a theoretical framework to explain (1) what determines secular expansion in national output and its long-term rate of growth, (2) why major and minor business declines occur

and how recovery can be brought about, and (3) what forces are at work to create inflation during times of prosperity and what policy measures are used to counteract these forces. But before we get on with the theory, let us take a closer look at the facts.

Economic Growth

Economic growth is an increase in the nation's output, which occurs both because the ability to produce rises and because this added ability is employed. There are both supply and demand aspects to it.

On the supply side, the capacity to produce is determined by the quantity, quality, and organization of resources. Economic growth occurs when there is increase in the labor force, accumulation of capital, and discovery of natural resources. Labor's productivity depends not only on the material resources with which workers are equipped but also on training, morale, mobility, and other dimensions of quality. The *quality* of capital is enhanced by progress in technology and the productivity of capital depends on its age composition. In other words, capital is affected by older equipment being worn, and newer equipment being of better design. Resources may be organized or combined for production in more or less fruitful ways. There is economic growth when these resources are reallocated from less to more useful employments or when the real costs of producing particular goods and services are reduced by better management.

During depressions the labor force and its potential productivity continue to expand. However, in place of economic growth there is falling output and employment. The trouble is on the demand side. The ability and willingness of households, businesses, and governments to buy does not match what can be produced at full employment of labor and capital. Most of our book will be concerned with what determines spending by consumers, producers, and governments for new goods and services. In sum, we shall center our attention on aggregate effective demand — *aggregate* because it concerns all spending for the nation's output and *effective* because demand is limited not by needs but by the means to serve these needs through purchases. The cruelest paradox of depression is that needs persist and even grow while the income that would turn these urgent needs into effec-

tive demand declines. We shall henceforth assume *effective* is understood and shall shorten our term to *aggregate demand.*

Some economists define *economic growth* as simply an increase in the nation's capacity to produce. By omitting the demand side, this definition asks us to say that growth occurs even when output declines during depression. On the other hand, in recovery from depression, output expands in part because existing resources are reemployed. If output simply returns to its previous level, we should not speak of this as economic growth either. Our definition requires both that the capacity to produce increase and that this capacity be utilized to increase output to higher levels than before.

Measuring economic growth We shall use gross national product valued in constant dollars to measure economic growth. This is the value of all final goods and services produced by the nation in a year (or quarter), whether purchased by households, bought by government, exported, or retained by business as capital for use in future production and sales. Care is taken to exclude intermediate outputs, such as wheat or steel, which are inputs for final outputs of the year, such as bread or automobiles. The value of wheat is contained in the price of the loaf and should not be counted a second time when it comes from the farmer.

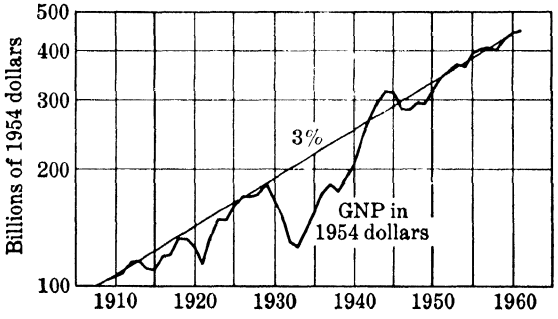
Gross national product is initially measured in the prices current during the production period. Thus an increase of GNP in current prices may be due wholly or in part to a rise in prices. To isolate the change in output, GNP is adjusted with price indexes so that it represents goods and services priced as they were in a single base year. Thus "1960 GNP in 1954 dollars" is final output in 1960 valued at the prices of 1954. Only in 1954 does a series on this base have the same value for GNP in current prices and GNP in constant (1954) dollars. Since the price level in 1960 was higher, GNP in current prices was greater for 1960 than GNP in 1954 dollars.

We must guard against unwittingly committing the politician's trick of artfully choosing beginning and terminal dates when we measure the average rate of growth. Republicans could view with alarm the modest 1.7 percent average annual growth rate during the two Truman administrations, 1945 through 1952, while Democrats could point with pride to the 4.6 percent rate from 1947 through 1952.

Both are calculated from GNP in 1954 dollars. The difference is that output declined during 1945 and levelled through 1946, when factories stopped turning out war goods and temporarily closed down while preparing for peace-goods production.

We should choose initial and terminal years that witnessed about the same rate of employment, unless we have some stated reason for doing otherwise. Furthermore, in order to iron out short-run fluctuations, it is wise to measure growth over a decade or more. The longer the time span, the less crucial are modest differences in employment rates between the years being compared. If output doubles in 20 years, the rate of growth is 3.5 percent. Should the terminal-year value of two decades be, because of recession, only 90 percent above the beginning year, the rate is reduced only to 3.3 percent.[1]

Historical rates of growth Figure 1-1 is a chart of U.S. gross national product in constant (1954) dollars from 1909 through 1961. The vertical axis, on which GNP is measured each year, is scaled in



1-1 Gross national product, 1909–1961

[1]This discussion assumes that growth is measured by the formula: $GNP_1 = GNP_0(1 + r)^t$, where GNP_1 and GNP_0 are values for the terminal and beginning years, respectively, where t is the span of time in years, and where r is the rate of growth to be determined. This is easily solved by conversion to logarithms:

$$\log (1 + r) = (\log GNP_1 - \log GNP_0)/t.$$

A more difficult method is to fit a logarithmic trend function by the method of least squares to all the annual data over the time span, perhaps excluding the extreme years of depression and the war boom. This gives a rate which is determined by more than just two years; however, over long spans of time there is likely to be little difference in this rate compared with the one obtained by our simpler method.

logarithms. Therefore, a straight line sloping upwards to the right represents a constant proportional or percentage rate of growth per annum.

The straight line connecting 1909 to 1961 outputs indicates an average 3-percent annual rate of growth. This trend line seems to fit the Twenties very well. It bridges the depressed Thirties and tunnels the World War II boom to emerge as a good fit for the prosperous Fifties. In sum, the easily remembered rate of 3 percent, at which output doubles in 23 years, well represents the rate of growth of twentieth-century American capitalism during periods of peacetime prosperity.

Growth in earlier periods. The official Department of Commerce estimates, shown in this chart, have been carried back only through 1909. However, Simon Kuznets and Raymond Goldsmith have derived estimates of U.S. gross national product back to 1839. Rates derived from these estimates, for 40-year periods, are shown in Figure 1-2. These indicate that the rate of growth declined as the American economy matured. At the 4.31 percent rate from 1839 through 1879, output doubled in 16 years. During the period 1879 through 1919, national output, doubling in 19 years, grew at an average 3.72 percent rate.

Growth rates for GNP per person are also shown in Figure 1-2. These are computed by dividing GNP each year by the population in that year. Note that these show the highest rate of growth in the second 40-year span, from 1879 through 1919. At the rate of 1.76 percent, output per person doubled in 40 years. Since the first World

1-2 Rates of economic growth, 1839–1959
(Percent increase per year)

	Entire period, 1839–1959	*40-year periods*		
		1839–79	*1879–1919*	*1919–59*
Total GNP, 1929 prices	3.66	4.31	3.72	2.97
GNP per person, 1929 prices	1.64	1.55	1.76	1.64

Source: Joint Economic Committee, 86th Cong., 1st sess., *Staff Report on Employment, Growth, and Price Levels* (Washington, D.C.: Government Printing Office, 1960), p. 34.

War, gross national product per capita has grown at an average 1.64 percentage rate, doubling in 43 years.

International comparisons In recent years there has been widespread public concern, shared by a number of economists, about the slow rate of growth of U.S. output compared with that of the U.S.S.R. and of other industrial countries of the world. Figure 1-3 presents average annual growth rates in constant prices over the decade 1950 through 1959 of aggregate gross domestic product and GDP per capita. Gross domestic product differs from GNP by excluding the usually minor item of net earnings from foreign assets and labor resident abroad. We can safely assume that the growth rates for GNP are virtually the same as shown in this table.

All rates except Russia's are calculated from estimates conforming substantially to uniform definitions and coverage recommended by the United Nations. Official Communist figures exclude the value of services — inasmuch as they are calculated according to the material definition of output held by Karl Marx; so, for this reason and on other grounds, their figures are not comparable to conforming rates. Experts working with the U.S. Central Intelligence Agency (CIA) estimate that Soviet GNP in constant prices grew at an average rate of 7 percent from 1950 through 1958. The per capita rate in the table is derived from this CIA estimate adjusted with Soviet population data.

It is apparent from this table that U.S. growth in the Fifties was comparatively low both in total and in per capita GNP. The remarkable rate for Japan, which doubles output in eight years, may be biased by the short period (1955–59). Nevertheless, industrial production indexes covering all the Fifties support the notion that Japan has led the field in economic growth rates.[2]

Some major growth factors. What accounts for the high rates of some countries? Without going far into the subject at this point, a few particularly important factors may be mentioned. A substantially larger proportion of Japanese, German, and Russian output consists of new industrial structures and equipment than in most other countries. In addition, the war-devastated areas, though they were

[2]See the indexes reproduced in U.S. Department of Commerce, *Business Cycle Developments* (monthly).

1-3 Growth rates in selected countries, GDP in constant dollars, 1950–59

Country	*Total GDP*	*GDP per person*
Japan (1955–59)	9.3	8.1
West Germany	7.5	6.3
U.S.S.R. (GNP, 50–58)	7	5
Austria	5.7	5.5
Italy	5.7	5.1
Netherlands	4.6	3.3
Switzerland (1954–59)	4.3	3.0
France	4.0	3.1
Canada	3.9	1.2
Norway	3.5	2.5
Sweden	3.3	2.6
United States	3.3	1.6
Belgium	2.7	2.1
Denmark	2.7	2.0
United Kingdom	2.4	2.0
Luxembourg (1950–57)	1.8	0.9

Sources: Except U.S.S.R., United Nations, *Yearbook of National Accounts Statistics, 1960* (New York: United Nations, 1961), pp. 265–69; U.S.S.R., testimony of Allen W. Dulles, Joint Economic Committee, 86th Cong., 1st sess., *Comparisons of the United States and Soviet Economies, Hearings* (Washington, D.C.: Government Printing Office, 1960), pp.1–28.

substantially rebuilt by 1950, were equipped with more modern and newer equipment in the Fifties. Consequently, a smaller share of structures and equipment produced each year was needed for replacement and a correspondingly larger share added to total capacity.

West Germany and, to a lesser extent, Austria greatly benefitted by mass immigration of young and often skilled workers from the Soviet satellites. Russia and Italy were able to recruit industrial labor from large pools of underemployed peasants. Russia has an extensive, underdeveloped, and mineral-rich frontier similar to the early West of the United States. Finally, in the Fifties, Japan and Germany, in particular, found large markets for their specialized exports.

Business Fluctuations

From colonial times, few decades have passed which did not witness a depression in commerce and industry. These depressions brought a wave of bankruptcies to capital and the hardships of long-term unemployment to labor. John Adams recalled that the colonial wars of 1745 and 1755, the Revolution, and the War of 1812 were followed by "general distress, embarrassments of commerce, destruc-

tion of manufactures, fall of the price of produce and lands."[3] Following the Napoleonic Wars, Europe suffered acute depression which infected U.S. business in 1819. That year, a speaker before New York's Society of Tammany intoned, "A deep shadow has passed over our land; a commercial and individual gloom has created a universal stillness. In our remotest villages the hammer is not heard."[4] Before the Civil War there were several more periods of lengthening shadows, particularly in the early 1840's and late 1850's.

Depressions and recessions Economists of the National Bureau of Economic Research have settled on a series of peak and trough dates for the general business cycle (their "reference cycle"), which are shown for peacetime periods since the Civil War in Figure 1-4. The term *peak* means that production, employment, and other indexes of business activity were, by and large, at their highest levels prior to a downturn. The *trough* is the ensuing low point prior to recovery. Not all such indexes move together and it is sometimes difficult to judge when a monthly series, pushed up and down by seasonal and irregular influences, has rounded the corner. The NBER's statistical work has earned such respect that these dates are generally accepted by students of the business cycle.

The National Bureau does not distinguish between major and minor fluctuations. However, the public does, and we shall also, follow the practice of referring to severe declines as "depressions" and minor ones as "recessions." We shall view the downswings occurring after 1873, 1882, 1893, 1907, 1920, and 1929 as depressions. Periods of generally full employment have been interrupted every three or four years by recessions, of roughly a year to 18 months' duration, in which unemployment has increased by only two or three percentage points. Two exceptions in the table of dates must be noted. It would be better to term the declines after December 1895 and May 1937 as resumptions of acute depression rather than as recessions. Both occurred after abortive recoveries from depression declines.

The last column lists the earliest time after each depression when

[3] *Works,* vol. 10, p. 384, quoted in S. Lebergott's testimony in, Joint Economic Committee, *Employment, Growth, and Price Levels, Hearings, Part 3,* 86th Cong., 1st sess., (Washington, D.C.: Government Printing Office, 1959), p. 582.

[4] Quoted by Lebergott, *ibid.*

1-4 Peacetime peaks and troughs in business, 1865–1961

Peak prior to:						*Prosperity*	
Depression		*Recession*		*Trough*		*resumed*	
			Civil War				
		June	1869	December	1870		
October	1873			March	1879	Fall	1879
March	1882			May	1885	Spring	1887
		March	1887	April	1888		
		July	1890	May	1891		
January	1893			June	1894	Fall	1898
		December	1895	June	1897		
		June	1899	December	1900		
		September	1902	August	1904		
May	1907			June	1908	Fall	1909
		January	1910	January	1912		
		January	1913	December	1914		
			World War I				
January	1920			July	1921	Fall	1922
		May	1923	July	1924		
		October	1926	November	1927		
August	1929			March	1933		
		May	1937	June	1938		
			World War II				
		November	1948	October	1949		
		July	1953	August	1954		
		July	1957	April	1958		
		May	1960	February	1961		

Sources: National Bureau of Economic Research reference cycle peaks and troughs, reproduced in U.S. Department of Commerce, *Business Cycle Developments*, April 1962, p. 61; "prosperity" designations by Willard Thorp, *Business Annals* (New York: NBER, 1926).

business journals generally said that "prosperity" had returned. By comparing peak with prosperity dates, we can see that depressions have had widely varying durations. Those in the 1870's, 1880's, and 1890's lasted five or six years, while those beginning in 1907 and 1920 were over in a little more than two years.

The great depression During the generally prosperous Twenties there were two mild recessions; one in 1923–24 and the other in 1926–27. In the summer of 1929, first signs of another one appeared, and by fall a recession could be clearly marked. It seemed to center in the automobile and related industries, such as steel,

where demand had been at record levels in earlier months but was now down apparently because of a temporary saturation of household needs. The stock market, which usually anticipates business downturns, continued to climb through the summer and showed only a little hesitancy in September. Many people believed that capitalism had entered a "new era" of unlimited expansion; no one guessed that the weakness in autos and steel was the beginning of the end — that for more than a decade there would be the greatest depression of modern history, making the serious declines of the 1870's and 1890's pale in comparison of amplitude, duration, and human tragedy.

Following the stock market crash of October, the decline became general and severe. Production, employment, and prices fell through 1930, 1931, 1932 to a low point in 1933. The annual flow of goods and services dropped by 30 percent in four years; factory employment fell by a third; wholesale and consumer prices dropped 30 and 25 percent, respectively. As usual in downturns, it was in the production of automobiles, machinery, and other consumer and producer durables where the greatest cuts were made. In 1932, output of durables was only a quarter of its 1929 peak.

By 1933, corporations were suffering losses at the rate of 2 billion dollars a year. The plunge of securities' prices from 1929 highs, collapse of international payments in 1931, and the bank runs of 1932–33 punctuated a story of liquidity crises and business failures. Many small savers lost their life savings; if they survived the crash in 1929 by holding cash, they fell victim to bank failures in 1932–33. Falling prices and incomes pressed hard on small debtors, particularly farmers, and many lost their mortgaged homes and lands.

The idle and restless. For two years, 12 million people able and willing to work — a quarter of the labor force — could not find jobs. Some families were able to get by with the wife and older children taking odd jobs, though these were few; some had savings to draw upon or they could borrow for a few weeks from relatives and sympathetic merchants. A number were able to go back to their parents' farms, where they could grow their food, while others moved in with urban relatives who were still lucky enough to be employed. Far too many were forced to apply for local relief. Many towns and cities ran out of funds; while cutting relief rations to the bone, they begged state governments for help, and the state governments appealed to Washington.

Idle and restless men camped in "Hooverville" shack towns and impatiently waited for something to be done. Riots at farm bankruptcy sales, a march on Washington by bonus-seeking veterans, the sudden popularity of technocracy and other economic panaceas, the brief rise of Huey Long's threat of dictatorship to "share the wealth," and the rapid increase of Communist influence over labor and some intellectuals were ominous signs of discontent. In Germany, the Nazis seized power and the die was cast for World War II.

Abortive recovery and stagnation. Recovery began slowly in mid-1933, and, by 1937, gross national product had just topped its 1929 level, though there remained six million unemployed in the now larger and more productive labor force. Then, in 1938, much of the hard-won gain was swiftly lost as the economy slipped into a renewed depression. Fortunately, this was brief and business turned upward after a year; it continued to rise until World War II. In 1940, when the first war orders were placed, there were still seven million unemployed. Unemployment did not drop below 10 percent of the labor force until 1941. No wonder that many economists and some business leaders anticipated renewed depression and stagnation after the war.

The economic cost. One way to put a figure on the cost of the Great Depression is first to estimate what would have been produced each year if output had grown from its 1929 level at the historical rate of 3 percent a year. Then deduct in each year what was actually produced and cumulate the differences. The resulting figure, for 1930 through 1941 valued in 1954 prices, is $627 billions — nearly three-and-a-half times the total value of GNP in 1929 ($182 billions in 1954 dollars).

Moreover, throughout the decade, there was almost a moratorium on net investment in housing, commercial and industrial structures, and equipment. The building and equipment production that did occur probably did not even offset physical depreciation.[5] Families could not afford new homes, and businesses had neither the means nor the desire to add to capital, when much of what they had was

[5]Figures on capital in manufacturing are available in U.S. Department of Commerce, *U.S. Income and Output; A Supplement to the Survey of Current Business* (Washington, D.C.: Government Printing Office, 1958), p. 196. Goldsmith's estimates for national wealth in 1929 dollars may be found in U.S. Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1957* (Washington, D.C.: Government Printing Office, 1960), p. 152.

standing idle. This loss of potential capacity, which was compounded by a second curtailment of investment in civilian enterprises during the ensuing war years, resulted in lower levels of output and, perhaps, a lower rate of economic growth after World War II.

Inflation

Inflation is an upward trend in the general price level. *Deflation* is a downward trend. It is not necessary that all prices rise for inflation to exist; some may be falling. All that is required is a widespread increase in prices of important things; so we can reasonably say that the money costs of living and producing have gone up. A small increase in a price index that lasts only a month or two, which is subsequently offset by about the same decline, should not be termed inflation. Minor ups and downs are to be expected; we should reserve the term inflation for a longer, nonreversing trend that is of such duration and intensity that the effects of rising prices are widely felt.

Price indexes The Bureau of Labor Statistics, Department of Labor, compiles and publishes monthly wholesale and consumer price indexes. The *wholesale price index* (WPI) represents prices paid by producers for their materials, with each item's price weighted to reflect its relative importance in the total cost of aggregate production during a recent year. The *consumer price index* (CPI) measures change in the retail cost of a representative "marketbasket" of goods and services bought by an urban wage-earning or clerical family. The contents of this imaginary marketbasket or shopping list is altered every few years when extensive household-interview surveys indicate changes in the types and average quantities of goods and services bought by such families.

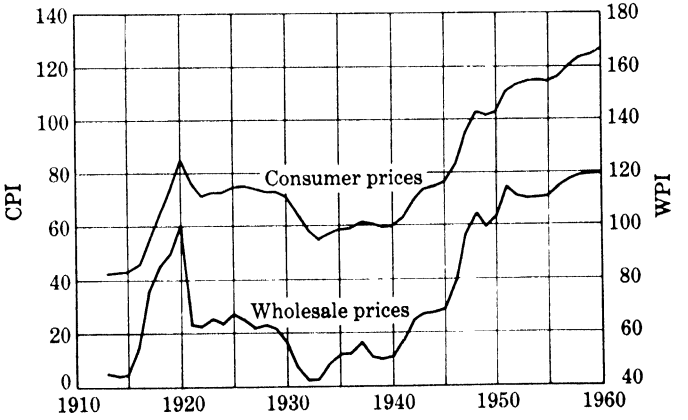
Wholesale prices tend to change more rapidly and with greater amplitude than retail prices. Though the two series generally move in the same direction, there have been occasions when one has stood still or even declined, while the other advanced over several years. For instance, the WPI showed a horizontal trend from early 1959 through the early months of 1962, while the CPI rose 3.8 percent over these three years. When the indexes disagree, we shall employ the CPI in

deciding whether there has been inflation. Although it fails to reflect the cost of living of some important groups, such as single people, the urban middle classes, and the rural population, the CPI is the better measure of direct effects of price trends on households.

Annual averages of the monthly consumer- and wholesale-price index numbers are charted from 1913 in Figure 1-5. The CPI has been plotted against a separate and higher vertical scale (left axis) in order to make the chart easier to read. The base period for both indexes is the three years 1947 through 1949, so that the average figure for this period is 100. An index number indicates relative changes from one date to another. The CPI number in March 1962 was 128.8, meaning that the cost of the marketbasket had risen 28.8 percent over its average cost in the 1947–49 base period. In 1945, with wartime price controls still in effect, the annual number was 76.9 on the same base. Thus, by early 1962, consumer prices had inflated by two-thirds over the level that existed during and shortly after the closing months of World War II (i.e., 128.8/76.9 = 1.67).

Recent inflation in perspective In Figure 1-5, we see that there have been three inflationary periods following World War II. First, with release of wartime controls, consumer prices began to climb steeply in mid-1946 and rose by one-third, before peaking in mid-1948. After that, they declined moderately, along with production, in the

1-5 Consumer and wholesale price indexes (1947–49 = 100)



1949 recession. At the outbreak of the Korean War, June 1950, consumer prices began another strong advance. By mid-1952 the CPI had risen 10 percent from June 1950. Consumer prices were nearly level through the remainder of 1952, 1953, 1954, and 1955. In the spring of 1956, a third postwar uptrend began. Although less rapid than the previous rises, this creeping inflation persisted longer, and, by March 1962, the CPI had risen nearly 12 percent, averaging 1.9 percent a year.

Inflation and war. Let us place this experience in historical perspective. Inflation has been associated with every major war in U.S. history. During the Revolution, the Continental currency became virtually worthless when prices skyrocketed in hyperinflation. Acute inflation occurred during the War of 1812 and the Civil War.[6] We see in Figure 1-5 that prices not only rose rapidly during World War I but continued to soar until they collapsed in the depression of 1921. The principal distinction of World War II is that inflation was largely repressed by controls during the hostilities, so that the wartime money and credit expansion was prevented from boosting spending and prices until after the war.

Inflation and economic growth. The creeping inflation after 1956 could not be attributed to war. Many people came to view inflation as the inevitable price of economic growth, although the rate of growth was well below 3 percent. There may be new conditions in the economy, such as powerful labor unions, greater concentrations of capital, farm price supports, and a managed monetary system, which supports this belief. The case is not clear and we shall later consider these modern institutions at greater length. It may also be true that the growth of any period would have been more rapid had there been moderate inflation; we have no way of knowing.

However, it is clearly not true that inflation has always been a concomitant of growth. The over-all price trend was about level during the prosperous Twenties, as we see in Figure 1-5. From 1820 until the beginning of the Civil War, the trend of prices was moderately

[6]For an index of wholesale prices from 1720 and of consumer prices from 1800 see the testimony, statement, and charts presented by Ethel D. Hoover, of the Bureau of Labor Statistics, before the Joint Economic Committee, in its *Employment, Growth, and Price Levels, Hearings, Part 2*, 86th Cong., 1st sess., (Washington, D.C.: Government Printing Office, 1959), pp. 384–410.

downward, while the average growth rate for our young economy was high.[7] Again, after the Civil War, prices generally declined until the mid-1890's, bringing agrarian unrest and demands for money expansion. Meanwhile, the historically highest long-run U.S. rate of growth in per capita GNP was achieved. The ensuing period of gradual inflation, prior to World War I, enjoyed more prosperous years per decade but not higher rates of economic growth.

Inequities of inflation Inflation serves to redistribute income and wealth in ways that subsidize the strong and that tax the poor and weak. Profits tend to rise, since prices increase, but interest and other expenses set by long-term contracts remain the same. Historically, wages have tended to lag, but, in the last few decades, powerful unions have been able to reverse this tendency in some industries. Debtors gain at the expense of creditors inasmuch as the dollars of repayment come easier but have less purchasing power than the dollars previously lent. Although people of moderate means are often in debt, the greatest amount of private debt is borne by business, and a large proportion of creditor claims is held by insurance companies and retirement funds providing for people who can no longer earn incomes.

Probably the worst hit are the elderly. As a prudent middle-income person approaches retirement, he is apt to shift most of his financial wealth from stocks, which share inflated profits, to less risky bonds or fixed-value assets, such as saving accounts, which lose purchasing power from inflation. He might have bought U.S. Savings Bonds at $18.75 apiece during World War II and cashed them at their 10-year maturity value of $25.00 in the early Fifties. What he received was worth from 15 to 17 dollars in the prices that were current when he patriotically bought these popular government bonds. Had he bought stock or a house and held it this long, he probably would have come out ahead in real (purchasing power) terms. Moreover, the retirement plan that he or his employer bought during earlier decades turned out to be less than adequate when he reached an age when he and his wife could no longer earn supplementary income.

Inflations differ in degrees, causes, and consequences. We shall discuss these things more fully in a later chapter, where other burdens and dangers of inflation will be discussed.

[7]Cf. Hoover statement, *op. cit.*, and our Figure 1-2.

Summary

In this chapter we have defined and measured economic growth, business fluctuations, and general price trends. Economic growth is an expansion in aggregate productive capacity accompanied by employment of this capacity. We measured economic growth with GNP valued in constant dollars and found that the long-range rate in this century has been about 3 percent a year, which doubles output in 23 years. This is a lower rate than was achieved in the nineteenth century, but the rate of growth of GNP per capita has been about the same since World War I as the average rate of growth over the past 120 years. The per capita rate of 1.64 percent doubles output per person in 43 years.

The over-all growth in U.S. per capita output over the past century is a record not yet approached by another country. It has raised the American household to an affluence unknown to the mass of consumers elsewhere. Nevertheless, slowdown in U.S. growth in the past decade stands in marked contrast to acceleration in the old countries of Europe and the industrially young Soviet Union.

From colonial times, economic growth has been interrupted frequently by minor recessions or major depressions in business activity. Since the Civil War there have been six depressions, of which those in the 1870's, 1890's, and the 1930's were particularly severe. In terms of amplitude and duration, the Great Depression, starting in 1929 and terminated by World War II, has no peer in modern history. Periods of prosperity have been briefly interrupted every three or four years by recessions lasting a year to 18 months. Since World War II, these occurred in 1949, 1953–54, 1958, and 1960–61.

After World War II, fear of renewed depression gave way to concern about inflation when consumer prices rose 50 percent in a decade. This occurred in two upswings; the first was an apparent result of backlogged needs and means after wartime controls were lifted, and the second due to accelerated buying in the early months of the Korean War. After 1956, a moderate but persistent inflation which could not be attributed to war began. In six years, consumer prices rose another 12 percent.

This is the factual background we need to understand the meaning and importance of our subjects — economic growth, fluctuations in output and employment, and trends in the over-all price level.

Reading and Research

At the end of each chapter, we shall mention a few selected books or journal articles which amplify or supplement materials in the chapter. Besides providing collateral reading, the publications cited should also serve as starting points for research on term papers.

General bibliographies in economics. If you have been assigned a term paper or wish to do independent research, you should begin compiling a working bibliography on your subject. Recent articles in economic journals and new book titles are separately classified by subject in each number, except May, of the *American Economic Review.* Each volume of the American Economic Association's *Index of Economic Journals* (Homewood, Ill.: Richard D. Irwin, Inc.) provides a cumulative listing, by subject and author, of journal articles. Volume 1 covers 1886 through 1924; volume 2 includes 1925–39; volume 3 is for 1940–49, and volume 4 lists 1950–54 articles. By the time you read this, volumes covering more recent years will probably have been published. Use the *Review* numbers back to the most recent *Index* volume and then switch to it for earlier articles.

The Department of Political Economy at The Johns Hopkins University publishes two very useful annotated listings of books entitled *Economics Library Selections.* One series is "New Books in Economics," which is published quarterly. The other series is "Basic Lists in Special Fields" and it gathers together the most important titles for such fields as business fluctuations and international economics. These series are primarily for librarians, and you should ask your librarian to allow you to use them. They are also available to individuals by subscription, and your instructor or his department may have them.

Joint economic committee publications. The Joint Economic Committee of the Congress conducts frequent hearings and studies of important economic problems, drawing on expert testimony by economists, business and labor leaders, and government officials. Of particular value for the subjects of this chapter is its monumental "Study of Employment, Growth, and Price Levels" conducted in 1959 and 1960. To begin, look for the *Staff Report on Employment, Growth, and Price Levels* (December 24, 1959) and the *Index to Hearings* (December 30, 1960), which also includes tables of contents of study papers and the *Staff Report.*

The great depression and postwar inflation. An amusing and informative account of speculation in the Twenties, collapse of the stock market, and its consequences is John K. Galbraith's *The Great Crash, 1929* (Boston: Houghton Mifflin Company, 1955). The human cost of depression is poignantly related by many of the contemporary accounts compiled by David A. Shannon in *The Great Depression* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1960). Rewarding insights into how contemporaries viewed the Great Crash and Depression can be obtained by browsing through issues of the *New York Times* (on microfilm in many libraries) or through journals such as *Business Week* published in 1929 and later years. A nontechnical discussion of postwar inflation is in Willard L. Thorp and Richard E. Quandt, *The New Inflation* (New York: McGraw-Hill Book Company, Inc., 1959).

2 Macroeconomics; Wealth, Income & the Circular Flow of Payments

There is more to economics besides the study of growth and fluctuations in output, employment, and the general price level. Economists are also interested in what determines the composition of GNP — why food is becoming a smaller share and services a larger share; what happens when a nation decides to produce more arms at the expense of consumer goods. They also ask what influences the way in which things are produced — why Indians build dams with human energy for jobs that could be done more easily and quickly by earth-moving machinery. Economists since Adam Smith have sought to

solve the riddle of what guides division of the national product by distributive shares — why some families are rich and others poor; what causes the share of income and purchasing power of landed proprietors to increase at the expense of capitalists and workers in some countries and to decrease in other countries.

At a more basic level, economists inquire into what determines relative prices in individual markets in the short-run and over longer periods. It is the system of relative prices which is Smith's "unseen hand" guiding the decisions of individual households, firms, governments, and nonprofit organizations so that their combined behavior determines the composition, method of production, and distribution of the nation's output.

Individuals and aggregates Economic theory is divided into two branches, as yet imperfectly joined. One is *microeconomics*, which is the study of individual prices, outputs, and employments. It is concerned with answering the "what, how, and for whom" questions we have just posed. Microeconomics analyses an individual, abstract household or firm to find out how the decision-making unit maximizes its net gains, how it acquires income, how it divides its income between saving and spending, in what it invests its current and past savings, and what things it buys with its spending. It also goes beyond the individual unit in order to see how the results of these decisions work to determine the composition, method of production, and distribution of the nation's output.

While microeconomics focuses on individuals, *macroeconomics* focuses on aggregates. This is a book in macroeconomics and, as is already clear, is concerned with what determines growth and fluctuations in the levels of aggregate production, employment, and the general price level. While we shall often disaggregate and consider the behavior of typical households or firms, we shall do so only as it sheds light on the behavior of aggregate demand and supply.

Some paradoxes of macroeconomics When we jump from the individual to the aggregate, some strange paradoxes appear. The individual can improve his fortunes if he saves; but when many households cut back on consumption to save, widespread unemployment, lower incomes, and less savings are apt to result. On the other hand, when an individual elects to spend more, he enjoys a larger flow

of goods and services. When many households increase their spending, if labor and capital are fully employed, they are likely to enjoy few more goods and services; instead, their higher spending is mostly absorbed by price inflation.

An individual may decide to hoard and, consequently, he builds up his cash holdings. If all people elect to hoard, the effect is usually to drive up interest rates and drive down output and prices of goods and services. If the aggregate quantity of money remains the same or diminishes, which it is likely to do when business declines, the public will end up actually holding no more and perhaps less money than before it decided to hoard. We shall meet other paradoxes later.

Gains and losses of aggregation It is sometimes said that human behavior is unpredictable. If this were true, advertising would be useless, insurance companies would go broke, and business would be unable to plan production on the basis of expected sales. It is true that we cannot predict the behavior of an individual unless we know him very well. But we can predict, with reasonable accuracy in many cases, the behavior of a large group of people. Individual peculiarities tend to disappear or to be offsetting in the mass. We can generally pick out a handful of economic variables that apparently account for most of the changes in aggregate behavior.

For example, some people are misers and others spendthrifts. Some plan every purchase and others act on impulse. There are people who buy more when prices rise and people who buy less when prices fall. Nevertheless, aggregate consumption seems to be largely determined by aggregate household income after taxes, together with a few other variables such as aggregate personal wealth, the price level, and the rate of employment. We shall generally be right if we predict a rise in consumption when income rises; also, we can learn to forecast aggregate consumption with a small margin of error most of the time if we include in our forecasting equation the effects of two or three other variables. This "consumption function" will play a central role in our later analysis.

Errors in prediction. We can predict human behavior in the aggregate — but occasionally our predictions go wide of the mark. There are several reasons for this. First, although behavior patterns of major subgroups may remain stable, their relative proportions in the

aggregate may change. Consumption behavior of farmers is sufficiently different from that of city folk so that we must be alert to a change in the proportions of aggregate income going to each.

Second, the form of association between aggregates may be misunderstood or may change. For instance, from inadequate data on the past, we may be led to believe that aggregate consumption will rise in proportion to aggregate household income when, in fact, the rise was less than proportional or will become so in the near future because of an alteration in economic institutions.

Third, variables that generally have a minor influence may, at times, leap in importance or entirely new ones may appear. Spending may rise rapidly because the public is suddenly alarmed by the belief that war is imminent and expects this to bring inflation or rationing.

The aggregates of macroeconomics are sufficiently few and important that a wealth of data measuring them has been collected by public and private agencies. Statistical techniques are available and they permit us to find relationships between human behavior patterns and to use these for predictions. But our predictions sometimes turn out poorly because (1) the composition of aggregates has changed, (2) the relationship between aggregates was misunderstood or has changed, or (3) neglected variables that were previously of null or minor importance have become materially influential over the aggregate we are predicting.

Fact and theory Data on the aggregates of macroeconomics serve three purposes. First, they may be used to describe the past, as we did in the previous chapter. Second, they provide the means for testing hypotheses of human behavior to see if these adequately explain what has already occurred. Third, once our hypothetical models have passed their tests, we may feed more data into them in order to obtain predictions about economic behavior in the near future.

Experience or intuition leads us to suspect that one aggregate, such as consumption, is importantly dependent on another, such as income. So we set forth a hypothesis to this effect. If possible, this should be tested for conformity with data from the past. No test can prove a hypothesis correct; for even though it is consistent with the data, other possible hypotheses might be equally consistent. But the test can show inconsistency and thus indicate that the hypothesis is probably incorrect.

Once a hypothesis has passed such empirical tests, we may accept it as a working theory and use it for prediction. We may employ a consumption function to forecast household spending and to decide, on the basis of the forecast, whether government action will be needed to stimulate or dampen aggregate demand in order to maintain full employment along with price stability.

No theoretical model can (or should) comprehend all the complexities of reality, and each will fail from time to time, for the reasons we have already mentioned. The purpose of theory is prediction. All we should ask is that it be *usually* effective in this. When it fails repeatedly, then a new theory must be sought. It makes no sense to say or imply that the theory is right and the facts are wrong.

A last word of caution is needed. Statistical data are not always extensive or varied enough to reveal the true state of affairs, so we must generally question both the theory and the data when there are discrepancies. Often we tentatively employ plausible hypotheses, which have not been tested against facts, because we cannot ascertain from available data what the facts are.

Wealth and Income

Certain concepts are so fundamental to the understanding of macroeconomics that we shall introduce and emphasize them immediately. First is the distinction between a stock and a flow, and how the real stock of wealth is related to real flows of output, income, consumption, saving, and investment. Second, we shall consider the circular flow of money payments through incomes, expenditures, and back to incomes. This circular flow should be understood in order to see how fluctuations in production, employment, and prices can occur in a monetary economy.

Stock and flow When we think of the stock of something, we have in mind the total amount that exists or is held by someone, somewhere at a point in time. Perhaps we want to measure the stock of water contained in a lake on July 1, 1962. Or we may be interested in valuing the portfolio of securities and cash that we owned last April 2. The net asset value or capital of a corporation is measured as a stock on a stated accounting date and our portfolio may contain some

"shares of stock," which are legal claims to portions of the company's capital.

The flow of something occurs over time. It is measured as a volume *between* two dates or as a rate per unit of time. We may discover that 3,100 acre-feet of water flowed out of our lake between July 1 and August 1, 1962. We may prefer to express the flow as a rate by saying it was 100 acre-feet a day or 700 acre-feet per week. The income of a person or a firm may be measured from the beginning to the end of a single accounting period or may be expressed more generally as so much a year, a month, a week, or a day.

The essential difference lies not in what is being measured, but in how we measure it. Autos and other goods may be measured as the stocks existing at a point in time or as flows from production over intervals of time. Services, incidentally, cannot be measured as stocks, since they cannot be held or accumulated. Flows must be expressed not only in units of volume but also in units of time. It is not enough to say that the average flow of water over a spillway is 1,000 acre-feet. Is it 1,000 acre-feet a minute, a year, a decade, or a century? A stock measure should always be dated, because it may be changed from one date to another by flows in between, but the date is not a unit of measurement.

In business accounting, the balance sheet or statement of condition showing the values of assets, liabilities, and net worth "at the close of business, December 31, 19XX," is a measure of stocks. The accompanying profit-and-loss, or income, statement, showing sales, expenses, and profits "for the year ended December 31, 19XX," is a measure of flows. It would make no difference in the final balance sheet if these two statements were compiled quarterly, but there would be considerable differences in the profit-and-loss figures "for the quarter ended December 31, 19XX."

The stock of national wealth Broadly conceived, the wealth of a nation is embodied in anything that has the power to serve man's needs and desires. This includes many intangibles, such as accumulated knowledge and skills, social and legal organization, climate, and so forth. Labor power, represented roughly by numbers and skills of people in the labor force, weighted by the normal hours of work for each at full employment, is a major portion of the nation's wealth. Soils, deposits of known and accessible subsoil minerals,

and other gifts of nature are obviously wealth. Finally, man-made wealth or capital consists of producers' and consumers' goods capable of indirectly or directly serving needs by use in production or consumption.

Few of the intangibles are measurable. The stock of labor power, as distinct from the flow of labor services that are valued by wages, is not valued except in slave markets. The remainder of wealth is property, and its value, derived from purchase and sale transactions, can be determined with reasonable accuracy in a capitalist economy.

Raymond Goldsmith has estimated the values of capital and land for the United States (except Alaska and Hawaii) in current and constant dollars from 1850. His estimate for the close of 1958 in current prices is reproduced in Figure 2-1, with percentages added. Several types of property are not included since there is a lack of data or acceptable standards of valuation for them: (1) subsoil mineral deposits, (2) military structures and equipment, (3) household inventories, consisting of such things as foodstuffs, drugs, and cosmetics possessed by consumers on the date of enumeration, and (4) works of art or other collectors' items once made by man but not reproducible except as copies. Moreover, the values shown should be regarded as only approximate.

Size and composition of national wealth. National wealth in 1958 was nearly four times the value of GNP in current prices that year ($444 billions), while capital was about three times greater. We shall later refer to the national capital-output ratio, which has generally been between 2.5 and 3.5 during periods of prosperity since 1900. Eighty-two percent of measured wealth in 1958 is domestic capital. Six percent is private farm and forest land and 9 percent is land that is chiefly urban and suburban building sites. The remaining 3 percent consists of net foreign assets and public land.

About half of wealth, or three-fifths of capital, consists of structures, of which nearly half are housing. The values of business equipment and consumers' durables (principally automobiles, furniture, and appliances) are about equal; together they constitute a quarter of the value of capital. Private and public inventories amounted in value to nearly one-tenth of capital in 1958. Inventories are stocks of single-use goods, such as fuels and raw materials, and of short-lived tools of production. On the date of enumeration, inventories include

goods awaiting use as inputs, passing through the processes of production, or awaiting sale and shipment to customers.

When we think of capital as domestic man-made things that are capable of providing goods and services we do not usually include monetary metals or net foreign assets; however, the latter are properties which should be included in a comprehensive total. The monetary metals are contained in silver coin and in silver and gold bullion held by monetary authorities as legal backing for currency and commercial bank reserves.

Some domestic properties are owned abroad, while some foreign properties are owned by Americans. To get a correct total of wealth owned by Americans, as distinct from properties located in the U.S., the value of the former must be subtracted from and that of the latter added to the value of domestic capital. In 1958, the figure for net foreign assets was positive, indicating that Americans owned more wealth abroad than foreigners owned in the U.S. Prior to World War I, the reverse was true.

Intermediary claims to wealth The private part of national wealth is ultimately owned by households, but much of it is

2-1 National wealth, end of 1958, current prices

	Value (*$ billions*)	*Percentage of* *Capital*	*Wealth*
Reproducible tangible assets, total:	1,367	98	82
Structures, total:	833	60	50
Residential, nonfarm	391	28	
Business and institutional	274	20	
Government	168	12	
Equipment of producers	200	14	12
Consumer durables	179	13	11
Inventories	130	9	8
Monetary gold and silver	25	2	1
Net foreign assets:	24	2	1
The stock of capital:	1,391	100	83
Private farm and forest land	101		6
Other private land	149		9
Public land	41		2
The stock of land:	291		17
NATIONAL WEALTH	1,682		100

Source: Statistical Abstract of the United States, 1961, p. 325.

claimed only indirectly through a series of intermediate links. A factory building may be owned by a corporation, which is owned by a holding company, which, in turn, is in debt to an insurance company. Policyholders of the latter and the stockholders of the holding company may be viewed as the ultimate owners of the factory. Generally, the chain of intermediate claims has so many links and branches that it is hopeless to imagine identifying the ultimate claimants to individual capital goods — even if there were any point in trying to do so.

An individual household, firm, or other decision-making unit rightly views not only tangible assets but also financial assets as part of its own wealth. In seeking an acceptable balance between yield, expected appreciation and risk, it should view stocks, bonds, insurance and pension rights, savings accounts, cash, and so forth as alternatives to tangible assets. However, we must also realize that the sum of all claims to wealth greatly exceeds the value of the nation's real wealth, as our previous illustration implies. Against the corporation's factory are holding-company claims; against the holding company are stockholder and creditor claims; and against the creditor insurance company are policyholders claims. Summing all the claims would amount to counting the value of the factory several times over.

Business capital Goldsmith's estimates, in order to encompass all the nation's wealth, include assets of business, households, and domestic governments. The ability of the economy to serve human needs is as truly enhanced when households have more automobiles and governments operate more schools as when shippers acquire more trucks and farms buy more tractors. However, when economists speak of real capital they usually have in mind solely private-producer structures, equipment, and inventories. Consumers' durables, government structures, and other assets held for direct use by households and governments are excluded. Special importance is placed on the processes of accumulation and the use in production of business capital. We shall, therefore, keep in mind this more restricted scope when we use the term *capital* in the future, unless a different meaning is specified or clearly implied by the context.

Furthermore, it is often convenient to distinguish between *fixed capital,* which consists of business structures and equipment, and

inventories (less frequently termed *circulating capital*). In 1958, fixed capital was worth about $865 billions and private inventories were $100 billions, giving a total value of $965 billions for business capital as a whole. This was 2.2 times the GNP that year. These figures include housing. Although residences owned by their occupants might be viewed as consumer capital, houses and apartments leased to tenants are properly included in business assets.

Real National Income and Related Flows

The real income of a nation is the *flow* of goods and services, usually measured at an annual rate, which could be entirely consumed in serving the needs and desires of its people without depleting the *stock* of capital. This definition is based on analogy with the conventional meaning of a person's income. A household can spend its entire monthly income for goods and services that are consumed in the month without spending assets or incurring debt. Its capital — assets net of liabilities — will be the same at the close of the month as at the beginning (barring revaluation by capital gains or losses, such as those that occur when shares of stock rise or fall in price).

Real saving and investment The nation may and usually does save part of its real income in the form of new fixed capital and additions to inventories. Such additions to the total stock of business capital are also termed *net investment.* Real saving and real investment, to repeat, are exactly the same thing.

If an individual saves part of his income, his capital at the end of the month exceeds his capital at the beginning by exactly the value of his saving (again barring capital gains and losses). The same is true for the nation. Its aggregate capital at the end of the year equals the capital at the beginning of the year plus the flow of net real investment (saving) during the year. Goldsmith's estimates of national capital were obtained by summing estimated net investment values over previous years.

An individual may dissave by spending assets or by incurring debts for consumption purposes; the value of his dissaving matches the decline in his capital. A nation dissaves by failing to replace capital as it is used up in providing consumers' goods and services. Its capital declines in the same measure.

Gross national product and national income Although intermediate goods and services are excluded in computing gross national product, all new fixed-capital goods for business are included. In the course of a year's production, some structures and equipment produced in the past are scrapped or lose efficiency in production because of obsolescence, wear and tear, and accidental loss.

Thus, a certain value of new capital goods must be produced each year in order to maintain the stock of capital. Gross national product exceeds real national income by the amount of this annual replacement need. If all of GNP were consumed, capital would decline each year by the amount of capital used up in production.

Gross national product may be reduced to represent national income that is valued at market prices, by subtracting the value of capital used up in the year — that is, by removing that part of gross output needed to replace capital if the stock is to be maintained. This net figure is, however, officially termed *net national product* (NNP), inasmuch as the name *national income* is reserved, in the Department of Commerce accounts, for a somewhat smaller total of money incomes. The value of new fixed-capital goods and added inventories in GNP is termed *gross investment.* After subtracting replacement needs from the gross investment, the *net* investment remains.

Measuring an economy's performance in terms of meeting human needs, NNP is more appropriate than GNP, and many economists prefer to employ it. However, we shall continue to center attention on GNP for two reasons. First, estimates of capital depreciation are not very reliable, for reasons we shall consider in the next chapter. Second, GNP comprehends all production and expenditures for final output. Changes in demand for new capital goods greatly affect employment and prices, whether these goods replace or expand capital.

Stock-flow relations illustrated The essential stock-flow relationships may be summed up with an imaginary illustration, which emphasizes concepts involved without making concessions to practical problems of measurement. On January 1, 19XX, national capital in constant dollars was $1,000 billions. During the year ended December 31, 19XX, the following flows occurred: (1) production activities created $260 billions worth of final goods and $100 billions worth of

final services, (2) fixed capital worth $60 billions was used up by depreciation and scrappage, (3) all $100 billions worth of services were consumed and $150 billions worth of goods were bought and used up by households in providing directly for their own needs and desires. Thus total consumption was $250 billions.

Gross national product was thus $360 billions, but net national product was only $300 billions. Gross investment and saving were $110 billions, but $60 billions of this made up for capital depreciation; so only $50 billions, the part of net national product not consumed, remained as net investment and saving. This $50 billions was the net value of capital goods produced during the year and still in existence at the year's close. Consequently, the value of capital on December 31, 19XX, was $1,050 billions. This is the value of the stock at the beginning of the year plus that of the flow of net investment during the year.

The Circular Flow of Income-Expenditure Payments

We have a money economy. That is, money is used as a medium of exchange, a store of value, and a unit of account. In the first role, it serves as an intermediary in the exchange of goods and services produced by specialized producers. A worker sells labor services for money wages, then spends the wages for goods and consumer services he needs.

Money as a store of value is an asset that is merely an alternative to other tangible and intangible assets as a means of holding one's wealth. Most people and firms hold some assets in cash; misers hold most of their capital this way. We shall later argue that there are times when the most rational of men seek to convert most of their wealth into cash and hoard it.

Finally, the dollar provides a unit of account — a common denominator for combining things measured in different physical or temporal units, such as tons, gallons, hours, and for weighting them in proportion to their worth in the marketplace. Thus money provides the means for calculating stock and flow values in accounting and economics.

Real and money income We have been discussing real national income and wealth. The adjective *real* merely implies the

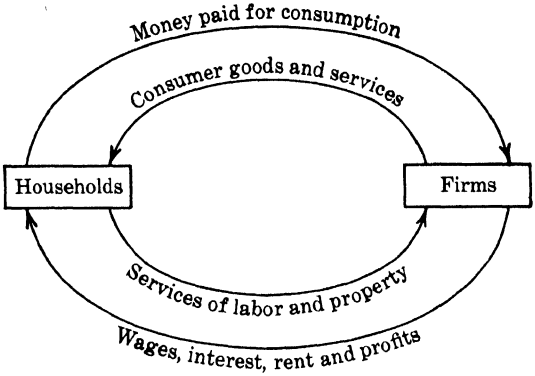
physical quantity of the stock or flow, but it means, more fundamentally, its power to serve man. The only way we can get indexes of real national income and wealth is to use money as a unit of account — measuring these aggregates in constant dollars over a period of time. Although stated in dollars for this reason, such indexes of national income should not be confused with money income flows.

Money income is simply the flow of money which a person, firm, or other entity receives and can spend without affecting its capital. It is what the individual usually thinks of as his income. (Some current-income receipts are not money, but other financial claims. We can ignore these for the present, without committing a serious error.)

Circular flow in a simple economy The circular flow of money income and expenditure payments is a basic concept of macroeconomics. To stress the main circuit, Figure 2-2 illustrates the circular flow for an imaginary, closed, private economy in which saving and investment are absent. A *closed* economy carries on no trade or other international transactions. By *private* economy, we mean that taxes and other government transactions are either absent or negligible. Since saving and investment are absent, all money income is spent for consumption and all final output is purchased for consumption. A corollary is that firms in this economy disburse all their profits to households as dividends or proprietors' withdrawals for personal use. Firms cannot consume; so retained profits are *business saving* by definition, and *saving* is not included in the model. In order to endow our economy with capital, we may suppose that saving has occurred in the past but not any longer.

On the right side of Figure 2-2 is a box that represents the business sector and is labelled "firms." All production occurs in this sector. Of course, there are many firms, but we lump them together as if there were only one and ignore all interfirm transactions. This sector pays out wages, salaries, rents, interest, and profits to households in exchange for services of labor and property, as shown by the arrows in the lower part of the figure. The household sector then returns this money to firms by purchasing goods and services for consumption.

Suppose that during one month, firms disburse incomes of $50 billions to households. Since no income can be saved, households



2-2 The circular flow of payments

spend $50 billions, their full income, for consumption by the close of the month. Thus, producers receive back as much as they disbursed and, since they are not permitted to retain business saving, they must again disburse this $50 billions as household incomes. The circular flow of payments will go on indefinitely without rising above or falling below $50 billions a month as long as households and firms save nothing. The value of goods and services produced each month will be $50 billions.

Other money flows Even in such a simple economy, we must suppose that there are other money flows besides the main income-expenditure circuit. For one thing, there are intrasectoral money flows that go on within the boxes rather than between them. Within the business sector, firms producing final goods and services spend money to obtain intermediate inputs from other firms at the early stage of production, and the latter firms in turn buy inputs from firms at still earlier stages. For example, dealers buy automobiles from manufacturers, who buy steel from rolling mills, which may buy ore and coal from independent mining companies.

Within the household sector, families and individuals transfer money between one another in the form of gifts, e.g., charitable contributions.

Payments for wealth and claims to wealth. Besides excluding intrasectoral flows, the circular income-expenditure flow also excludes

payments for previously existing tangible assets or claims to wealth. The circular flow is limited to payments which arise from and represent the value of current *production* of final goods and services (GNP or real national income). When a final good is sold to its first user, the value of this transaction is a part of the circular flow, since it represents the market value of a new good, but, if the first user later resells the good, the money he receives is not part of the circular flow. The resale constitutes a transfer of ownership of existing assets and does not reflect productive activities. Thus, we exclude payments for land, old houses and industrial structures, second-hand automobiles and machinery, and claims to wealth of all forms. Also excluded are the payments involved in lending and repaying loans, since these represent only creation and extinction of claims to wealth.

Complicating the model We shall only hint at the implication of a more realistic model now, putting off a more complete discussion until later. We can add government and foreign transactions as additional boxes. Into the government box flow mostly taxes and out of it flow expenditures and other payments to households, firms, and foreigners. The foreign box receives payments mostly for imports and disburses payments to firms for exports of U.S. output.

Net leakage. If households, firms, domestic governments, or foreigners save dollars, there is a "leakage" from the circular flow. If business firms borrow an amount equal to this saving and spend it for new plants, equipment, and inventories, they return the same amount to the circular flow. Consequently, so long as firms elect to invest in a period the same value as is saved, the circular flow may continue unchanged in amplitude.

However, if firms reduce intended investment, perhaps because something has impaired expected profitability of capital accumulation, there is a net leakage from the circular flow. Since less is being spent, quantities of output sold, or prices, or both must decline. In either case, it is likely that firms will cut back production and lay off workers, thereby bringing recession or depression.

Net pumpage. On the other hand, firms may decide to increase their investment expenditures over what savers decide to save. The difference is financed directly or indirectly, either by spending money previously held outside the circular flow, such as cash assets previously

held idle as liquid reserves, or else by spending new money. In either case, there is a net "pumpage" of money into the circular flow and expenditures rise. This necessarily means that either more output is sold or prices rise, or both. If there is mass unemployment of labor and capital, output is likely to expand greatly while prices increase only a little. Once full employment is reached, the reverse is apt to be true, so that inflation results.

Summary

Economic analysis is divided into two parts. Microeconomics is concerned with individual prices, outputs, and employments as they affect the composition of total output, techniques of production, and the distribution of income shares to final output. Macroeconomics, the substance of this book, deals with aggregates and seeks to understand the forces of economic growth and fluctuations in total output, employment, and prices. There is a great deal of data collected by private and public agencies which can be used for testing macroeconomic hypotheses and for making predictions based on macroeconomic theories. Predictions cannot be expected always to be accurate, and when they repeatedly fail, then theory must be revised. It makes no sense to say that a generalization is true in theory but false in fact; no theory is valid which does not accord with fact.

Economic aggregates are measured both as stocks and as flows. The stock of something is the total amount which exists at a point in time. A flow is the increase, decrease, or shift in status of something that occurs over a period of time. A flow must be stated in units of time, since the size of the flow depends on the period of measurement. A measure of stock should be dated, but the date is not a unit of measurement.

The wealth of a nation is the stock of productive resources possessed by its residents. It includes a number of intangibles, such as knowledge, the potential productive power of the labor force, natural resources, and instruments of production produced by man. The nation's real wealth in land and reproducible capital goods has been estimated by Raymond Goldsmith.

Production is a flow, usually measured in annual values. The real income of a nation is that part of its production which residents could entirely consume each year without reducing the stock of national real

capital. Gross national product exceeds real national income at market prices, which is termed net national product (NNP), because GNP includes new structures and equipment needed to replace depreciation and scrappage if capital is to be maintained. As a rule, the nation saves part of its real income and this saving is net investment in capital. Capital at the beginning of a year plus real income not consumed equals capital at the end of the year.

In the course of production money incomes are paid by producers to households, government, foreigners or are retained as business saving. These incomes provide their recipients with the means to buy what is produced. In spending income they return money to producers in a circular flow that then provides producers with renewed means to disburse incomes. Saving is a "leakage" from the circular flow, while investment purchases of new capital are a "pumpage." While the real saving and investment of a nation are identical, it is possible for producers to elect to spend less for new capital than savers wish to save in a period. There is then a net leakage of money from the circular flow of payments and a downward pressure on production, employment, and prices.

Reading and Research

General bibliographic references for use in economic research are given at the end of Chapter 1. The following suggestions relate to the topics of the current chapter.

Scope and method of economics. A more extensive discussion of the content of micro- and macroeconomics and the notions of stock and flow is in Chapter 1 of Gardner Ackley, *Macroeconomics* (New York: The Macmillan Company, 1961). Important contributions on the scope and method of economics in general are: Roy F. Harrod, "Scope and Method of Economics," *Economic Journal*, vol. 48 (September 1938), reprinted in Richard V. Clemence, *Readings in Economic Analysis, Volume I* (Cambridge, Mass.: Addison-Wesley Press, Inc., 1950); and Lionel Robbins, *An Essay on the Nature and Significance of Economic Science, Second Edition* (London: Macmillan & Co., Ltd., 1949).

Real wealth and income. The *Encyclopaedia Brittanica* articles on national income and wealth present excellent discussions of the mean-

ing and measurement of these aggregates. Goldsmith explains his methods, provides wealth estimates, and evaluates their significance in articles in *Studies in Income and Wealth*, vols. 12, 14, sponsored by the Conference on Research in Income and Wealth (New York: National Bureau of Economic Research, 1937–). Also, see his contributions in Series II and IV of the International Association of Economic Research, *Income and Wealth* (Cambridge, England: Bowes & Bowes Publishers, Ltd., 1957–). Series VIII of the latter is entirely devoted to measurement of wealth in nations throughout the world.

3 National Income & Output

National income was first defined and measured in the seventeenth century by the Englishmen Sir William Petty and Gregory King and by the Frenchmen Pierre de Boisguillebert and Sebastien de Vauban. Petty conceived of national wealth and income in virtually modern terms. Wealth was a stock of consumer and producer goods, whereas national income was a flow of goods and services produced annually by labor and material resources. King complied estimates of England's income and distinguished between its use for consumption and capital accumulation (investment).

While Petty and King included services in national income, Adam Smith reduced its scope to goods alone. A loaf of bread was a product, but a haircut was not. Marx embraced the material definition, and

official estimates in Communist countries are still largely restricted to goods. Elsewhere, economists returned to Petty's comprehensive definition.

Uses of national income and output estimates George Tucker compiled the first estimate of U.S. national income in 1843, using the material definition. In 1896 a second estimate, including services, was published by Charles Spahr and in 1915 his figures were extended by Willford King. We shall see that national income may be classified by earnings of labor and property. Spahr and King were primarily interested in determining whether income distribution was becoming more or less "equitable."

Since World War I, estimates of national income and output have been desired throughout the world for a wide variety of new uses. After the war, they were needed to assess reconstruction requirements. Nations sought measures of output to discover their own production potentials and to judge those of rivals in political power and ambition. In the search to understand the Great Depression, Congress authorized the first official U.S. estimates, which were published in 1934 and extended back through 1929. Mobilization for World War II called for detailed estimates of total production and led the Department of Commerce to compile figures on GNP as well as national income.

Since the war, the national income and output reports have become an indispensable tool in forecasting business conditions and framing policy to meet economic problems before or after they arise. The nations of Europe have employed income and output estimates to plan reconstruction, determine relative contributions to joint efforts, such as Marshall Plan, and to evaluate the consequences of such policy measures as the Common Market agreement. India and other industrially young countries use such accounts to plan what share of national output can be devoted to capital formation and in what sectors investment is most needed.

Businessmen regularly use expenditure and income data from the national accounts in their sales forecasts and they keep close tab on the change in total output as a signal of favorable or unfavorable general business conditions. University economists utilize these data in almost all aspects of macroeconomic research.

The system of accounts To better meet the varying needs of users and to give a more complete record of economic behavior, the Department of Commerce, in 1947, established an interlinking system of production, expenditures, and income accounts centering on its estimate of gross national product. The system measures GNP from three points of view: (1) final output originating in business, government, households, and foreign productive activities, (2) disposition of final output by sales and inventory accruals, and (3) disposition of incomes and other charges against the value of final output, which producers disburse to households and government or retain as gross business saving. Interconnected sectoral accounts trace the flow of incomes from producers to households and government, transfers between the initial recipients, and the disposition of income to current spending, saving, and investment by each sector. In 1958, the sectoral accounts were revised in order to eliminate some seldom-needed complicating details and to include additional information requested by users.

In this chapter, we shall discuss the measurement of GNP, first by expenditures, then by income flows, and finally by sector of origin. The sectoral accounts are reviewed in Chapter 4, along with estimates in constant dollars. The conceptual and practical problems of measurement are many and often controversial. We shall only touch upon the major ones, in order to see the forest and not get lost in the trees. Books cited at the end of this chapter develop the details and controversies.

Gross National Product by Expenditures

Gross national product measures the final output that flows from the productive activities of the nation's labor, capital, land, and intangible wealth in the course of a year (or quarter). Final output consists of goods and services produced during a year but not used up in further production during the same year. Productive activities are divided into many stages that begin with raw materials and end with the finished goods and services that are sold to their ultimate users. Crude oil is pumped from the earth, then refined into fuels and lubricants. These are then shipped to service stations, where they are finally purchased by consumers. Gross national product includes

only the fuels and lubricants sold to consumers and valued at consumer prices; it does not include the outputs of crude oil that are refined, nor the fuels and lubricants as they are sold by the refinery.

Avoiding double-counting In one way, such intermediate products are included in GNP. The retail price of a gallon of gasoline covers its wholesale cost to the service station and this, in turn, covers the cost of the crude oil employed in making the gasoline. Indeed, this is sufficient reason not to measure the crude and wholesale inputs separately in GNP. To add their values to the retail value of gasoline would mean counting the value of gasoline at wholesale twice, once separately, and once within the retail value. The value of crude oil would be counted three times — once alone, once in the wholesale value, and once again in the retail price.

Three things can happen to current output which is not used up in further production this year. First, it may be consumed in directly serving needs and desires of the nation's residents. Second, new goods may remain within the nation at the close of the year as additions to domestic capital. Finally, goods and services may be sold abroad; consequently, they leave the national economy. Output produced and disposed of in these three ways during a year is the final product that GNP is designed to measure.

Gross national expenditures In our industrial economy, most goods and services are produced for sale by businesses. We can measure final business output at market prices by the values of expenditures by entities that consume, store, or export goods and services. We shall see that GNP includes some output which is not sold; however, it is treated as if it were.

Figure 3-1 shows GNP for 1960 measured in this way. We call it *gross national product by expenditures* or, for short, *gross national expenditures* (GNE), in order to distinguish it from GNP measured in other ways. Let us see what these expenditures represent in more detail.

Personal consumption expenditures. All purchases of new goods and services by households and nonprofit institutions serving households are included in personal consumption expenditures except new housing and institutional structures. All construction is treated as capital

investment. Nonprofit institutions serving households include organizations such as unions, churches, nonprofit hospitals, private colleges, and universities.

Consumer durable goods are principally new automobiles, appliances, and furniture, as well as other articles normally lasting more than two or three years in use. Nondurables are foodstuffs, clothing, sundries, and other goods either exhausted in a single use or lasting for less than two or three years. Services are instantly consumed when produced. A major service value is rent from housing, which represents the flow of current services produced by the stock of residential structures.

Government purchases of goods and services. All purchases of output by federal, state, and local governments are included in this item. Such goods and services are employed in national defense, construction and maintenance of highways, and providing for the public health, education, and welfare. In one way or another, these activities directly serve the needs and desires of the nation's residents. Thus,

3-1 Gross national product by expenditures, 1960
(Billions of dollars)

Personal consumption expenditures		328.9
Durable goods	44.3	
Nondurable goods	152.4	
Services	132.2	
Gross private domestic investment		72.4
New construction:		
Residential nonfarm	21.1	
Other	19.6	
Producers' durable equipment	27.5	
Change in business inventories	4.2	
Net exports of goods and services		3.0
Exports	26.7	
Less: Imports	23.6	
Government purchases of goods and services		100.1
Federal:		
National defense (less sales)	44.9	
Other	8.0	
State and local	47.2	
GROSS NATIONAL EXPENDITURES (GNE)		504.4

Note: Details may not add to totals due to rounding.
Source: U.S. Department of Commerce, *Survey of Current Business*, July 1961, p. 10.

government purchases are treated as representing collective consumption activities, and are analogous to products bought by private nonprofit institutions serving households.

It would make the accounts more consistent if government construction were classified as investment in the same way that construction of residential and institutional structures is classified. This would necessitate measuring the annual flow of services from public structures in the same way that we measure housing services by rents. Unfortunately, data needed for such treatment of public capital are not available.

It may be surprising to discover that federal purchases, other than for national defense, came to only $8 billions in 1960. The government in Washington disbursed, in fact, nearly $48 billions, aside from purchases for national defense. However, $40 billions was in the form of money transfers to households, such as social security benefits and interest paid on government debt, and to foreign, state, and local governments as grants. Such transfer payments do not represent purchases by the federal government.

Gross private domestic investment. New fixed-capital goods produced during the year include all structures and producers' durable equipment. About half the construction in 1960 consisted of apartment houses and single dwellings not located on farms. Other construction included farm houses, barns, factories, dams, office buildings, and other business and institutional structures.

If output of producers' durables is considered investment, why isn't output of consumers' durables also investment? As in the case of government construction, it would be necessary to estimate current services provided by the stock of consumers' durables. The Department of Commerce does not attempt such an estimate and prefers to treat the purchases of consumers' durables as consumption. (We shall see later that the Federal Reserve System takes the opposite course and includes durables in investment by households as part of its flow-of-funds accounts.) In sum, the national income and output accounts confine capital formation to residential construction and capital-goods purchases by businesses and institutions.

Change in business inventories. Part of gross private domestic investment is the net change in business inventories. Most materials and semifinished and finished goods produced in a year are inter-

mediates used up in further production and sales activities. However, some of these outputs are not employed as inputs during the year, but are added to inventories at the close of the year. Their value must be counted as part of the year's final product.

On the other hand, productive activities this year draw upon some inputs produced last year or earlier. These inventoried goods were counted as final output in the year they were produced, and they are not the fruits of current production. Thus, we must subtract the value of withdrawals from inventory during the current year if we are to avoid double-counting when obtaining a figure that represents only productive activities of the current year. Adding production retained in inventories and subtracting withdrawals leaves the net change in inventories shown in GNP, a figure which may be either positive or negative.

Double-counting fixed capital. Suppose that last year flour worth $10 millions was produced and carried over in bakers' inventories to this year. Suppose, also, that this year bakers use this flour in the production and sale to households of $60 billions worth of bread. Since the flour was produced last year and counted at that time, we avoid counting it twice by deducting this inventory withdrawal from bakers' sales, leaving $50 billions as the figure for bakers' contribution to gross national product.

Now suppose that last year these bakers also purchased $80 millions worth of new equipment, which they depreciate at the rate of $20 millions a year on the ground that equipment of this type has a normal operating life of four years. The market price of bread covers all expenses, including this depreciation. The $80 millions of equipment was included in GNP last year as part of gross investment; one-fourth of its value is included again this year as part of the value of bread bought by consumers. In the next three years, the remaining investment value will also be included in GNP a second time. Thus GNP double-counts fixed-capital investment. The way to avoid this is to subtract depreciation (and related charges) from GNP, leaving net national product. This is another reason why many economists consider NNP the better measure of production.

Net exports. Goods and services sold abroad leave the national economy and, for this reason, are final output, though they include many materials and partially fabricated goods. In addition to

merchandise exports, such as cotton and automobiles, American firms sell service exports, such as transportation in U.S. ships and planes, insurance and banking services, and services provided foreign tourists visiting this country.

Similar goods and services are bought by Americans from foreign sellers. These imports are already contained elsewhere in GNE as portions of the values of personal consumption expenditures, government purchases, gross private domestic investment, and exports. But imports are not U.S. output. Thus, the value of imports must be subtracted to bring total expenditures in line with GNP. This could be done separately in each of the expenditures groups, but it simplifies the table and problems of data collection to deduct all imports together from the value of exports. Of course, the figure for net exports may be either positive or negative.

Final sales plus net inventory investment In sum, GNP may be measured by totalling (1) all purchases of new goods and services by domestic households and governments, (2) purchases of new fixed-capital goods and net changes in inventories by domestic business, and (3) exports to foreign buyers, net of the value of imports, since the latter are not U.S. products but are included in the values of national consumption and investment expenditures. It is important to note that we do not include purchases of materials by firms if these materials are used up in further production during the year, instead of remaining in inventories at its close. Such purchases do not represent the end results of production for the year, but only transactions occurring between stages in the flow of output to ultimate users.

Every purchase is a sale to the purchaser. Goods and services sold by producers to households, government, business as fixed investment, and foreign buyers are normally purchased for use rather than resale to Americans. These may be termed *final sales.*

This is not true of additions to inventories, since such goods are to be resold in their present form or after modification by further production processes. Even fuels and other materials physically destroyed in production impart their values, as costs, to output for sale. Consequently, GNP may be measured as the sum of final sales *plus* net inventory investment. In 1960, final sales amounted to $500.2 billions.

Unintended inventory investment. It is reasonable to suppose that all final sales represent deliberate or intended purchases. This is not true of all net inventory investment. To be sure, firms often do build up stocks in anticipation of expanded production and sales activities. They may also buy more than they expect to need in the near future, because materials are available at bargain prices, which are due to recent price declines, and because prices are expected to recover soon. Firms may stock up in advance if they anticipate a substantial rise in materials prices, shortages due to impending strikes in supplying industries, fear of wartime materials controls, or some other reason.

The National Bureau of Economic Research has found that manufacturers' inventories typically increase for a month or more after the beginning of a recession or depression.[1] This is hardly the time for many firms intentionally to invest in inventories. However, goods producers unintentionally invest when they end up the month with goods they had intended to sell but didn't sell because of an unexpected decline in customers' orders.

Similarly, firms may unintentionally disinvest in inventories when recovery in sales outruns scheduled production. The NBER has also found that inventories typically decline for a short time after the beginning of recovery from recession or depression. Of course, at times other than business-cycle turning points, individual firms may under- or overanticipate sales and end a period with unintended changes in inventories.

There is no way to distinguish in the data on net inventory investment between what was intended and what was not. Nevertheless, the existence of unintended inventory investment and disinvestment will play an important part in our later theory of business fluctuations.

The Value Added to Final Output by a Firm

We cannot measure GNP by summing *all* business sales. This would be double-counting if it included such things as the crude oil sold by independent wells and the fuels and lubricants sold at whole-

[1]See the NBER lagging indicators in the Bureau of the Census monthly, *Business Cycle Developments* (Washington, D.C.: Government Printing Office). For detailed description and historical data see *Signals of Recession and Recovery*, Occasional Paper 77 (New York: NBER 1961).

sale prices by refiners. However, we can measure GNP by summing the *values added* to production by all producers. This is another way to measure the value of final output.

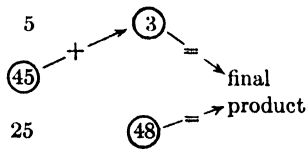
To find the value added by a firm, we subtract from its sales the values of inputs that were bought from other firms in either the current or previous years and that were used in production of the things sold. These inputs are materials, fuels, power, and various other goods and services that have been purchased from other firms, with the exception of fixed-capital goods. The value of a firm's sales is the aggregate value that has been added over all stages of production through that firm. Subtracting inputs means subtracting the value contributed by previous producers, leaving only the value added by the firm.

A simplified example The following example makes it clear that we can measure GNP this way. In Figure 3-2, we trace the making of bread, from sales of wheat by a farmer through the sales of loaves to consumers by a retail baker. In the current year the baker sold $45,000 worth of bread to housewives at retail prices. This is the value of final sales (circled). To make the bread he used up $20,000 worth of flour from his inventory. He more than replenished this withdrawal by purchasing $25,000 worth of flour from the miller; consequently, the baker ended the year with a net inventory investment worth $5,000.

The baker's purchases were the miller's sales. To produce this $25,000 worth of flour, the miller drew $12,000 worth of wheat from inventory. This was more than the $10,000 worth he bought from the

3-2 Final product by value added
(Thousands of dollars)

	Farmer	*Miller*	*Baker*	*Total*
Purchases	—	10	25	
Inputs	—	12	20	
Change in inventory	—	−2	5	
Sales	10	25	(45)	
Value added	10	13	25	(48)



farmer; so the miller ended up with a $2,000 net inventory disinvestment (negative investment).

We have made the unrealistic, simplifying assumption that the farmer purchased nothing from other businesses and used no inputs bought from other producers (e.g., commercial fertilizers and seed). Thus there was no change in his inventories — if he had any. We have also assumed that the other producers bought only the inputs of this example.

The value added by each producer is the value of his sales minus the value of his inputs of things produced by other firms. Thus, the value added by the farmer was $10,000; by the miller, $13,000; and by the baker, $25,000. The total of values added is $48,000, exactly equal to the sum of final sales plus the aggregate net change in inventories.

From business income to value added Let us now see how value added may be determined from a firm's own records, made available to national-income estimators principally via business tax returns. In doing this, we shall also discover that value added is made up of flows of income to households, taxes to government, and depreciation plus profits retained by the firm.

Figure 3-3 is the profit-and-loss, or income, statement for a hypothetical Able Baking Company, Incorporated, for the year ended December 31, 1960. Some items have been numbered for cross-reference to the value-added statement (Figure 3-4), in order to aid in understanding how the value-added figures were obtained, and it has been assumed that all values turned out to be even thousands of dollars.

The ABC corporation received income from sales of its bakery products (item 1) plus nonoperating income in the forms of interest on bonds and dividends on stock owned by the firm (items 9 and 10). These incomes total $107,000. Materials' inputs are measured by the cost of goods sold (item 2), which equals purchases to inventory *less* net inventory investment ($10,000). Operating expenses include advertising and insurance — which represent service inputs purchased from other firms — as well as compensation of employees, rents and royalties, sales and property taxes, and depreciation of plant and equipment (items 3 through 8).

These operating costs and expenses plus the nonoperating expense

3-3 ABLE BAKING COMPANY, INC.

Income Statement

For the year ended December 31, 1960

Items			
1	Sales		$100,000
	Cost of goods sold:		
	Beginning inventory, 1/1/60	$40,000	
	Purchases to inventory	30,000	
	Less: Closing inventory, 12/31/60	50,000	
2	Cost of goods sold		20,000
	Gross profit on sales		$ 80,000
	Operating expenses:		
3	Advertising	6,000	
4	Insurance	4,000	
5	Compensation of employees	30,000	
6	Rents and royalties	3,000	
7	Sales and property taxes	12,000	
8	Depreciation of plant and equipment	10,000	
	Total operating expenses		65,000
	Operating income		$ 15,000
	Nonoperating income:		
9	Interest received	4,000	
10	Dividends received	3,000	
	Total nonoperating income		7,000
			$ 22,000
	Nonoperating expenses:		
11	Interest paid		5,000
12	Net income		$ 17,000
13	Profit tax liability		9,000
14	Profit after tax		8,000
15	Dividends paid		5,000
16	Undistributed profit		3,000

of interest paid on the firm's debt (item 11) amount to $90,000. If this amount is deducted from the gross income of $107,000, a $17,000 profit or net income remains (item 12). Part of profit accrues to government as corporate profits tax (item 13), part is paid to owners in dividends (item 15), and the remainder is retained by the firm as undistributed profit (item 16).

Value added as sales less inputs. Figure 3-4 shows that the value added by ABC corporation to final output may be derived in two ways. First, it is obtained, as in our previous example, by deducting inputs from sales. In addition to materials' inputs, measured by the cost of goods sold, advertising and insurance services also are included. After subtracting all inputs, a value added of $70,000 remains.

3-4 Value added by Able Baking Company, Inc.
For the year ended December 31, 1960

*Items**			
	Value added as sales less inputs:		
1	Sales		$100,000
	Less: inputs from other producers:		
2	Cost of goods sold	$20,000	
3	Advertising expense	6,000	
4	Insurance expense	4,000	
	Total inputs		30,000
	Value added as sales less inputs		$ 70,000
	Value added as incomes and taxes:		
5	Compensation of employees		30,000
6	Rents and royalties		3,000
7	Sales and property taxes		12,000
8	Depreciation of plant and equipment		10,000
11 − 9	Net interest paid		1,000
12 − 10	Profit before tax (due to ABC operations alone)		14,000
13	Profit tax liability	9,000	
14 − 10	Profit after tax	5,000	
15 − 10	Net dividends paid	2,000	
16	Undistributed profit	3,000	
	Value added as incomes and taxes		$ 70,000

*Item numbers refer to the income statement of Able Baking Company, Inc., Figure 3-3.

Value added as incomes and taxes paid. Value added may also be computed by summing all remaining items, which do not represent purchases from other firms, after subtracting nonoperating income. The latter is deducted because it does not represent value added to production in ABC corporation; instead, it represents only its share in the proceeds of production by other producers.

Compensation of employees includes wages, salaries, and supplemental labor payments — which are paid to households for their labor services — as well as social security and other social insurance taxes paid by employers to government. Rents and royalties are here assumed to have been paid entirely to households. If they had been paid to other firms for the use of business structures and patents, we would have to deduct them along with advertising and insurance from sales.

Sales and property taxes, which are examples of what we shall later term *indirect business taxes*, are paid to government along with the accrued profit tax (item 13). Interest and dividends paid in value added are net of interest and dividends received as nonoperating income. The profit in value added differs from profit or net income in the income statement because it excludes profit from dividends received by ABC corporation. It represents only the profit earned by ABC from its own contribution to production and equals operating income less net interest paid. After deducting profit tax and net dividends paid, there remains the same undistributed profit as in the income statement.

GNP as the sum of values added. Now, suppose we were to compute value added as incomes and taxes for all firms in the economy and then cumulate all the incomes by type. We would then have the aggregate value of final output from business producers, classified as flows of (1) incomes to households, (2) taxes and other payments to government, and (3) depreciation plus profits retained by business. Even though some or all of the net interest and dividend disbursements by ABC corporation (or other firms) go to other businesses, they are subtracted from the accounts of the recipient firms as nonoperating incomes. Thus, the computing and totalling of values added eliminates all interfirm payment flows. What remains consists entirely of payments to entities outside the business sector plus retentions of depreciation and profits by the firms that earned them.

Gross National Product by Incomes

Figure 3-5 shows gross national product in 1960 by incomes and other receipts from production, as it would appear if values added were summed for all producers. For brevity, we shall call this aggregate *gross national income*, or GNY. (By convention, economists use capital Y to stand for income, reserving capital I for investment.) Letters in parentheses indicate whether each flow is disbursed as part of personal income to households (PY), accrued as business

3-5 Gross national product by incomes, 1960
(Billions of dollars)

Compensation of employees			293.7
Wages and salaries		271.3	
Disbursements (PY)	271.3		
Excess of accruals over disbursements (*S*)	0.0		
Supplements		22.4	
Employer contributions for social insurance (GR)	11.5		
Other labor income (PY)	10.9		
Proprietors' income (PY)			48.2
Rental income of persons (PY)			11.7
Corporate profits and inventory val. adj.			45.1
Profits before tax		45.0	
Tax liability (GR)		22.3	
Profits after tax		22.7	
Dividends (PY)	14.1		
Undistributed (*S*)	8.6		
Inventory valuation adjustment (*S*)		0.0	
Net interest (PY)			18.4
NATIONAL INCOME			417.1
Business transfer payments (PY)			1.8
Indirect business tax and nontax liability (GR)			45.6
Current surplus of government enterprises less subsidies (GR)			−.5
Capital consumption allowances (*S*)			43.1
Statistical discrepancy			−2.6
GROSS NATIONAL INCOME (GNY)			504.4

Source: Survey of Current Business, July 1961, p. 10.

taxes and other government receipts (GR), or is retained as the business share of gross saving in the economy (S).

National income The sum of money payments earned by labor and by owners of private property used in production is termed *national income* by the Department of Commerce. These earnings are included gross of direct taxes on incomes. National income is the principal portion of GNY, to which other charges are added against the value of final output.

Compensation of employees. All wages and salaries earned by labor in 1960 were paid, leaving none as accrued obligations of producers. These payments include commissions, tips, and bonuses. They range from the meager earnings of part-time laborers through the compensations of corporate executives and movie stars. Aside from social insurance contributions (payroll taxes) paid by employers to government, other supplementary labor income includes such things as employer contributions to private pension, health and welfare funds, compensation for injuries, and a few minor items.

Proprietors' income. This item is the net income of owners of unincorporated businesses. In addition to retail stores and farms, it includes net earnings of doctors, lawyers, and other professional people working independently or in partnerships.

Rental income of persons. This item covers rents received as supplemental income by persons who are not professional realtors. Rents received by unincorporated realty firms are included in proprietors' income, after deducting expenses of the realtor, and rents received by corporate realty firms are similarly reflected in corporate profits.

Corporate profits. Profits of corporations are divided into profit tax liability — which accrues to government — dividends paid to households, and the remaining undistributed profit saved by firms.

Inventory valuation adjustment. This curious item needs more extensive explanation. Gross national product is designed to measure business output at market prices current in the year of measurement. Some firms value materials withdrawn from inventory at original cost instead of the current price which must be paid for replacement. If materials' prices have risen, the net change in inventories is over-

valued for GNP purposes and, since profit is net of the cost of goods sold, reported profits are too high by the same amount. This can be made clear by an example.

Suppose a baking firm bought 100,000 pounds of flour in 1960 at the current price of 10 cents a pound, so that purchases amounted to $10,000. In 1960, the bakery withdrew 100,000 pounds of flour that it had bought the previous year for eight cents a pound. Valuing withdrawals at their original cost, they were given a total value of $8,000 by the bakery. Thus, its accounts show net inventory investment of $2,000.

The firm actually added nothing to its physical inventory and if withdrawals had been valued at the 1960 price of 10 cents, net inventory investment would have been zero. The national income estimator makes an adjustment which has the effect of valuing withdrawals at current prices. Thus he subtracts $2,000 from the bakery's reported inventory investment. The adjusted value (zero in this case, but not in others) is entered in GNE. The value of the adjustment (*minus* $2,000) is entered in GNY along with the firm's own estimate of its profit.

From this example, it should be clear that during periods of inflation the inventory valuation adjustment is likely to be a negative figure, whereas during deflation it is apt to be positive. Wholesale prices were virtually level for nearly two years prior to 1960 and during that year; so, the IVA in Figure 3-5 rounds to zero in $100 millions. It was actually $42 millions, a plus value for the first time since 1952.

Net interest. This item includes interest received by households from private producers. It does not include interest paid by U.S. federal, state, and local governments. Interest on public debt does not enter into the value of GNP for reasons we shall explain in our discussion of government's final output.

Other charges against GNP The market price of a good at retail covers more than just the incomes earned by labor and property employed in its production. In particular, retail price covers two other important expenses: (1) sales taxes and some other charges on business by government, and (2) depreciation and other accounting allowances for capital consumed in production. There are two other minor charges against final output and the residual discrepancy.

Business transfer payments. Transfer payments to households and nonprofit institutions are expenses that do not purchase labor or property services. The most obvious form of transfer payment is a gift of money and this item includes corporate gifts to nonprofit institutions, such as colleges and universities.

Indirect business tax and nontax liability. A direct tax is one levied directly on income, and the direct taxes paid by business are corporate profit taxes. (The employer contributions to social insurance are direct taxes levied on labor income but forwarded by business to government.) Thus indirect business taxes include sales and excise taxes, import duties, business property taxes, and all other taxes paid by business except profit taxes. The *nontax* payments in this context mean license fees, fines, and other such government levies on business which are not called taxes.

Current surplus of government enterprises less subsidies. A government enterprise is a publicly owned producer which sells its output and does so at prices designed to cover all or most of its costs. Examples are the federal post office, state toll highways, and municipal utilities. The current surplus of a government enterprise is the accounting equivalent of profit in private enterprise.

Cash subsidies are paid by the federal government to ship companies, airlines, farmers, and some other industries to enable them to sell their products at prices below cost and yet to make a profit. The output of a subsidized industry enters GNP by expenditures at its market price, which does not include the subsidy. Wages, salaries, and other expenses, together with profit enter GNY; also included are those paid with the subsidy. To make total GNY equal to GNE (and GNP), it is necessary to subtract the value of the subsidy. The current deficit of a government enterprise, being a minus value, is treated as equivalent to a subsidy to private enterprise. The government, in effect, grants a subsidy to its own enterprise to enable it to produce and to sell output for less than it costs.

Capital consumption allowances. This item represents the value of fixed capital used up in the year through wear and tear, accidental loss, and obsolescence. It is composed principally of the accounting depreciation charges reported by business enterprises.

Statistical discrepancy. We have seen that the sum of values added is

conceptually equal to the sum of final sales plus the net change in inventories. However, errors and omissions in data available to government estimators cause the total of GNY to differ by a modest amount from GNE. This statistical discrepancy did not exceed $4.5 billions in absolute value in any year from 1929 through 1960 and in nearly two-thirds of these years it was less than $1 billion.

Gross National Product by Origin

About 80 percent of gross national product has been produced for sale by business and government enterprises in recent years. We have seen that the items which compose GNY correspond to expenses and profits of private and public enterprises and that those of GNE are classified as final sales and net inventory investment of such producers.

Productive activities occur in other sectors of the economy. Government employees serve the public. Some production occurs in households, and nonprofit institutions provide numerous services for the public's welfare. Labor and property of Americans are used in production abroad and the values they add to output in the rest of the world accrue as incomes to our own residents. Government, household, and institutional output is not sold; therefore, it must be valued at cost instead of market price. The value added to foreign production by American wealth is treated as an export of the services of labor and property.

In order to obtain a more complete and consistent index of consumption by households, certain nonmarketed outputs are estimated and their values included by imputation. For the most part, these goods and services are provided at cost by business or government and are so valued, or they are sufficiently like marketed outputs, that their values can be estimated from final sale prices of their counterparts.

Figure 3-6 shows gross national product in 1960 by origin, including the portion valued by imputation. To simplify the table, the $409.3 billions of output produced by business and government enterprises is not classified by incomes and other charges in GNY, or by expenditures in GNE. The other 20 percent of output, shown by origin, is classified on the left by the income item containing it in GNY and on the right by the expenditure to which it belongs in GNE.

Of course, the business share of any income or expenditure can be obtained by deducting values in this table from the corresponding item values in Figures 3-1 and 3-5. Thus, of the total $328.9 billions of goods and services consumed by households (Figure 3-1), $19.5 billions were produced by themselves and by nonprofit institutions, $26.0 billions worth were obtained free of direct charge and valued by imputation, and the remaining $283.4 billions worth were bought from private and public enterprises.

Government production Services provided free or at nominal price to the public by federal, state, and local governments are valued at their labor cost. (The output of government enterprises is, of course, omitted here.) In GNY this is part of the compensation of employees by producers. In GNE, government is treated as purchasing its own product at cost, which it then provides free to the public. Nearly half of government purchases in 1960 were services of its own employees.

The stock of public capital also contributes to current output. Public schools, highways, municipal airports, and other public assets are obviously productive in the same sense as private schools, railroads, and factories. Value added by private capital is represented by rent, interest, and profit returns to owners from the market value of output. By valuing government output only at labor cost, the national accounts omit the contribution of public capital.

Government interest omitted. Interest paid by government might be included in GNP in order to represent current services of public capital. The national income estimators have decided not to do so on the ground that government interest payments fluctuate out of proportion to changes in the services of public capital.

For instance, during World War II the public debt increased sixfold, and interest payments on it increased almost in proportion. Yet Goldsmith's estimates of nonmilitary government structures, valued at constant prices, show less than 5 percent increase from 1939 through 1945. The borrowed funds went mostly to buy military equipment and services. But this equipment was either destroyed or soon scrapped after the war, and the interest payments, continuing on this debt, could not be rationally construed to represent services provided by assets acquired with the borrowed funds.

3-6 Gross national product by origin, 1960
(Billions of dollars)

Gross national income (GNY)		*Gross national expenditures* (GNE)	
Produced by business for sale:		Produced by business for sale:	
All incomes and other charges against GNP	409.3	All final sales and net change in inventories	409.3
Produced by government:		Produced by government:	
Compensation of employees	47.3	Government purchases	47.3
Produced by households and institutions:		Produced by households and institutions:	
Compensation of employees	12.8		
Net interest	6.6		
TOTAL	19.5	Personal consumption expenditures	19.5
Produced by rest of world:		Produced by rest of world:	
Wages and salaries	0.0		
Corporation profits after tax	1.9		
Net interest	.4		
TOTAL	2.3	Net exports	2.3
Imputations:		Imputations:	
Wages paid in kind:			
Wages and salaries	1.9		
Food and fuel on farms:			
Proprietors' income and other charges	1.3		
Rent of owner-occupied housing:			
Rental income of pers.	6.4		
Indirect business taxes	5.6		
Capital consumption allowance	5.5		
Free financial services:			
Net interest	5.3		
TOTAL IMPUTATIONS	26.0	Personal consumption expenditures imputed	26.0
GROSS NATIONAL PRODUCT	504.4	GROSS NATIONAL PRODUCT	504.4

Source: Survey of Current Business, July 1961, pp. 11 and 33.

Production by households and nonprofit institutions Wages and other compensations paid to domestic servants and the employees of nonprofit hospitals, churches, private schools, and other institutions primarily serving households represent value added to output by labor. Value added by institutional structures is measured by interest payments of such institutions. Interest paid by households to business on consumer debt is also included, since it represents a small portion of the services provided by consumer durables used in households. In GNE, all these values are part of personal consumption expenditures, inasmuch as they measure services to persons.

Only a small part of the productive activities in households is included in GNP. Services of consumer assets are omitted, except for a modest coverage by interest on consumer debt. The important labor services of housewives and do-it-yourself husbands go completely unrecorded. It is not that national income estimators wish to imply wives and hobbyists are useless; there is just no reasonable basis to estimate and put price tags on their services.

If a man marries his housekeeper, GNP declines by the amount he formerly paid her in servants' wages. If his new bride refuses any longer to wash his shirts and sends them out to be done, GNP partially recovers, by the amount paid the laundry firm.

Value added to production in the rest of the world Gross national product covers the values added by American labor and property to final output at home or abroad. Exports of goods and services produced in this country *less* imports produced abroad are already included in business output. The value added by U.S. wealth to foreign production is represented by labor incomes earned by Americans overseas (a small figure rounding to zero in $100 millions during 1960) and by profits and interest earned on foreign assets. From these are subtracted equivalent earnings by foreign wealth in this country. The remaining value of net exports of labor and property services is part of the total net export figure in GNE.

Imputations Personal consumption expenditures include four types of output which are not actually purchased by the persons who consume them but are treated as if they are purchased in order to simplify the accounts and make them more comprehensive.

Wages paid in kind. Domestic servants, military personnel, sea-

men, loggers, and some other employees of government and business receive board, room, and clothing directly from their employers. These things serve consumers' needs as much as their purchased counterparts and are included in GNP at cost to the employers. They are included as part of wages and salaries in GNY — as if the employers paid their value in money to employees who then purchased them for consumption.

Food and fuel on farms. Farmers grow some of the food and fuel which they consume themselves. Estimates of this nonmarketed output are valued at the prices that farmers receive for equivalent products which they do sell. Monetary or imputed costs incurred by farms in producing them are distributed among the appropriate entries in GNY, while the remaining imputed profit is part of proprietors' income.

Rent of owner-occupied housing. An estimate is made for the services of shelter, comfort, and prestige enjoyed by homeowners from their dwellings. We have already noted that such services received by tenants of leased housing are represented in GNP by the rents they pay. Imputing rent to owner-occupied housing means that if a family purchases the house it previously rented, the value of GNP is not thereby reduced. Such rent is estimated from rental payments for comparable housing and is divided, as are gross money rents, into depreciation, property taxes, and net rental income.

Free financial services. Commercial banks and some other financial institutions provide a substantial part of their services to the public without direct charge. A commercial bank charges at most a nominal service fee to depositors for safeguarding their funds and providing the convenience of a checking account. The bank covers most of its costs and profit from interest earned in lending depositors' money.

Fairly complicated adjustments are made to value these services. In essence, they treat the bank as paying to depositors all the interest it receives and, then, as charging them enough, in addition to the actual service fees, to cover the costs (other than inputs from other firms) and the profit of the bank. Similar adjustments are made for trust funds and life insurance companies. The imputed interest to household and institutional depositors is included in the net interest item of GNY and its value measures free financial services to households in personal consumption expenditures (GNE).

Evaluating the Estimates

How good are the official estimates of GNP and its components? This question can mean two things. First, how reliable are the estimates as measures of what they include? Second, are the flows they include sufficiently comprehensive and detailed to serve the many purposes for which aggregate data are needed by economists, businessmen, government officials, and others?

Reliability The National Income Division of the Department of Commerce draws upon a huge amount of statistical data collected by agencies of government and many private groups such as trade associations, unions, and research organizations. Of central importance are the business records reported with social security and income tax returns and with the comprehensive periodic censuses of manufactures, business, and agriculture. The censuses, which are designed to survey all units of the populations they represent, provide both checks on the accuracy of past estimates and benchmarks for use in making future estimates until new census data become available.

Statistical theory does not provide a means of checking the accuracy of GNP. However, there are a number of internal consistency checks in the system of national accounts and criteria for judging particular types of data. Figures on wages and salaries in GNY are believed to be most reliable, because they consist largely of data from social-security tax returns by employers who ordinarily keep accurate records, report them with little error in value or variance in definition, and provide them in a form that can be included in national income with very little modification. Government purchases in GNE are almost equally trustworthy for similar reasons.

At the other extreme are estimates of rental income of persons, for which complicated and tenuous estimates must be made in lieu of accurately kept and reported household records, and of the net change in inventories. The latter require considerable estimation of uncertain quality because (1) some firms do not keep or report inventory records adequately, (2) some use original cost and other valuation systems where adjustment is required to meet national accounting definitions and, (3) the net figure is subject to relatively large fluctuations, since it is the small difference between two large and volatile totals.

Discrepancies and revisions. To an important degree, the GNY and

GNE totals are compiled from independent data. That the remaining statistical discrepancy between them is of relatively small size is thus a reassurance of their accuracy. However, some of the data series are not independent and are reflected in both totals, so there remains the possibility that both are too high or too low for this reason.

Some of the most reliable data series only become available to the national account statisticians several years after the events they measure. Thus, the GNP figures for recent years are subject to later revision. For example, GNP for 1957 was first given as $440,328 millions; in 1961 it was reported to have been $442,769 millions. The major revisions occur in the first two years after the estimates are first released. That these revisions rarely alter GNP by more than 1 percent is a further assurance of the high quality of the initial estimates.

Scope and detail The national income and output accounts are employed widely and for a variety of purposes. They cannot be expected to satisfy all users completely. In order to permit adjustment of such totals as GNP or national income, many tables of item breakdowns of the totals and ancillary data are published in the *Survey of Current Business*. A researcher can pick what he deems most appropriate from the itemized series on expenditures, income flows, production by origin, durability of product, and others.

In macroeconomics, we need two types of aggregative data in particular. First, our study of aggregate demand as the determinant of business fluctuations requires detailed records of *spending* for final output. For clues to spending behavior, we also desire figures tracing the circular flow of *money payments* from production through incomes which are available for spending by households, firms, and government. Gross national expenditures, as well as the sectoral income accounts that we shall consider in the next chapter, are well designed to meet these needs. Even the nonmarketed output included by imputation may be a desirable portion of the total, on the ground that consumers would probably have purchased these things had they not been provided free or as incomes in kind.

Indexes of welfare. The second broad use of aggregate data is to compile an index of *productive performance* that serves the needs and desires of the nation's residents. We cannot hope to measure satisfactions directly, but we can seek to obtain data on economic growth

that plausibly represent gains in the ability to satisfy. It is in this normative area that the national accounts are subject to the greatest criticism.

For this purpose, net national product (national income at market prices) is conceptually superior to GNP. It is measured by subtracting capital consumption allowances from GNP, but unfortunately, these allowances are not very reliable indicators of actual capital consumption. Firms calculate depreciation on the basis of original cost, so that their reported figures undervalue replacement needs during inflationary periods. This is the same difficulty we met regarding inventory investment, but the problems of estimating a "fixed-capital valuation adjustment" are so much greater that this is not done by the Department of Commerce. Furthermore, depreciation accounting by firms is controlled by tax laws and influenced by tax-saving considerations that have little to do with changes in productivity or the serviceable lives of fixed-capital assets.

We may choose to limit our index of growth to personal consumption expenditures and government purchases on the ground that these alone represent output currently serving households. Nevertheless, personal-consumption expenditures still suffer from failure to include most output within the household, such as labor services of wives and property services of consumers' durables. Although purchases of automobiles have doubled in a year, personal transportation by automobile has not doubled — only the stock of autos held by households has jumped. For the most part, this represents greater service only in later years, as the cars are used.

Intermediates in government purchases. Accounting for government raises the greatest problems. First, we have seen that public capital is inadequately treated. Current services provided by government assets are not represented in government output. Also, government purchases of structures and other capital goods are not treated as investment, but instead are lumped with purchases of nondurable goods and services.

Another difficulty is that much of government output serves producers, instead of consumers, and should logically be considered intermediate instead of final. The protective services of private plant guards are excluded as intermediates, but those provided to business by city police are included in GNP. Also included are expenditures

for the maintenance of highways serving both trucks and passenger cars. There is no practical way to divide many government outlays between consumer and producer services; consequently, they must either be wholly included or excluded.

These are the principal shortcomings that cannot be satisfactorily remedied from ancillary data provided by the Department of Commerce. Figures are available on military expenditures and, if we wish, we may deduct these figures from government purchases on the ground that they have only a tenuous relation to current welfare. The GNE aggregates are published in constant dollars, so that the effects of changes in the price level are eliminated. It is a simple matter to reduce these to per capita figures with Census population data.

No matter how we adjust the data, however, it is well to remember that an index of output is not an index of satisfactions. In 1960, households spent about the same amount on cigarettes and other tobacco products as they spent for medical and dental services. Does this mean they received about the same gain in well-being from both? This question cannot be answered, though it is implicitly posed whenever we measure growth in output to indicate growth in welfare.

Summary

The system of national income and output accounts centers around gross national product, which is the market value of total final output for a year (or quarter). GNP is measured in three primary ways. First, it is the sum of final sales of new goods and services to households, domestic governments, business firms as fixed capital, and the rest of the world (less imports), *plus* the net change in business inventories. These are classified as (1) personal consumption expenditures, (2) government purchases of goods and services, (3) gross private domestic investment, which includes the net change in inventories, and (4) net exports. These four major groups make up GNP by expenditures or, for short, gross national expenditures (GNE).

Second, GNP may be represented as the sum of values added by all producers, when these values are expenses for labor and property services, taxes, profits, and certain other charges that do *not* represent payments by one firm to another for current inputs but are

part of the market values of final goods and services. The sum of labor and property incomes, gross of direct taxes, is termed *national income* by the Department of Commerce. The principal nonincome charges are indirect business taxes and capital consumption allowances. We have dubbed the sum of national income and other charges with the name, *gross national income* (GNY). Net national product is GNP minus capital consumption allowances.

Third, gross national product is the sum of final goods and services originating in the productive activities of businesses and government enterprises, general government, households and nonprofit institutions, and net foreign assets. Some output, mostly originating in the business sector, is not sold to final users and must be valued by imputation. The chief omissions from measurement are services of government capital and the bulk of household labor and property services. On the other hand, GNP double-counts to some extent by including depreciation of capital and some government output which serves producers instead of consumers.

Reading and Research

National income concepts and measurement, in general. An encyclopedic yet highly readable treatment of all aspects of national income accounting is: Paul Studenski, *The Income of Nations, Theory, Measurement and Analysis, Past and Present* (New York: New York University Press, 1958). Look for books and articles by Simon Kuznets, the leading American authority on national accounting. Two series of volumes are devoted to issues and findings in national accounting: Conference on Research in Income and Wealth, *Studies in Income and Wealth* (New York: NBER, 1937–) and International Association for Research in Income and Wealth, *Income and Wealth* (Cambridge, England: Bowes & Bowes Publishers, Ltd., 1951–).

Extensive bibliographic references are found in the appendix notes to Studenski's book. The Internation Association for Research in Income and Wealth publishes a *Bibliography on Income and Wealth* (Cambridge, England: Bowes & Bowes Publishers, Ltd., 1952–). See also the general bibliographic references at the end of Chapter 1.

The official U.S. system of accounts. Detailed explanations of concepts and data sources are presented by the Office of Business Economics, in two *Supplements* to the *Survey of Current Business: National*

Income, 1954 Edition and *U.S. Income and Output* (Washington, D.C.: Department of Commerce, 1958). They should be used together. Volume 22 of the *Studies in Income and Wealth* (cited above) is entitled *A Critique of the United States Income and Product Accounts.* In particular, see the first contribution, which is an evaluation and defense of the official system by George Jaszi, Chief of the National Income Division of the Department of Commerce.

International comparisons. Two international governmental agencies publish studies in national accounting and report estimates of member nations: The Statistical Office of the United Nations and the Organization for Economic Cooperation and Development (OECD), formerly the Organization for European Economic Cooperation (OEEC). For an interesting attempt to overcome the valuation problems in international comparisons see: Milton Gilbert and Associates, *Comparative National Products and Price Levels: A Study of Western Europe and the United States* (Paris: OEEC, 1958). Gilbert's methods are critically reviewed by J. L. Nicholson, "The International Comparison of National Products," *Economic Journal,* vol. 65 (June 1955), pp. 352–59.

Other textbook discussions of national accounting. Most textbooks in macroeconomics present a chapter or two on the concepts and measurement of national income and output. See Ackley's book cited at the end of Chapter 2, Barry N. Siegel, *Aggregate Economics and Public Policy* (Homewood, Ill.: Richard D. Irwin, Inc., 1960), or Thomas F. Dernburg and Duncan M. McDougall, *Macro-economics* (New York: McGraw-Hill Book Company, Inc., 1960). Much more intensive treatment will be found in the following: Richard and Nancy Ruggles, *An Introduction to National Income and Income Analysis* (New York: McGraw-Hill Book Company, Inc., 1956); Alice J. Vandermeulen and Daniel C. Vandermeulen, *National Income: Analysis by Sector Accounts* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1956); and J. P. Powelson, *Economic Accounting* (New York: McGraw-Hill Book Company, Inc., 1955).

4 Sectoral Income & Flow-of-Funds Accounts

The first part of this chapter continues discussion of the national income and output accounts. We first consider the interlinking sectoral accounts that trace the disposition of gross national income. Then the method for deflating GNE to constant dollars will be investigated and we shall see that an important series of price indexes, termed *implicit deflators,* is a by-product of this operation.

The national income and output accounts are supplemented by the flow-of-funds accounts, which trace the disposition of saving by each sector and record lending, borrowing, and transfers of financial assets among sectors. We shall conclude with a brief mention of other national accounting systems.

The Sectoral Accounts

In Chapter 2 we set forth the circular flow of money payments for a closed private economy without saving. The Department of Commerce provides a system of sectoral accounts that trace the circular flow for our more complicated economy of reality. We noted, in Figure 3-5 for gross national income, that each income flow is allocated in one of three ways. It is either (1) paid to households as part of personal income (PY), or (2) accrued to federal, state, and local governments as government receipts (GR) from producers, or (3) retained by business as part of gross saving (S) in the economy.

There is a difference between income that a household or government receives as its share in GNY and the amount that a household or government has available for spending for current purposes or saving. From their earnings, households must pay taxes to government, whereas government must return to households the interest on government debt and transfer payments such as social security and unemployment benefits. Government also transfers money to foreigners in foreign aid, which permits them to pay for some net exports without incurring debt or using their own dollars.

Summary accounts for personal income and outlay, government receipts and expenditures, and foreign transactions trace payments from producers through these intersectoral transfers to their final disposition as current expenditures and saving. Another summary account draws together in one table the gross saving by businesses, persons, and government and matches this with gross national investment at home and abroad. This last account emphasizes the conceptual and definitional equality between aggregate saving and investment.

The personal income and outlay account Figure 4-1 is the summary account for households or persons. On the income side we see the same items that were labelled PY in the GNY table. These make up earned personal income (plus business transfers). In addition, households receive transfer and interest payments from government. We have noted that interest on public debt is not part of GNP. Yet it is part of the money income of persons. Thus it is akin to a transfer payment — a payment which does not reward or represent current productive activities.

4-1 Personal income and outlay account, 1960
(Billions of dollars)

Personal tax and nontax payments		50.4	Wage and salary disbursements		271.3
Personal consumption expenditures		328.9	Other labor income		10.9
			Proprietors' income		48.2
Durable goods	44.3				
Nondurable goods	152.4		Rental income of persons		11.7
Services	132.2				
			Dividends		14.1
Personal saving		22.9			
			Personal interest income		26.2
			From business	18.4	
			From government	7.8	
			Transfer payments		29.1
			From business	1.8	
			From government	27.3	
			Less: Personal contributions for social insurance		9.3
PERSONAL OUTLAY AND SAVING		402.2	PERSONAL INCOME		402.2

Source: Survey of Current Business, July 1961, p. 10.

Personal income is defined as the sum of these earnings and transfers less personal contributions for social insurance. The latter are payroll taxes deducted by employers and paid, along with their own contributions, directly to government.

On the left side of this account we see the disposition of personal income. A portion is returned to government in personal taxes. These are mainly income taxes, but also include taxes on personal property, gifts, automobile license fees, and other government levies on households rather than businesses.

Disposable income. Personal income less personal taxes equals the disposable income of persons. In 1960 this was $351.8 billions. Disposable personal income is of particular importance in macroeconomics, since it represents the income people are free to consume or to save as they wish. We shall later investigate the statistical relationship between this and personal consumption expenditures as a central part of the theory of aggregate demand.

The difference between disposable income and GNY will often be important to us and this is a good place at which to show it:

Gross national income

Less gross business saving:
Capital consumption allowances
Undistributed corporate profits
Inventory valuation adjustment
Excess of wage and salary accruals over disbursements

Less government receipts:
Employer contributions to social insurance
Personal contributions to social insurance
Corporate profit tax liability
Indirect business tax and nontax liability
Personal tax and nontax payments
Current surplus of government enterprises less subsidies

Plus government payments to persons:
Net interest paid by government
Transfer payments by government to persons

Equals disposable personal income

In short, disposable personal income is GNY after deducting all business retentions and all taxes or other government receipts net of government interest and transfer payments back to persons.

Consumption and personal saving. Disposable personal income is divided between personal consumption expenditures and personal saving. The latter is a residual item balancing the two sides of the account. By definition *saving* is "income not consumed," but this unitemized residual may leave the mistaken impressions that saving is nondeliberate and that it remains wholly in cash.

Most households plan their saving with as much or more care as they do consumption expenditures. Income which they save may be held as money, but under most circumstances little is retained in this form. Money saved may be used to repay personal or mortgage debts or be used to acquire nonmonetary assets of various types. Examples of the latter are deposits in savings accounts, downpayments for houses, payments into life insurance and pension funds, and purchases

of securities. Personal saving includes proprietors' income used to repay business debt or buy plant, equipment, and inventories for the proprietor's own unincorporated business. This might better be treated as business saving, but the Department of Commerce does not try to divide proprietors' saving into parts retained for personal and business use.

Saving increases the wealth of a household by increasing assets or reducing liabilities. While the national income and output accounts do not indicate the allocation of saving, the flow-of-funds accounts, which we shall briefly review later, do this job.

Government receipts and expenditures The combined account for federal, state, and local governments in 1960 is shown in Figure 4-2. On the right is listed all tax receipts of government from business and persons. Instead of treating the current surplus of government enterprises less subsidies as government income, the account reverses the sign of this item from GNY and views it as a net expenditure: "subsidies less the current surplus of government enterprises." Deducting this plus government purchases of goods and services, transfer payments, and net interest paid by government from total tax receipts leaves the residual surplus or deficit on income and product

4-2 Government receipts and expenditures account, 1960
(Billions of dollars)

Purchases of goods and services		100.1	Personal tax and nontax receipts		50.4
Transfer payments		28.8	Corporate profits tax accruals		22.3
To persons	27.3				
Foreign	1.6		Indirect business tax and nontax accruals		45.6
Net interest paid		7.8			
			Contributions for social insurance		20.7
Subsidies *less* current surplus of government enterprises		.5			
			Employer	11.5	
Surplus or deficit (−) on income and product account		1.9	Personal	9.3	
GOVERNMENT EXPENDITURES AND SURPLUS		139.1	GOVERNMENT RECEIPTS		139.1

Source: Survey of Current Business, July 1961, p. 10.

account. This item may be termed *government saving* (surplus) or *dissaving* (deficit), since it is income less current outlays.[1]

This account must not be confused with the federal budget. It includes state and local transactions, nets out intergovernment transfers, includes payments to and from trust funds such as social security, is on a calendar year rather than fiscal year basis, and in other ways differs from the federal budget.

Foreign transactions account Foreign transactions in 1960 are summarized in the account of Figure 4-3. The U.S. obtains claims against foreign persons, firms, and governments by selling exports. Part of these claims is paid back for imports to the U.S. and another part is cancelled by government transfer payments abroad. The remaining claims constitute net foreign investment for the year and are an addition to net foreign assets.

Gross saving and investment account The table in Figure 4-4 draws together saving by all sectors, on the right, and domestic and foreign investment, on the left. This also includes the statistical discrepancy carried over from GNY and treated as if it were saving.

4-3 Foreign Transactions account, 1960
(Billions of dollars)

Exports of goods and services	26.7	Imports of goods and services	23.6
		Transfer payments from U.S. Government	1.6
		Net foreign investment	1.5
RECEIPTS FROM ABROAD	26.7	PAYMENTS TO ABROAD	26.7

Source: Survey of Current Business, July 1961, p. 10.

[1]Suppose the Department of Commerce chose to treat the current surplus of government enterprises less subsidies as a net income item in this account. The value −.5 would be included on the right and the .5 would be omitted on the left. This would reduce the totals in both columns by half a billion dollars. However, it would not affect the other entries; in particular, the surplus would remain 1.9 billions. Subsidies less the current surplus of government enterprises is not treated as a transfer to the personal sector because, as we previously noted, incomes of the personal sector already include those financed by subsidies.

4-4 Gross saving and investment account, 1960
(Billions of dollars)

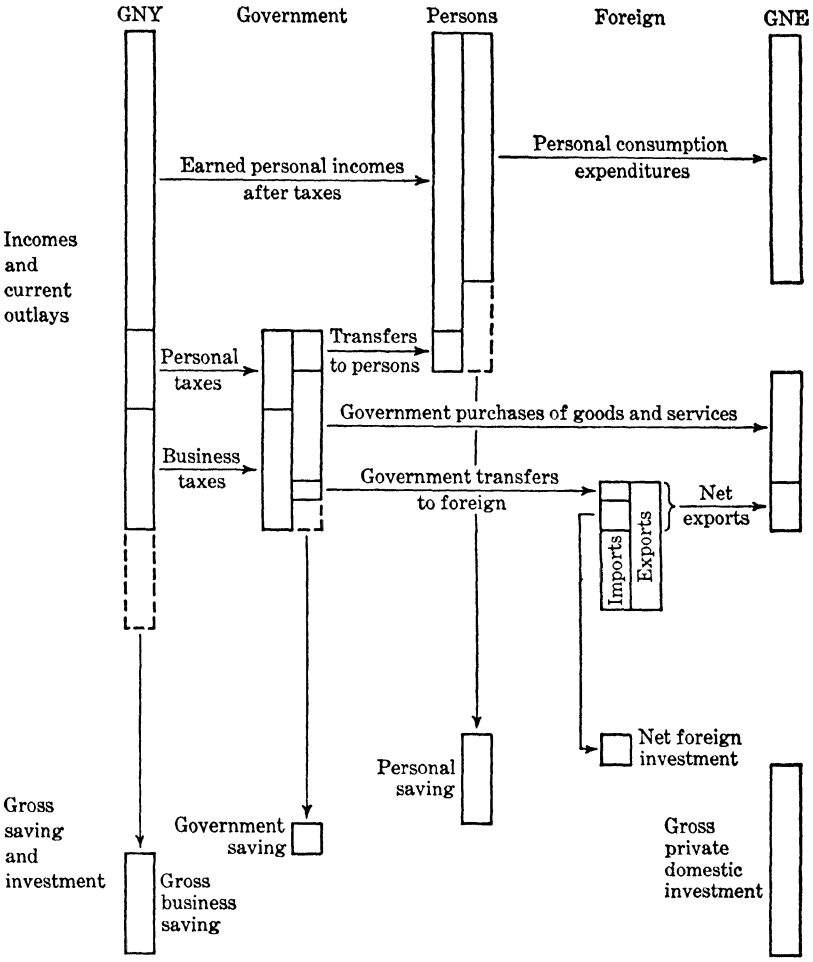
Gross private domestic investment		72.4	Personal saving	22.9
			Excess of wage accruals over disbursements	.0
New construction	40.7			
Producers' equip.	27.5			
Change in business inventories	4.2		Undistributed corporate profits	8.6
Net foreign investment		1.5	Corporate inventory valuation adjustment	.0
			Capital consumption allowance	43.1
			Government surplus or deficit (−) on income and product account	1.9
			Statistical discrepancy	−2.6
GROSS INVESTMENT		73.9	GROSS SAVING AND STATISTICAL DISCREPANCY	73.9

Source: *Survey of Current Business*, July 1961, p. 10.

An Integrated System of Accounts

The national income and output account (GNY and GNE) and the sectoral accounts are linked together in a completely integrated system, which traces receipts from production through to their disposition in expenditures for or claims to final output. In reviewing the sectoral accounts, it may have been noted that each item of GNY appears again in one of these accounts and each new item in the latter, such as government transfer payments to persons, appears as income for one sector and outlay for another. Each of the items of GNE is also repeated as an expenditure in one sectoral account. In the terminology of business accounting, the items debited to the GNY statement are credited to the recipient sectoral accounts and those credited in GNE are debited to the accounts of sectors making these outlays.

The flow of payments Figure 4-5 is a bar chart designed to make clear how receipts from production flow through these accounts to be disposed of as expenditures for or claims to final output. Two minor adjustments have been made. Personal taxes are treated as being paid directly from producers to government without passing



4-5 The flow of payments

through households. Indeed, the major portion of personal income taxes is paid this way through the withholding system. Second, the minor and troublesome item of the current surplus of government enterprises less subsidies is omitted. These adjustments allow us to visualize the whole flow of payments as proceeding from left to right.

Each sector is represented by two adjacent vertical bars, the left

one indicating income, and the right, current outlays. The difference between these is saving, which is dropped to the bottom of the diagram to be gathered into the gross saving and investment account.

Government's income consists of taxes from which it disburses transfer payments (including interest) to households and the foreign sector, purchases final goods and services, and saves the remainder. Households receive disposable income, personal taxes having already been deducted, by earnings and transfers. They spend part for consumption and save the remainder. Foreigners receive transfers and income from their sales of goods and services to Americans (imports). They spend for American exports. The value of net exports less claims covered by transfers remains as net foreign investment by Americans.

At the bottom of the chart, gross business saving plus government saving plus personal saving equals net foreign investment plus gross private domestic investment. The bars representing saving have the same combined length as those representing investment.

We could have included the current surplus of government enterprises less subsidies in GNY and either added its value, along with taxes, to government income or subtracted it from government outlays, as subsidies less the current surplus of government enterprises. As the previous footnote shows, either treatment would leave the same value for government saving and the total saving of all sectors would still equal national investment.

The nation's economic budget Figure 4-6 briefly summarizes the system of accounts for 1960 and provides the means to demonstrate that saving and investment are made equal by the definitions of the accounts. This table has been labelled the nation's economic budget by the President's Council of Economic Advisers, because it shows disposable income, current expenditures, saving and investment by all sectors.

The "expenditures" column is GNE without change. The "receipts" column equals the value of GNY, but after taxes and transfers have redistributed it among sectors. The net receipts of government (T) is the sum of business and personal taxes less government interest payments, transfers to persons and the foreign sector, and subsidies less the current surplus of government enterprises. The two are, of course, identically equal since they both measure gross national

4-6 The nation's economic budget, 1960
(Billions of dollars)

		Receipts	*Expenditures*	*Excess of receipts or expenditures (−)*
Persons:				
Disposable personal income (DPY)		351.8		
Personal consumption expenditures (*C*)			328.9	
Personal saving (PS)				22.9
Business:				
Gross retained earnings (GBS)		51.7		
Gross private domestic investment (DI)			72.4	
Excess of investment				−20.7
Government:				
Tax and nontax receipts or accruals	139.1			
Less: Transfers, etc.	37.1			
Net receipts (*T*)		102.0		
Purchases of goods and services (*G*)			100.1	
Surplus or deficit (−) on income and product account (GS)				1.9
Foreign:				
Net transfer payments by government (NFT)		1.6		
Net exports (NX)			3.0	
Net foreign investment (FI)				−1.5
Statistical discrepancy (SD)		−2.6		−2.6
GROSS NATIONAL PRODUCT		504.4	504.4	—

Source: Survey of Current Business, July 1961, p. 31.

product. Using the symbols shown in parentheses in the stub, we can express this identity:

$$\text{DPY} + \text{GBS} + T + \text{NFT} + \text{SD} \equiv C + \text{DI} + G + \text{NX} \quad (4\text{-}1)$$

By definition, personal saving (PS) is equal to disposable personal income minus personal consumption expenditures (DPY − *C*). Also by definition, net foreign investment (FI) is net exports minus net foreign transfers (NX − NFT). Thus, if we subtract consumption and net foreign transfers from both sides of this identity, we are left with personal saving in place of DPY on the left and net foreign

investment in place of NX on the right. To simplify, we combine foreign and domestic investment and call it *gross national investment* (I). The statistical discrepancy has no conceptual legitimacy and we can make it disappear by including it, together with personal saving and gross business saving, in gross national saving of persons and businesses (S). These operations leave us with the identity:

$$S + T \equiv I + G \tag{4-2}$$

One step remains to show the identity of total saving and investment in the national accounts. We have defined government saving as net receipts from taxes, after deducting transfers and transfer-type outlays, minus government purchases of goods and services (i.e., $\text{GS} \equiv T - G$). Subtracting government purchases from both sides of identity 4-2 leaves:

$$S + \text{GS} \equiv I \tag{4-3}$$

That is, gross national saving by all sectors is identically equal to gross national investment.

It is important to note that total saving and investment are equal by the definitions of the accounts. The sense behind these definitions is that for every new good of value produced there must be an additional claim held by someone somewhere in the economy to this value. If the claim is not exercised by a current purchase then it must remain as a claim to investment in new capital.

Thus actual saving and investment are always equal in the aggregate, no matter whether income and output are measured over a year, a quarter, a month, or a day. This does not mean either that saving and investment cannot change in the next period or that the amounts saved and invested represent what people planned or intended to save and invest in the period of measurement. In particular, investment may include unintended change in inventories. Equality does not mean equilibrium.

Gross National Product in Constant Dollars

The Department of Commerce compiles and publishes gross national product by expenditures (GNE) in constant dollars as well as current prices. We employed the constant dollar series in Chapter 1

to indicate economic growth. A change in this series from one year to another represents change in aggregate real output since the expenditures have been adjusted to remove the effects of inflation or deflation of prices.

This adjustment process can be described in a sequence of steps. First, GNE is divided into as small expenditure flows as available data permit. For instance, one such division of personal consumption expenditures is "shoes and other footwear." Second, for each of these categories an appropriate price index is compiled from price data collected by various government agencies. For example, an index of shoe and footwear prices is compiled from several price series for types of shoes and related items collected by the Bureau of Labor Statistics for use in the official consumer price index (CPI).

Next, the expenditure figures in each category are divided year by year (or quarter by quarter) by the corresponding price index numbers for those years. This is known as "deflating" the expenditure series. The "shoes and other footwear" expenditures for (say) 1954, 1955, and 1956 are divided by the index numbers for prices of shoes and related items in 1954, 1955, and 1956, respectively.

Finally, these deflated expenditures are summed over all categories in a single year to give GNP in constant dollars for that year. The major divisions of GNE, such as government purchases or personal-consumption expenditures for durables, are also obtained by summing the appropriate deflated expenditure categories. The constant dollar figures represent expenditures at prices of a stated year, this year being the base year of the price indexes used in deflation.

An illustrative example A hypothetical example, tabulated in Figure 4-7, will serve to show how this is done. Suppose that two categories of gross private domestic investment are trucks and farm tractors. We have the sales of these new capital goods in 1954 and 1960 (items 1 and 2) and the average price of a truck and a tractor in 1954 and in 1960 (items 4 and 5). Of course, trucks vary widely in quality and price. It is a simplification in this example to deal with an average price for a truck. In practice, a composite price index, weighted by quantities of each major type of truck sold in the base year, would be used. The same is true for tractors.

Our job is to deflate truck and tractor sales to express them in constant 1954 dollars and, then, to combine the results as we would on

4-7 Deflating final sales of trucks and tractors
(A hypothetical example)

Item		*1954*	*1960*
	Final sales at current prices (millions of dollars):		
1	Trucks	200	450
2	Tractors	150	200
3	TOTAL	350	650
	Prices per unit (thousands of dollars):		
4	Trucks	10	15
5	Tractors	5	10
	Price indexes (1954 = 100):		
6	Trucks	100	150
7	Tractors	100	200
8	Tractors and trucks (1954 sales weights)	100	171
	Final sales in constant dollars (millions of 1954 dollars):		
9	Trucks	200	300
10	Tractors	150	100
11	TOTAL	350	400
12	*Implicit deflator for trucks and tractors*	100	162

the way to determining aggregate investment and GNP as a whole in 1954 dollars.

We first make indexes for truck and tractor prices, using 1954 for the base year (items 6 and 7). An index shows the price level in any given year as a proportion of its level in the base year. If the given year is also the base year, this proportion is, of course, 1.00 in decimals. It is customary to express the proportion in hundreds; so we write 100 for the price index number in 1954.

The average price of a truck rose from $10,000 to $15,000, an increase of 50 percent, so the truck-price index number for 1960 is 150. The average tractor price doubled, thereby giving 200 as the 1960 number.

Item 9 is the deflated value of truck sales, obtained by dividing sales at current prices by the truck index numbers in decimal form (i.e., 1.00 for 1954 and 1.50 for 1960). Algebraically, dividing by the price index (p_{60}/p_{54}) is equivalent to multiplying by its reciprocal

(p_{54}/p_{60}). The value of truck sales in 1960 is price times quantity in that year ($p_{60}q_{60}$) and we can express the deflation process by the formula:

$$p_{60}q_{60} \times \frac{p_{54}}{p_{60}} = p_{54}q_{60} \tag{4-4}$$

Price in 1960 cancels out and, hence, leaves truck sales valued in 1954 prices. Tractor expenditures are deflated the same way.

While truck sales in actual prices rose from $200 millions in 1954 to $450 millions in 1960, prices increased by half so that sales valued in constant dollars increased only to $300 millions. The increase in tractor sales at current prices was more than offset by the increase in tractor prices, so tractor sales valued in 1954 prices declined by a third.

Finally, we sum the constant-dollar sales figures for 1954 and for 1960 (item 11). The 1954 sales value remains the same, since it is valued at the same prices in both the current-price and constant-dollars series. However, combined sales in constant dollars in 1960 are only $400 millions, in contrast to $650 millions at current (1960) prices. To this we then add the deflated expenditures for other equipment, for housing and other construction and the net change in inventories to get gross private domestic investment in 1960 valued at 1954 prices.

Implicit deflators The Department of Commerce publishes an important series of price indexes, called *implicit deflators*, corresponding to the major expenditure groups in GNE. An implicit deflator is obtained by dividing current-price expenditures by constant-dollar expenditures. The base year of this price index is the year whose price level is represented in the constant-dollar figures. Thus, we obtain the 1960 implicit deflator for personal-consumption expenditures, with a 1954 base year, by dividing 1960 current-price consumption by 1960 consumption expenditures valued in 1954 dollars.

In Figure 4-7 the implicit deflator for combined truck and tractor sales is shown by item 12. The base year, 1954, has the value 100 as in any price index. We may express the implicit deflator number for 1960 in decimals by the equation:

$$\frac{\text{Sales in 1960 prices}}{\text{Sales in 1954 prices}} = \frac{\text{Sum } p_{60}q_{60}}{\text{Sum } p_{54}q_{60}} = \frac{650}{400} = 1.62 \tag{4-5}$$

Comparison with a fixed-weight price index. The importance of the implicit-deflector series may be understood by comparing it with a price index compiled as the consumer, wholesale, and farm price indexes are calculated. These indexes employ constant weights, usually sales in or near the base year. Indexes are weighted so that relatively minor items, such as razor blades in the consumer price index, do not influence the index more than in proportion to their importance in purchasers' budgets.

Item 8 is a price index for trucks and tractors using base-year (1954) sales values for weights. It is computed in decimal form by the formula:

$$\frac{\text{Sum } (p_{60}/p_{54})(p_{54}q_{54})}{\text{Sum } p_{54}q_{54}} = \frac{(15/10)(200) + (10/5)(150)}{200 + 150} = \frac{600}{350} = 1.71 \qquad (4\text{-}6)$$

The relative increase in the truck price (p_{60}/p_{54} for trucks) is multiplied by sales of trucks in the base year ($p_{54}q_{54}$ for trucks). The same is done for tractors. Then these figures are totalled and divided by the sum of the weights. The result in decimals is finally multiplied by 100 to give the number 171.

In Equation (4-6), prices for 1954 algebraically cancel out in the numerator:

$$\frac{\text{Sum } (p_{60}/p_{54})(p_{54}q_{54})}{\text{Sum } p_{54}q_{54}} = \frac{\text{Sum } p_{60}q_{54}}{\text{Sum } p_{54}q_{54}} \qquad (4\text{-}7)$$

Thus, the price index, which is weighted by base-year sales, is equivalent to one weighted by base-year quantities sold. This equation can stand for a consumer price index in which the quantities are for a 1954 marketbasket. The index divides the cost of this basket in 1960 by its cost in the base year (1954).

Now compare Equations (4-5) and (4-7). The only difference is that the implicit deflator uses given-year (1960) quantities as weights, while the price index uses base-year quantities. In statistics, the former is known as a *Paasche index of prices,* and the latter, a *Laspeyres index of prices.*

In Figure 4-7 the implicit-deflator (Paasche) index has a lower value for 1960 than the Laspeyres index (162 and 171, respectively). This is to be expected, since the item that rose relatively more in price (tractors) rose relatively less in quantity sold — in this case, the

quantity sold fell by a third, as indicated by sales in constant dollars. There is a strong tendency for producers and consumers to economize and to make substitutions for things that rise most rapidly in price and to increase their purchases relatively faster of goods and services that rise least or fall in price. Consequently, as a rule Paasche index series show a more moderate degree of inflation than constant-weight indexes, of which the Laspeyres is an example.

For some purposes, a Paasche index is more appropriate. In each year its weights reflect the importance of items actually bought that year. The implicit deflator for personal consumption expenditures in 1961 is weighted by quantities bought in 1961; that for 1962 has 1962 quantity weights, and so forth. Because of this, it appeals to some as a better measure of the cost of living than the consumer price index. On the other hand, it does not represent the change in cost of a given marketbasket and some economists prefer an index that measures price changes alone, not an indivisible change in both prices and quantities. In any event, our example is an extreme case. The implicit deflator for personal consumption expenditures almost always moves in the same direction and at nearly the same rate as the official consumer price index.

Disposable personal income in constant dollars The Department of Commerce does not publish a constant-dollar series for the components of GNY or national income. Some of these value flows can be thought of as price-times-quantity totals, such as the wage rate times numbers of hours worked, but many cannot. Even if the wage-and-salary series were deflated by wage-and-salary rate indexes, assuming these could be compiled in sufficient detail and scope, it is questionable whether the resulting figures would have any clear-cut meaning or be useful for many purposes. If information on changes in hours worked is desired, it can be obtained directly and in greater detail from other data published by government.

However, it does make sense to deflate an income series by price indexes covering the goods and services that the income receiver is apt to purchase. If disposable income of households doubles and if the price level of consumer goods and services also doubles, the purchasing power of disposable income remains the same. In this sense we can say that the real income of households has not changed. The Department of Commerce does publish a constant-dollar series for disposable

personal income. This is obtained by deflating with the implicit deflator for personal consumption expenditures.

The Flow of Funds Accounts

The national income-and-output accounts derive saving for each sector as the difference between its income and current outlays, but they fail to show how saving is allocated among various real and financial investments. Following pioneer work by Morris Copeland of Cornell University, the Federal Reserve System has compiled, since 1955, flow-of-funds accounts which both indicate the disposition of saving and provide a record of borrowing and lending by major sectors of the economy. These accounts contain both quarterly and annual flow estimates. They are published in the statistical appendices of the *Federal Reserve Bulletin*, and the data for the previous calendar year appears in the April issue.

Flow-of-funds accounts provide important information to the macroeconomics researcher. Aggregate demand, output, and employment are strongly affected by changes in the public's attitudes toward holding, lending, or borrowing cash. Shifts in assets between sectors or in the forms of assets and liabilities within a single sector, shown by comparing flow-of-funds tables over several quarters or years, provide evidence of shifts in these attitudes and attendant behavior. Although definitions of saving and investment differ somewhat between the national income-output and flow-of-funds accounts, data from these two systems (and other sources) may be used together in ways which provide clues to the interrelations of producing, current spending, saving, investing, borrowing, and lending.

The summary table Figure 4-8 is the summary table, presented in a much condensed form, of the flow-of-funds accounts for 1960. This table is particularly useful because it traces intersectoral flows and because it displays the conceptual structure of this accounting system. To reduce the size of the summary table and to make it easier to read, several changes have been made.

First, the eleven sectors of the *Bulletin* table have been consolidated into three. The "consumers" sector, which is taken directly from the *Bulletin* without further consolidation, covers households and nonprofit institutions with nearly the same scope as the personal

4-8 Summary of flow-of-funds accounts for 1960
(Billions of dollars)

Transactions	*Consumers*		*Businesses*		*Govt. and foreign*		*All sectors*	
	*U**	*S**	*U*	*S*	*U*	*S*	*U*	*S*
Gross saving†		72		46		−1		117
Gross investment	72		46		−1		117	
Private capital expenditures	66		51		—		117	
Net financial investment	6		−5		−1		—	
Net acquisition of financial assets	22		38		10		70	
Net increase in liabilities		16		43		11		70
Money	**		−2	**	3		1	**
Fixed-value redeemable claims	13		**	15	2	**	15	15
Life insurance and pension funds	11			8		3	11	11
Securities:								
Govt. obligations	−1		2		**	1	1	1
Corp. and foreign bonds	1		3	5	1	1	6	6
Corporate stock	**		3	4			4	4
Mortgages	1	11	12	4	2		15	15
Consumer credit		4	4				4	4
Other financial transactions	**	1	14	11	3	6	17	19
Proprietors' net investment	−5			−5			−5	−5

*The column heads *U* and *S* mean "uses of funds" and "sources of funds," respectively.

†Gross-saving entries include statistical discrepancy from gross investment.

**Two asterisks indicate entry of less than $500 millions in absolute value.

Note: Detail entries may not add to totals because of rounding.

Sources: Federal Reserve Bulletin, April 1961, p. 484; April 1962, pp. 473–79. Details from sources have been consolidated.

account in the Commerce system. Our "businesses" sector consolidates seven sectors in the *Bulletin:* three nonfinancial business sectors (farm, nonfarm-noncorporate, and corporate businesses) and four financial sectors (commercial banking and monetary authorities, savings institutions, insurance, and other financial institutions). The "government and foreign" sector in Figure 4-8 combines separate accounts for federal, state, and local government and for transactions with the rest-of-the-world. Transactions of all domestic sectors and the rest-of-the-world sector are combined in the "all sectors" column, which is unchanged from the *Bulletin.*

Second, several of the transactions items (rows) have been condensed. Third, data have been rounded off from hundreds of millions to even billions of dollars. Consequently, some items do not add to their totals. Finally, to emphasize the conceptual equality between gross saving and investment in each sector, statistical discrepancies in actual measurement are included in gross saving, just as they are in the national income and output accounts.

Structure of the accounts Each sector's columns are headed by *U* for "uses of funds" and *S* for "sources of funds." A sector obtains funds by saving current income or by borrowing. Saving is gross since it includes capital-consumption allowances. Borrowing is shown as a net increase in liabilities. If a sector pays off more debt of a certain type than it creates by borrowing in one year, the amount of this net reduction in liabilities is entered as a negative figure in the sources (*S*) column. (One exception is the minus five shown for "proprietors' net investment." This is a reduction in ownership rather than a notation of creditor claims against unincorporated enterprises.)

A sector uses funds for real or financial investment. Since all funds received are allocated to assets, including those retained as cash, gross saving is necessarily equal to gross investment in each sector. Real investment, mostly through purchases of new fixed capital and net changes in inventories, is shown by "private-capital expenditures." The flow-of-funds accounts record the shifts in ownership of existing assets as well as the creation of new wealth, so they should show intersectoral transfers of land and previously produced capital goods. However, most such transactions are omitted for lack of data.

Financial transactions. Net financial investment is the net acquisition of financial assets by a sector minus its net increase in liabilities. Alternatively, it may be viewed as the value of financial assets obtained with funds saved, rather than borrowed, or as the addition to the sector's net financial capital from the year's transactions. A negative figure in the "net financial investment" row is disinvestment or the year's increase in net liabilities. The business sector borrows to finance real investment in excess of its own saving from profits and depreciation.

Funds lent by one sector are borrowed by another, and the value of what is lent in the aggregate among all sectors must be equal to the amount that is borrowed. Consequently, net financial investment for all sectors together must be zero.[2]

For the same reason, each type of financial transaction has the same total value as a use and a source of funds. For instance, households and businesses borrowed $15 billions in new debts secured by mortgages in 1960. These funds came partly from other households and from government (entries on "mortgages" row, *U* columns), but mainly from banks, savings institutions, and insurance companies in the business sector. The $15 billions used to advance mortgage loans by all sectors stands in the *U* column for "all sectors" opposite its value received as a source of funds by all sectors. Uses and sources of "money" and "other financial transactions" are not exceptions on principle. The differences shown in the "all sectors" columns are due to statistical discrepancies.

To review, the accounts are structured on two fundamental identities. First, all funds saved are invested. Second, all funds lent are borrowed. The first identity is represented in the top two rows of Figure 4-8; the second is shown in the two columns for "all sectors."

Saving and investment in the two accounting systems

Gross saving and investment by all sectors is $117 billions, in contrast to gross national saving and investment of only $74 billions in the U.S. Department of Commerce accounts (Figure 4-4). The difference is due to two things. First, all-sectors investment does not include net foreign investment. This value must be added to

[2]From the standpoint of the nation, net foreign investment remains, but this is offset by net financial disinvestment in the rest-of-the-world sector. See the next footnote.

both gross investment and gross saving in the flow-of-funds accounts to convert them to figures for national saving and investment.[3]

Second, the flow-of-funds accounts treat the purchases of consumers' durables as *investment* rather than as consumption and include an estimated capital-consumption allowance for household stocks of durables in the gross saving of consumers. The $72 billions shown for consumer gross saving is disposable income minus personal consumption expenditures for services and nondurables only.

The $66-billions private-capital expenditures by households and nonprofit institutions include not only new consumer durables but also construction of houses for owner-occupancy and new institutional structures and equipment. The U.S. Department of Commerce accounts treat all residential and institutional construction as part of business investment, but the flow-of-funds transfers these particular items to the consumer account. This does not alter total investment by all sectors, of course.

All government purchases are treated as current — public investment, as in the Commerce accounts, is neglected — and all foreign investment is financial. Consequently, capital expenditures occur only in the consumers and businesses sectors.

Reading the consumers account To understand what types of information are disclosed by these accounts, let us read down the "consumers" columns. In 1960, households and nonprofit institutions saved $72 billions and borrowed another $16 billions,

[3]National investment in the flow-of-funds accounts is the combined investment of all *domestic* sectors, which does include a net financial claim. Since internal claims and liabilities are offsetting, this net financial claim is net foreign investment. The rest-of-the-world sector has an offsetting (negative) net financial claim, since its net indebtedness to the U.S. increases by the amount of new U.S. net claims against foreigners. No capital expenditures are attributed to the foreign sector, so its gross investment and saving are identical with this net increase in its liabilities. National and all-sector flows are reconciled in the following accounts for 1960 (figures in billions of dollars):

	All domestic sectors		*Rest-of-the-world*		*All sectors*	
	U	*S*	*U*	*S*	*U*	*S*
Gross saving (including statistical discrepancies)		118		−1		117
Gross investment	118		−1		117	
Private-capital expenditures	117		—		117	
Net financial investment (i.e., net foreign investment)	1		−1		—	

mostly by mortgaging land and structures. Of this $88 billions of funds, they invested $66 billions in consumer and institutional structures and durable goods.

The remaining $22 billions constituted financial assets of various forms. A small amount was retained as money in currency and checking accounts. These are liabilities of commercial banks and monetary authorities. Thirteen billions were deposited in savings accounts, put into shares (deposits) in saving and loan associations, used to buy U.S. savings bonds, or held in other such "near-money" forms. These assets have fixed monetary values and can be readily converted into cash, so they are almost as liquid as money.

Consumers acquired claims worth $11 billions to life insurance and pensions administered by private and government agencies. The value of this saving is premiums paid in 1960 *plus* interest earned on past accumulations invested by the administering agencies *minus* benefits paid and the costs and profits of administering the insurance and pension funds.

Households sold or redeemed $1 billion worth of government bonds and other public-debt obligations. Reading along this row, we see that businesses bought $2 billions worth, while government issued $1 billion worth through borrowing in 1960. It is important to note that these, as well as the other financial uses and sources figures, are net for the year — for instance, government might have borrowed (say) $3 billions in total during 1960, but paid off $2 billions of existing debt. To repeat an earlier observation, repayment of debt is a subtraction (negative figure) in the sources column; it is not a positive entry under uses. Positive figures for uses indicate that more assets were bought by the sector than it sold. On balance, claims against government were shifted from households to businesses.

Consumers bought a billion dollars worth of corporate and foreign bonds from other sectors, a small amount of stock, and another billion dollars worth of mortgages. Legally, stock is an ownership rather than a creditor claim against corporations; however, selling stock is a source of funds to the firm, and is treated in this account as equivalent to borrowing. The table tells us that corporations issued $4 billions worth of new shares and businesses bought $3 billions worth.

The $5 billions net disinvestment by proprietors is an imputed item. As in the national-income accounts, the net incomes of farmers, storekeepers, independent professionals, and other proprietors of

noncorporate businesses are entirely included in personal (consumers') income. But here explicit allowance is made for the portion of this income plowed back through investment in business assets. Proprietors' net investment is equal to total investment of noncorporate businesses in real and financial assets *less* borrowing and capital consumption allowances. Although purchases of new capital goods by unincorporated firms exceeded their capital consumption in 1960 (figures not shown), so much of this investment was financed by borrowing that the net business assets owned by their proprietors declined by $5 billions.

Other National Accounting Systems

The national income-output and the flow-of-funds accounting systems omit or contain only in net form some things which a comprehensive set of national accounts would include in detail. First, as flow accounts, they omit stock measures of national and sectoral real and financial assets, liabilities, and net worth (ownership). Second, we have noted that the U.S. Department of Commerce accounts deliberately exclude transactions in intermediate goods and services. Finally, both systems explicitly include only net foreign transactions, leaving out the details of imports, exports, transfer payments and gross international capital flows.

National balance sheets As a supplement to the flow-of-funds accounts, the *Federal Reserve Bulletin* in recent years has published in its April issue a summary statement of financial assets and liabilities held by sectors at the close of the previous calendar year. The format of this table is the same as Figure 4-8, except that the headings U and S are replaced by A and L, meaning "assets" and "liabilities." Since it is limited to financial stocks, the table has no entries for gross saving, investment, or real capital. In place of "net acquisition of financial assets," it has "total (financial) assets," and "net increase in liabilities" is replaced by "total liabilities." Assets and liabilities are equal in the "all sectors" columns, since every debt liability (or ownership claim against a firm) is an asset to the creditor (or owner).

This summary of sector balance sheets is largely a cumulation of past flows, except where capital gains or losses are included. For instance, on December 31, 1959, consumers held $201 billions in fixed-

value redeemable claims. Figure 4-8 shows they acquired $13 billions more during 1960. Consequently, the summary assets-liabilities statement for December 31, 1960, lists these assets for consumers as $214 billions.

Sectoral and national balance sheets for years extending back into the nineteenth century have been compiled by Raymond Goldsmith. These cover both real wealth (see Figure 2-1) and financial assets and liabilities.[4]

Interindustry accounts Transactions in intermediate, as well as final, goods and services are recorded in interindustry accounts, often termed *input-output tables.* These were developed by Wassily Leontief at Harvard University during the 1930's, and official tables for 1947 have been compiled and published by the Bureau of Labor Statistics. Although such national accounts have proven highly useful in military-logistics planning as well as in other types of research, the immense amount of data which must be compiled and processed to assemble such tables has deterred regular publication of these accounts.

Figure 4-9 presents a greatly consolidated and rounded version of the 50-sector national input-output table for 1947.[5] The economy is divided into three producing sectors — food and agriculture, mining and manufacturing, and transportation and other services. The source table divides each of these into many industries. Reading across each row, we see the total output of an industry divided into intermediate inputs of other industries and final sales plus inventory changes (final demand). Thus firms in food and agricultural industries produced $50 billions worth of output of which $5 billions were used by mining and manufacturing, $6 billions by transportation and service industries, and $39 billions were sold to final purchasers or were accumulated in inventories.

[4]See Goldsmith's monumental three-volume work, *A Study of Saving in the United States* (Princeton, N.J.: Princeton University Press, 1956); tables are in the third volume. Summary data from these balance sheets are contained in the Bureau of Census reference volume, *Historical Statistics of the United States: Colonial Times to 1957* (Washington, D.C.: Government Printing Office, 1960). Most libraries carry this important compendium.

[5]For a more detailed explanation of these accounts and the 50-sector table for 1947 see: W. D. Evans and M. Hoffenberg, "The Interindustry Relations Study for 1947," *Review of Economics and Statistics,* vol. 34, no. 2 (May 1952), pp. 97–142.

4-9 Interindustry flows of goods and services, 1947
(Billions of dollars)

	Food and agriculture	*Mining and manufacturing*	*Transportation and services*	*Final demand*	*Total outputs*
Food and agriculture	—	5	6	39	50
Mining and manufacturing	6	—	43	62	111
Transportation and services	10	33	—	125	165
Other charges	34	73	116	—	226
Total inputs	50	111	165	226	552

Source: Noted in text footnote.

Reading down the columns, we see the inputs for a given industry as being the outputs of other industries and we also see payments for labor and property services, taxes, and other charges. Thus, food and agriculture industries used $6 billions of output from manufacturing and mining, $10 billions of transportation and other business services, and paid $34 billions for wages, salaries, rents, profits, interest, taxes, and depreciation.

The final demand values represent about the same things as GNE, except that they are classified by industry of origin, and there are some differences in definitional scope. Similarly, the "other charges" row covers nearly the same items as GNY. The other elements in the matrix measure intermediate goods and services. Note that total inputs for a sector equal total outputs in value. This follows from each intermediate input by one sector being an output of another.

The balance of international payments Foreign transactions of the national economy are estimated and compiled in balance of international payments statements. These are published quarterly and annually by the Department of Commerce in the *Survey of Current Business*. They show in considerable detail imports and exports of goods and services, including earnings on foreign assets, international transfer payments, direct and financial foreign investment, and changes in international reserves.

An integrated system of stock and flow accounts It is conceivable that these separate accounting systems may someday be

organized on internally consistent definitions and integrated into a master system of interlinked stock and flow accounts. This was recommended in 1958 in a report to Congress by the National Accounts Review Committee of the National Bureau of Economic Research.[6] Such an integrated system of accounts would aid researchers in tracing interrelationships between stocks of real wealth and financial assets and liabilities, and flows of production, incomes, borrowing and lending, and international transactions. Some important steps toward integration of the accounts have been taken since the Committee made its report, but many remain.

Summary

The sectoral accounts compiled by the Department of Commerce trace the disposition of gross national income as (1) business saving, chiefly undistributed corporate profits and capital-consumption allowances of businesses, (2) payments to households, mostly the earnings of labor and property, and (3) business taxes and related payments to domestic governments. The value of GNY is then redistributed among sectors: (1) households pay personal taxes to government, (2) government returns interest and transfer payments to households, and (3) government transfers money payments to foreign governments.

The personal sector then has disposable personal income, which it divides between personal-consumption expenditures and personal saving. Government receipts after transfers and transfer-like outlays is divided between purchases of goods and services and the government surplus or saving. In the foreign transactions sector, transfers from government are deducted from the value of net exports to leave net foreign investment. Gross domestic and net foreign investment are made identically equal to saving by all sectors in the accounts and these capital flows are brought together as balanced entries in a fourth sectoral account.

Gross national expenditures and disposable personal income are deflated to constant dollar figures. Expenditures are first disaggregated, then divided by appropriate price indexes, and finally re-

[6] *The National Economic Accounts of the United States: Review, Appraisal and Recommendations*, General Series 64 (New York: National Bureau of Economic Research, 1958).

aggregated to measure output at the price level of the indexes' base year. Dividing current-price aggregates by corresponding constant-dollar figures yields new price indexes known as *implicit deflators.* They reflect changes in the composition of expenditures as well as changes in prices.

The Federal Reserve System compiles and publishes an important supplement to the national income-output accounts entitled the flow-of-funds accounts. These allocate funds saved and borrowed by each sector among its real and financial investments. They also show net shifts in financial assets among sectors. This accounting system is structured on two identities: (1) saving equals gross real plus net financial investment in each sector and (2) borrowing in any form is equal to lending in the same form, so that total lending and borrowing (including ownership transactions) are equal.

A master system of national accounts would include statements of the stocks of real wealth and financial assets and liabilities, production and disposition of intermediate goods and services, and gross international transactions in detail. Accounts exist for all of these, but they differ in definitional details and have not yet been brought up to date and linked together in a fully integrated system of national accounts.

Reading and Research

For reading and research on the sectoral accounts and constant-dollar estimates, see the citations at the end of Chapter 3.

Flow-of-funds accounts. Morris A. Copeland's path-breaking study is *A Study of Moneyflows in the United States* (New York: National Bureau of Economic Research, 1952). The Federal Reserve System reveals its concepts and methods of measurement in the *Federal Reserve Bulletin,* October 1955, pp. 1085–1124, and in its document, *Flow of Funds in the United States, 1939–1953* (Washington, D.C.: Board of Governors of the Federal Reserve System, 1955). Important revisions in this system are discussed in the *Federal Reserve Bulletin,* August 1959, pp. 828–859.

Other national accounting systems. The source for Goldsmith's national balance sheets is noted in a footnote; see also his writings cited at the end of Chapter 2. Wassily W. Leontief's development of the input-output system of interindustry accounts will be found in his volumes:

The Structure of the American Economy, 1919–1939, 2d ed. (New York: Oxford University Press, 1951) and (with others) *Studies in the Structure of the American Economy* (New York: Oxford University Press, 1953). There is a large literature on input-output, much of it listed in Vera Riley and Robert L. Allen, *Interindustry Economic Studies: A Comprehensive Bibliography on Interindustry Research* (Baltimore, Md.: The Johns Hopkins University Press, 1955). Explanation of the balance of international payments may be found in any international economics textbook, such as P. T. Ellsworth, *The International Economy* (New York: The Macmillan Company, 1958).

5 Introduction to the Theory of Aggregate Demand

Discussion of how economic activities are measured by the national accounts is now concluded. In this chapter, we shall use a circular-flow model to emphasize the need for a theory of spending or, more elegantly, a theory of aggregate effective demand. Classical economists did not feel the need to develop such a theory because they believed that no matter what the level of aggregate output would be, the process of production would create sufficient demand for it. They accepted Say's Law of Markets — supply creates its own demand.

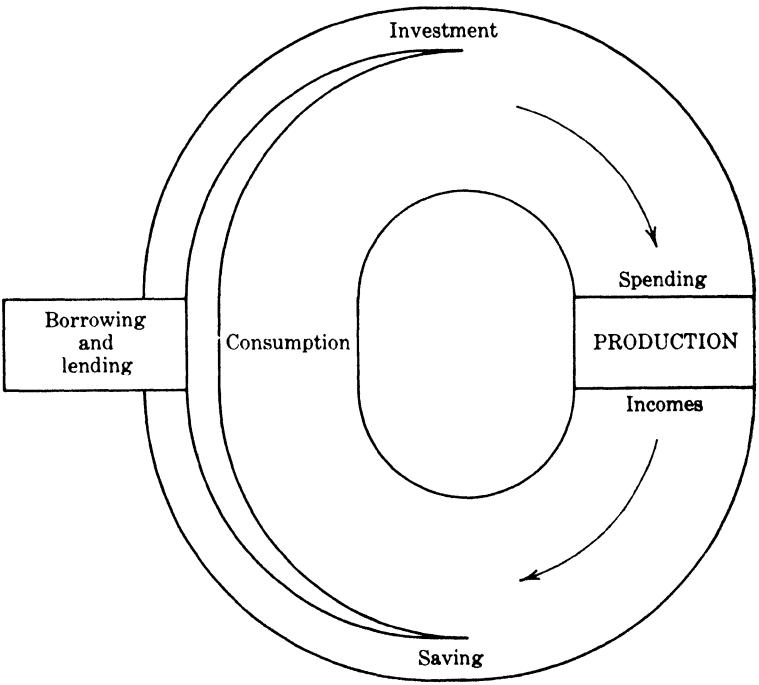
In 1936, John Maynard Keynes published a book that dealt a death blow to unqualified acceptance of Say's Law and that provided

the foundation for our modern theory of aggregate demand. In this chapter, we shall review the classical position and Keynes' attack on it. Our discussion will be summary in form, leaving a great deal of detail to be filled in by subsequent chapters. The important thing to realize here is that there is a need for an aggregate-demand theory and its role in accounting for business fluctuations.

The Circular Flow with Saving and Investment

Figure 5-1 is the circular flow of income and spending that we met in Chapter II, except that there is now both saving and investment and lending and borrowing. The model still represents a closed private economy. Production of final output is represented by the right-hand box. From this box, incomes that are generated by production and that constitute GNY flow clockwise through the lower

5-1 The circular flow of payments



"pipe." Into the box, from above, flows spending for consumer goods and new real capital.

Part of GNY is business saving, chiefly represented in the forms of capital consumption allowances and profits retained by business. Since governmental claims are absent, all income disbursed by businesses is disposable personal income. Households spend part of this for consumption of final goods and services, returning this money directly to producers. The rest is personal saving. The sum of personal and business saving is channelled or piped into the box on the left, which represents the capital markets. In this box occur the transactions measured by the flow-of-funds accounts — except consumer durables purchases, which are included in consumption spending.

From the capital markets, businesses obtain money in order to purchase new housing, plant, equipment, and added inventories. Some of this investment is financed internally with the firm's own current profits and depreciation allowances. In this case, the firm, in effect, obtains its own saving through the capital markets, though, in fact, no external transactions occur. The remainder of investment is financed by borrowing funds saved by other businesses or by households.[1]

Spending and GNE To avoid confusion, we need a term to distinguish the sum of intentional purchases of GNP in a given period from its actual disposition by gross national expenditures. We shall use the term *spending*, and it shall mean "only the purchases which constitute final sales of output plus intended inventory investment." Thus, spending includes consumption expenditures, gross private-

[1]Figure 5-1 can easily be revised to include government and foreign transactions. GNY flowing from the production box would include business taxes. We would then imagine a redistribution of income by transfers and personal taxes, leaving disposable personal income, net government receipts, and net foreign transfers to be added to gross business saving (GNY redistributed as in Figure 4-6).

The saving pipe would then channel the combined saving of businesses, households, and government into the capital markets. The consumption pipe would also include government purchases and net foreign transfers. At the top of the chart, the latter would merge with net foreign investment, financed through the capital markets, to equal net export expenditures. These plus consumption, government purchases, and intended gross private-domestic investment would make up the total spending entering the production box from above. The reason for limiting investment to intended capital outlays is explained in the next section of the text.

domestic investment in fixed capital, the *intended* net change in inventories, and, in a total-economy model, government purchases and net exports.

Spending may equal GNE, in which case all final output is sold to final users and there is no unintended net change in inventories. Spending may be less than GNE, which means that some output that producers expected to sell is not sold. When spending exceeds GNE the difference represents the unintended depletion of inventories.

The upper pipe in Figure 5-1 carries only spending payments back to producers. Thus, the value of payments entering the production box from above may be different from the value of incomes disbursed through the lower pipe.

The total value of incomes must equal the value of final output, including the net change in inventories. The latter are valued, in the national accounts, at their cost to the firms which accumulate them. For instance, suppose that an automobile dealer ends up the year with automobiles purchased from a manufacturer. These are counted at the price that the dealer paid for them, and this price includes profits and expenses of the manufacturer, his suppliers, the suppliers of his suppliers, and so forth. The values added at each stage are incomes leaving the production box from below.

The circular flow in equilibrium Now we can use Figure 5-1 to illustrate the mechanism of change in the circular flow. Suppose that flow aggregates are measured monthly. In the course of production last month, let us assume that firms disbursed $90 billions in wages, salaries, and payments for property services to households. They priced their output at $100 billions in order to recover $10 billions to cover capital consumption allowances and profit on final sales. From day to day through the month, they sold this output and thus realized capital consumption allowances and profits as money income.

Suppose, further, that during last month, households saved $10 billions and spent the remaining $80 billions for consumption. As they realized depreciation and profit, firms saved this money, so that total personal and business saving was $20 billions. Finally, suppose that prospective profits from fixed investment were sufficient to induce firms to borrow and to use their own saving to finance $20 billions of investment spending for new housing, plants, and equipment. We assume that they did not intend to change their inventory stocks.

Producers priced their output at $100 billions, and total spending by consumers and investors was $100 billions. Consequently, there was no unintended investment in inventories — the value of output produced for sale was, in fact, sold. The leakage from the flow of $20 billions in saving was offset by a pumpage back into the flow of $20 billions of investment spending. Producers are in equilibrium, because what they intended to sell was sold, and there is no pressure on them to change production schedules.

The circular flow in disequilibrium Suppose that producers anticipate the same level of sales this month and, not wanting to add to inventories, they schedule the same volume of production. Again they disburse $90 billions to households — price output to sell for $100 billions — and realize depreciation and profits as sales actually take place. We again suppose that households spend $80 billions for consumption and save $10 billions.

However, in the current month, the profit outlook for investment deteriorates for some reason. Firms elect to spend only $10 billions for new capital. Total spending is thus only $90 billions. Of the output which producers expected to sell for $100 billions, they actually sell only $90 billions worth. The remaining unsold goods are not recorded at $10 billions in the national accounts, but at their cost to the firms which hold them. Suppose that this is $9 billions in incomes disbursed to households as part of the $90 billions they receive during the month. The other one billion dollars that firms expected to receive would have covered capital consumption and profit on final sales. Thus, the value of final output for the month is $99 billions — $90 billions sold and $9 billions left in inventory.

The value of income is also $99 billions — $90 billions disbursed to households and $9 billions of profit and depreciation actually realized by producers through sales. Saving is $19 billions — $10 billions by households plus the $9 billions of profits and depreciation retained as business saving. Actual investment in the month is also $19 billions — $10 billions of intended investment in new fixed capital and $9 billions of unintended investment in inventories. Gross national expenditures (GNE) equal the value of gross national product for the month, but total *spending* falls short by $9 billions.

The vicious circle of decline The leakage of saving from the circular flow in the aforementioned month exceeds, by nine billion

dollars, the pumpage through investment spending. Businessmen find they overproduced nine billion dollars worth of goods at cost. Although one would expect them to revise production schedules, firms realize that predictions are not expected to be perfect and may expect sales to recover the next month. However, if this condition persists, businessmen will sooner or later cut back on production, lay off workers, and disburse less income.

As men become unemployed and their incomes fall, they are likely to reduce consumption expenditures; consequently, sales fall still further. Moreover, businessmen, finding that the plant and equipment they already have are not fully utilized, are less likely to invest in more capital. A vicious circle appears: reduced spending leads to reduced production, and the consequent reduction of income reduces spending still further. We shall later discuss this *feedback* effect in more detail and discover how it may be brought to a halt.

Compensating production and price changes Failure of spending to meet expectations in the current month might bring two other responses from business. First, if sales fall off in the first few weeks, firms may reduce production enough to clear unwanted inventories by the end of the month. Second, although producing the same real volume of output as they planned, firms may cut prices sufficiently to induce buyers to purchase all that is produced. In either case, the month's values of production and income payments are reduced in the same amount. In these cases, although spending is reduced, it is equal to the value of production, and intended investment equals saving.

If producers could cut costs in proportion to the drop in prices, they could protect profit rates on sales, and there would be no reason to expect them to curtail production. However, this is unlikely to occur. Interest and debt repayment charges are fixed by contract, wages of organized labor are also set by contracts, and even wages and salaries of the unorganized are difficult to force down in a few weeks. Consequently, profits are reduced. Marginal firms are forced to suspend operations, while others generally find they can make the best of their bad lot by reducing output and laying off employees. (Between 1929 and 1932, corporation profits of $10 billions turned to losses of $2 billions; compensation of employees declined by 40 percent.)

In all three cases, then, a fall in spending may be expected to bring

a fall in output and employment. To understand what causes business fluctuations, we need a theory of aggregate demand — a theory based on what determines spending by consumers, investors, and government. We shall begin to develop the theory of aggregate demand in the next chapter.

The Equation of Exchange

There is another way to represent the circular flow which antedates the income-spending analysis in macroeconomic theory. Though it receives much less attention today, the classical equation of exchange will help us understand the monetary side of macroeconomic theory. The equation, which is actually an identity, is:[2]

$$MV \equiv PY \tag{5-3}$$

The capital M represents the stock of money; V is its average velocity of circulation during a given period; P is an index of the average price level of final goods and services; and Y is the real volume of final output or real income of the nation during the period. The combination PY represents price times quantity and is the total value of final output at prices actually paid for it. Thus, GNP at current prices may be used to measure PY, or the two variables can be measured separately by the GNP implicit deflator for P and GNP in constant dollars for Y.

Money. The stock of money (M) consists of coin, currency, and demand deposits (checking accounts). These are the media of exchange. Coin and currency, which are issued by public monetary authorities (the U.S. Treasury and the Federal Reserve System), are more convenient for small, daily consumer purchases. Demand deposits are employed, through payment by check, in nearly all business transactions and in many household purchases. It has been estimated that about 90 percent of purchases, measured by value, are paid for with checks.

[2]The equation of exchange is often defined as: $MV = PT$, where T represents all monetary transactions, including exchanges of existing real wealth, claims to wealth, transfer payments, purchases of intermediate goods and services, and purchases of final output. Velocity in this equation represents money turnover in all these transactions and is therefore considerably higher in value than V in the identity of Equation 5-3, the so-called income version of the equation of exchange.

Velocity of circulation. The velocity of circulation, in payment for final goods and services, is the average number of times that a dollar makes the circuit of Figure 5-1 in the course of a given period.

The following examples will help us to understand the meaning of velocity. Suppose that the total stock of money consists of four billion one-dollar bills only. Suppose, further, that producers disburse all this money, except the portion saved by business, to households at the beginning of the month. By the close of the month, households return all this money to producers, either in consumption expenditures or by lending their saving to investing businesses. Money saved by businesses is also spent for investment before the end of the month. We are assuming, for simplicity, that spending equals production in this month. Thus, all the money makes a single circuit of the flow of payments. The monthly velocity is one and the annual velocity is 12.

In the course of a year, the four billion dollar bills are spent 12 times, so the total value of expenditures is MV = \$4 billions $\times$ 12 = \$48 billions. The value of purchases must be the same as the value of spending, since these are but two names for the same transactions; so, PY must also be \$48 billions.

Suppose the four billion bills were tied together in bunches of five bills, equivalent to five-dollar bills. If each bunch were spent once in a month, the velocity of circulation of each dollar would remain one a month and 12 a year. It does not matter in what denominations the money supply is divided.

We have data on the stock of money and final output in current prices (or GNP in constant dollars and its implicit deflator if we wish to measure P and Y separately). It is, then, an easy matter to measure the average velocity of circulation:

$$V \equiv \frac{PY}{M} \equiv \frac{\text{GNP in current prices}}{\text{Average money supply}} \tag{5-4}$$

For instance, in 1960 gross national product in current prices was \$504.4 billions. The stock of money held by the public at midyear, which we may use to represent approximately the average stock, was \$136.1 billions. Thus, the average velocity of circulation was 3.70 per annum.[3]

[3]Money is the stock reported for the end of June in the *Federal Reserve Bulletin*. It includes only currency outside banks and demand deposits adjusted to exclude interbank holdings.

Changes in the supply of money Demand deposits come into existence through bank lending. Suppose that businessman Adams borrows $10,000 from his bank. The bank officer credits Adams's account with the value of this loan; so Adams now has $10,000 more money in the form of a demand deposit. Suppose that he writes a check for $10,000 and gives it to the Brown Manufacturing Company in payment for goods he has received. Brown deposits the check to its own account in another bank. The check is returned to Adams's bank. The added deposit to Brown's account is offset by a reduction of Adams's account. However, the $10,000, which was new money created by the first bank in its loan to Adams, still exists; it has simply changed location and ownership by being deposited to Brown's account. From there it may circulate indefinitely through other hands.[4]

Demand deposits are extinguished when a person or firm repays a bank debt. Suppose that businessman Chandler repays $20,000 to his bank by writing a check for this amount against his deposit in this bank. The bank deducts $20,000 from Chandler's account and cancels the debt claim. Total demand deposits in the economy are thus reduced by this amount. The same would be true if Chandler repaid his debt with a check drawn on a second bank. His account in the latter bank would be reduced by $20,000.

Bank reserves and lending. The amount of lending and, thus, money creation that banks can legally undertake is limited by their reserves. By law, most banks are required to have reserves equal in value to roughly 20 percent of their demand-deposit liabilities. Consequently, the total amount of demand-deposit money is kept at a level no greater than about five times the reserves held by the banking system. The amount of reserves, in turn, is controlled by the Federal Reserve System, a government agency that regulates reserves with

[4]Our discussion of money changes is designed to be only a review of fundamentals already learned in a principles course. For a more thorough review of money and banking consult an elementary economics principles text, such as Paul A. Samuelson, *Economics: An Introductory Analysis* (New York: McGraw-Hill Book Company, Inc.); George L. Bach, *Economics: An Introduction to Analysis and Policy* (Englewood Cliffs, N.J.: Prentice-Hall, Inc.); or Campbell R. McConnell, *Elementary Economics: Principles, Problems, and Policies* (New York: McGraw-Hill Book Company, Inc.).

the purpose of altering the ability or willingness of banks to lend and create money.[5]

As a rule, banks lend almost to the limit of their ability; so, demand-deposit money is about five times reserves. However, there are times when business conditions are so poor that relatively few businessmen come to the banks to borrow, and many of those who do come have such poor asset and earning positions that banks are unwilling to take the risk of lending to them. In these circumstances, banks curtail their lending. When past bank loans are paid off at a faster rate than banks are willing to make new loans, the total quantity of money is reduced well below five times the banks' reserves. Action by the Federal Reserve System to increase reserves is apt to have little effect toward increasing the quantity of money.

In 1934 bank reserves were 75 percent above their 1929 level, but demand-deposit money was 25 percent below its 1929 figure. When the turn toward recovery began, bank lending and money increased, but at a slower rate than reserves until the end of 1935. The downturn late in 1937 again discouraged lending and reserves grew faster than money until World War II.[6]

Determinants of velocity While the actual velocity of circulation is simply defined by the Identity 5-4, it reflects habits and attitudes of the public toward holding and spending money. Besides its use as a unit of account, money plays two vitally important roles. First, as the medium of exchange it circulates, by passing from hand to hand, in purchase-sale, lending-borrowing, and transfer payment transactions. Assume that we could divide the total stock of money into two parts. The part which circulates in transactions we shall dub *active* money because it regularly serves as a medium of exchange.

The velocity with which active money travels around the circuit of payments is probably quite stable in the short run. Its stability de-

[5]The Federal Reserve Banks are nominally owned by private, commercial banks, but the System is charged with public responsibility and is better viewed as an agency of government. It is the central bank of the U.S.

[6]Data from U.S. Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1957* series 252 and 268 (Washington, D.C.: Government Printing Office, 1960), pp. 642 and 646. Data on reserves is only for member banks of the Federal Reserve System, which do the bulk of banking transactions; it is assumed that their proportional increase in reserves is representative for all banks.

pends upon how frequently producers disburse incomes and at what rate the recipients spend these incomes on final output. If all incomes were weekly wages and if all earners spent their earnings in a week, the average active dollar would make four circuits in a month. The social and legal institutions governing income disbursements and the habits of income recipients in making purchases change only slowly over time. Of course, active money enters into many transactions that transfer existing real wealth and claims to wealth, as well as those transactions that represent current production. It also serves as the medium for exchanging intermediate goods and services. However, habits and institutions govern these flows as well, and they are not apt to change substantially in the short run.

Idle money. The other use of money is as a store of value. People hold money which they regard as an asset — a part of their wealth to be held rather than used in the ordinary transactions of a period. Money earns no return, but it is safer than other types of assets. The public is apt to want to hold more such *idle* money (1) if it *expects* prices of stocks, bonds, real estate, and other assets to decline soon, (2) if it is increasingly *apprehensive* that various assets *might* fall, or (3) if the rate of return on assets that are regarded as risky is reduced. In these circumstances, people retain more of their saving in cash and sell other assets in order to hold the money proceeds, instead. The evidence is apparent in any major stock or bond market decline. The desire to sell "securities" and to hold money may turn into a panic.

Changes in velocity Money held idle throughout a period has zero velocity, of course. Given the total quantity of money in existence, the larger the proportion held idle, the lower the average velocity of circulation of all money. Suppose that one month there is $50 billions of money in existence, and all of it is active and has a velocity of circulation of four. The whole stock turns over four times, buying $200 billions worth of final goods and services. The next month half the money is hoarded in idle balances, while the remainder continues to circulate at the active-money rate of four. Purchases of goods and services amount to $100 billions ($25 billions $\times$ 4); so the average velocity of circulation is two ($V \equiv$ $100 billions/$50 billions).

In 1929, the velocity of circulation (V) was 4.0; it dropped continually, thereafter, until 1932, when it averaged 2.9 annually.

Throughout the remainder of the Great Depression, it failed to rise above 3.0, averaging about 2.9 until the downturn of 1938, after which it declined to 2.6 in 1940. In sum, it fell by more than 25 percent during the initial downswing of business in the Great Depression and then remained low through the rest of the 1930's.

The Fundamental Identity of Macroeconomics

We have learned that GNY in our closed private economy is divided into consumption and saving by persons and businesses: $\text{GNY} \equiv C + S$. Gross national product by expenditures is consumption plus actual (in contrast to intended) investment: $\text{GNE} \equiv C + I$. We have also found that GNP can be represented by the equation of exchange. Since these identities measure the same total, let us combine them in one grand identity and dub it the Fundamental Identity of macroeconomics:

$$C + S \equiv C + I \equiv MV \equiv PY \equiv \text{GNP (in current prices)} \quad (5\text{-}5)$$

The Fundamental Identity tells us nothing about how income, expenditures, and final output are determined. We leave this to the theory of aggregate demand. It is only a way of classifying these flows by components defined in a way which makes their products and sums identical in value.

The importance of the Fundamental Identity is that it reminds us that when one aggregate variable changes value, there must be compensating changes in one or more of the others. For instance, suppose that, from one year to the next, GNP at current prices declines. This means that there have been declines in (1) the price level, real output, or both, (2) the quantity of money, its velocity of circulation, or both, (3) consumption, investment, or both, and (4) consumption, saving, or both.

Suppose that we posit an increase in money. There must then be either an equiproportional decline in velocity or else an increase in income, expenditures, and the value of production at current prices. If investment falls, while consumption remains the same or rises less in absolute value, there must be (1) a decline in the value of production through deflation or production cutbacks, or both (2) a decline of saving, and (3) a fall either in the quantity of money or its velocity of circulation, or both.

Say's Law and Keynes' General Theory

Prior to the Great Depression, orthodox English and French economic theory could provide no explanation for the major depressions which occurred nearly every decade. Credit crises and stock market crashes were explained as being due to temporary failures in confidence resulting from excessively optimistic speculation. Continued depression for half a decade or more of production, employment, and prices could not be explained.

Indeed, economists argued that there could not be a "general glut" or overproduction of commodities. Certainly, a particular industry could produce more than its market would purchase at prices covering costs and enough profit to make production worthwhile. But overproduction in one industry was necessarily matched by underproduction in one or more other industries. Whatever the level of aggregate output, there would always be sufficient means to purchase it, and these means would be spent. Spending equalled output; aggregate demand equalled aggregate supply, no matter what its level.

Say's law of markets The case against the general glut is Say's Law of Markets, named after the French economist Jean Baptiste Say (1767–1832), who first termed the principle *a law*. Briefly, it means that "supply creates its own demand." In answer to Sismondi and Malthus, important economic thinkers who insisted that general gluts do occur, the great Classical economist John Stuart Mill succinctly stated Say's Law and defended its universal validity in Chapter 14 of his *Principles of Political Economy*. People produce goods and services beyond what they need for their own use only with a view to exchanging the surplus for other commodities they need. Thus Mill stated:

> . . . the means of payment for commodities . . . is simply commodities. Each person's means of paying for the productions of other people consists of those which he himself possesses. All sellers are inevitably and (by the meaning of the word) buyers. Could we suddenly double the productive powers of the country, we should double the supply of commodities in every market; but we should, by the same stroke, double the purchasing power. Everybody would bring a double demand as well as supply: everybody would be able to buy twice as much, because everyone would have twice as much to offer in exchange.[7]

[7]Sir W. J. Ashley Edition (London: Longmans, Green & Co., Ltd., 1929), pp. 557–58. The first edition of Mill's *Principles* was published in 1848 and the last major revisions by the author were made in the sixth edition, 1865.

Of course, most exchanges are not by barter. A person sells his surplus commodities for money and then uses the money to buy what he needs. A worker exchanges his productive services for consumers' goods by first working for money wages and then spending his paycheck. Money itself is sterile; it cannot serve human needs until it is exchanged for something else. Thus, the Classical economists assumed that every sale for money would quickly be followed by a purchase with the money, completing the exchange of goods and services for goods and services.

Keynes' general theory As depression deepened after 1929, and several years passed without signs of recovery, Say's Law was called into question. Industries in the aggregate found it hard to sell all the output produced at even the reduced rates of employment. There certainly seemed to be a general glut.

In 1936, John Maynard Keynes (later Lord Keynes), a genius in several fields with an established reputation in monetary theory, published *The General Theory of Employment, Interest and Money*.[8] This book, which worked a virtual revolution in economic theory by the end of World War II, rejected Say's Law without qualification and argued that aggregate demand need not be equal to aggregate supply at full employment. Spending could fall to the point where it would absorb only a greatly depressed level of output and remain there indefinitely, unless deliberate action were taken by government to increase spending.

Keynes referred to the prevailing orthodox English economic doctrines that accepted Say's Law as "classical economics" (with a small *c*), and we shall follow his lead. Most notably, the classical economists include David Ricardo, J. S. Mill, Alfred Marshall, F. Y. Edgeworth, and A. C. Pigou. Keynes and Pigou were both students of Marshall, whose work laid the foundation for modern price theory. Pigou had written on business fluctuations and Keynes directed his sharpest criticism at Pigou's contributions. Pigou accepted the challenge and we shall later review his most telling point of criticism, which is termed the "Pigou effect" in economic literature.

Saving and investment Our model of the circular flow, Figure 5-1, provides a vehicle for showing the points at issue between

[8]John Maynard Keynes, *The General Theory of Employment, Interest and Money* (New York: Harcourt, Brace & World, Inc., 1936).

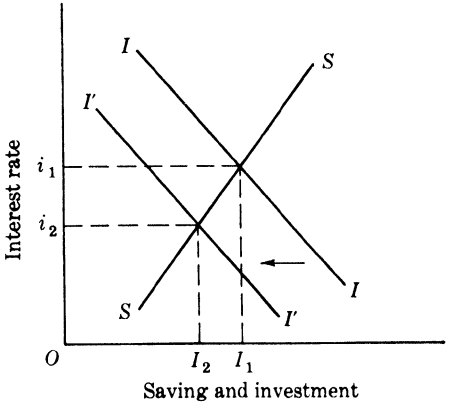
Keynes and the classical writers. Both were agreed that production creates income of equal value and thus provides the means to purchase all that is produced. They differed on whether the means would be spent — whether all income would be returned through the upper pipe to producers.

Suppose that prospective returns from investment should be reduced. If businessmen intend to borrow and invest less than savers elect to save, then, according to the classical economists, interest rates would fall. Consequently, saving would be reduced (consumption increased) and investment stimulated until they became equal again. The argument is illustrated in Figure 5-2.

Demand for investment. The line *II* represents the demand for funds to invest in new real capital at each level of the rate of interest. By "the rate of interest" we mean a price index of interest rates. (Changes in the structure of interest rates can be expected to have an independent effect on investment, but this is a secondary consideration that we ignore by assuming that *relative* rates on loans of different risk are constant.) If an investment project involves an immediate outlay of $100,000 and promises to return $25,000 a year for five years, its total return is greater than its present cost. However, the firm must deduct interest charges before realizing a profit. At low interest rates, the project promises to be profitable; at high interest rates, it does not.

Some projects promise higher returns over present cost than do

5-2 Classical equilibrium in the capital markets



others. As the rate of interest declines, more and more projects promise to be profitable, and we can expect that firms will seek more funds for investment. Thus the II line slopes down to the right, indicating that investment increases as the interest rate falls.

Supply of saving. The classical economists argued that people would rather consume than save. To induce them to postpone consumption by saving, they must be offered more means to consume in the future than they give up in the present. Thus, interest must be offered, in addition to repayment of principal, to induce saving — the higher the reward for saving, the greater the level of saving. Thus, the saving supply of funds for investment (SS) slopes upward to the right.

Equilibrium and changes in the demand for investment. At the rate of interest i_1, the supply of funds saved equals the demand for funds to invest. There is no net leakage from the circular flow. All income not spent for consumption is lent to firms, which spend it on new plant, equipment, and inventories.

Now, suppose that the outlook for investment deteriorates, so fewer projects than before promise to be profitable at i_1 and at each other potential rate of interest. This means II shifts leftward to $I'I'$.

If interest were to remain at i_1 there would be a net leakage from the circular flow, but the classical economists argued that competition among savers would drive down the rate. Rather than be left holding idle money, savers would offer to lend it at lower rates. When the rate of interest falls, the reward for saving declines, and the inducement to invest increases. At the rate of interest i_2, the capital markets are again cleared. All saving finds its way into investment spending. Although investment is less than before (I_2 instead of I_1), consumption is higher, since saving has decreased, and total spending equals total output. There is no general glut.

Financial intermediaries. Of course, not all savers lend directly to investors. Much of saving goes into savings banks, insurance, already existing stocks, bonds and other claims to wealth, as well as other financial channels. However, the seller of an old stock has no more desire to hoard money than the saver; he buys other securities with the proceeds of his sale, and the next recipient of the money spends it for other assets, and so forth. Finally, all the money saved finds its way into the hands of firms that spend it for new real capital.

Similarly, savings banks and other institutions lend funds that they receive to investors. Since, according to the classical position, no one wishes to hoard money, all seek to lend it, even though they must accept a lower rate of interest in order to find a borrower.

Wicksell's theory of interest Nearly 40 years before the *General Theory*, the Swedish economist Knut Wicksell suggested one reason why the rate of interest might not fall sufficiently to maintain equality between saving and intended investment. He doubted that banks respond quickly to changes in investment demand. Bank interest rates are set by policies based, to a large extent, on routine and rule of thumb. Consequently, they do not lower (or raise) rates readily when borrowing demand slackens (or quickens).

Wicksell defined the *natural rate of interest* as that rate which maintains equality between saving and investment spending. With investment demand at II, in Figure 5-2, the natural rate is i_1. The market rate is the rate of interest actually charged by banks and paid by them (less a small margin to cover expenses and profit) to depositors. (In this country only savings accounts are relevant to this analysis, since demand deposits no longer earn interest.) If the market rate is equal to the natural rate, there is no net leakage from circulation. Let us suppose that the market rate is initially i_1; consequently, it equals the natural rate.

When investment demand shifts to $I'I'$ the natural rate falls to i_2. Suppose that banks maintain the market rate at i_1 or, at least, do not lower it all the way to i_2. Banks lend less than they receive from current saving. Some of the money saved is used to repay past bank loans and, since new lending is curtailed, the supply of money decreases. The reduction in spending is accompanied by a fall in M.

The fall in demand-deposit money means that banks come to have a larger proportion of reserves than the law requires (in this country) or than prudent bank management calls for in normal circumstances. But, by the time that banks become aware of their surplus lending power, the decline in spending may have forced some marginal firms into bankruptcy, and the general worsening of business conditions may then give banks sufficient reason to keep the market rate high and to curtail lending.

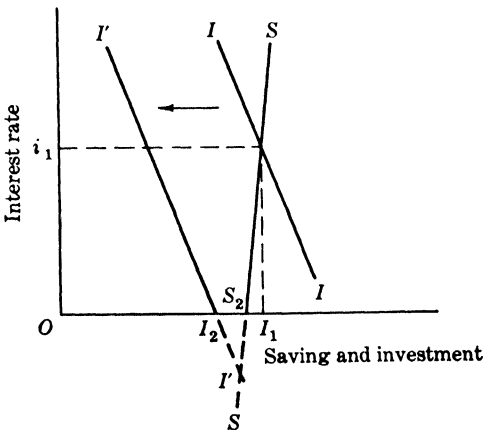
Saving and interest in the general theory Keynes took issue with the classical theory of interest adjustment on two grounds.

First, he denied that saving is sensitive to changes in the rate of interest — at least in the short run — and argued that the chief determinant of consumption and saving is the level of real income. If people experience a fall of money income, not matched by a fall in the price level, their real income is reduced, and they both spend less for consumption and save less in real terms. Their propensity to consume and to save a given level of real income is governed largely by habit, in the short run. Consequently, Keynes would draw the saving line for income at full employment as nearly vertical — SS in Figure 5-3. (He gave reasons, which we shall consider later, why saving might even increase modestly as interest falls.)

Second, he held that interest is a reward necessary to induce lending, rather than saving. Since money is the most liquid asset, potential borrowers must offer savers interest in order to induce them to accept the risk that they will not be able to recover all that they lend. As the interest rate falls, more and more saving leaks from the circular flow as hoarding of idle balances of money occurs, by persons who now view the rate as too low to compensate for the risk of lending.

To illustrate an extreme case, suppose that the demand for investment shifts from II to $I'I'$ in Figure 5-3. A negative rate of interest would be required to make investment equal to saving. However, savers will not pay borrowers a premium to induce them to borrow, which is the meaning of a negative rate. Instead, once interest reaches

5-3 A Keynesian view of saving and investment



zero, savers will surely hoard all their current saving, and there will be a net leakage measured by S_2 minus I_2. Keynes believed interest would not have to fall all the way to zero before this would occur. At some low rate, the return to lending would be viewed by all savers as inadequate to cover the risks of even the most secure loans.

Adjustment through the propensity to save. Even if investment demand does not shift to the point where the natural rate is below this "liquidity trap," the public's liquidity preference drains off some money into idle holdings when the market rate falls below i_1. Thus, the velocity of circulation (V) is reduced as savers enlarge their idle cash holdings because of the lower interest rates. In the meantime, money that is hoarded is not spent and spending declines.

If prices of goods and services do not fall as rapidly as spending, then real output and income decline. With the fall in real income, people save less and SS shifts to the left. Thus, the natural rate of interest is raised and a new equilibrium at a positive rate high enough to avoid the liquidity trap is obtained. However, resumption of equality between spending and output is acquired only at the cost of depression. Output and employment are well below full employment levels and there is no force present to bring them back to prosperity.

Adjustment through deflation Some classical writers recognized that not all of income might be immediately spent, particularly if there were a crisis in credit and confidence. However, they expected the temporary drop in MV to be offset by a fall in P, the price level of goods and services, leaving Y, real output, at the full employment level. In order to sell all they produce, firms would cut prices. While this might initially mean lower profits and cause a cutback in production and employment, idled men would compete for jobs by offering to work at lower wages. When wage rates declined, costs would be reduced, and profits would return to the point where firms were willing to expand output back to the full employment level. If changes in the rate of interest failed to do the job, deflation would overcome a general glut and restore spending to equality with output at full employment.

Keynes' position. Keynes had two replies to this. First, he doubted that labor would quickly accept a cut in money wages. To be sure, once large-scale unemployment had been created by production cuts

and layoffs, workers still employed would be fearful of losing their jobs and would be pessimistic about chances of finding new openings. By threatening to close down or to severely cut back production and employment, management could force even reluctant unions and unorganized workers to agree to a wage cut. The point is that deflation of wage rates is a long, drawn-out, and painful process. In the meantime, profits, output, and employment are substantially reduced.

Keynes' second objection is more fundamental. Suppose that labor should agree to a cut in money wages as soon as spending declines. Labor is by far the largest consumer of output and a cut in its wages would result in a further drop of spending. President Hoover and his advisers were very much aware of this fact and in the early months of the Great Depression, the President called on business not to cut wages. When one giant corporation was reluctantly forced, because of falling profits, to announce that it would press for a substantial wage reduction, the public saw this as an act bound to depress markets still further.

The need for a theory of aggregate demand The general glut at full employment occurs, because the portion of real output that consumers are willing to buy, plus the portion investors are willing to hold, is less than what is produced at full employment. Deflation will not correct this problem unless it somehow induces households to spend a larger proportion of the real income they receive when labor is fully employed, or it induces businessmen to purchase a larger proportion of real output for investment, and the combined increase in spending is great enough to purchase all that is produced.

The initial decline in spending usually occurs because the outlook for profit from investment deteriorates. This may be merely a failure in confidence, perhaps triggered by a collapse in securities speculation. However, there may be a real basis for diminished expectations. Important sources of investment opportunities are invention and discovery of new resource deposits, new types of products, new methods of production, or new markets for existing output.

Furthermore, as the total stock of capital grows relatively to the supply of labor, returns from further investment are likely to fall, unless inventions offset diminishing returns by providing profitable labor-saving techniques of production. Finally, once a decline in spending has set in, the idling of capital undermines business' willingness to buy more.

We shall see that plausible arguments have been advanced to show that deflation may increase either the propensity to consume real income or the expected returns from real investment, or both. The Pigou effect is one such theory. However, these arguments all meet Keynes on his own ground. They tacitly agree that supply does not create its own demand and that a theory of spending is required. The lasting part of the "Keynesian revolution" is that Say's Law has been rejected, and economists must pay explicit attention to the determinants of aggregate demand.

Summary

In producing final output, firms create income which is equal in value to output. Thus, production creates its own means of purchase, but it does not necessarily follow that the means will be spent. We employed a circular flow model to indicate that a reduction in spending would be likely to cause a reduction in output, employment, and prices. Although spending falls short of output in a period, actual investment, which includes unintended investment in unsold inventories, must always equal saving. Nevertheless, the occurrence of unintended investment is sufficient reason to expect a subsequent cutback in production.

The classical equation of exchange measures the circular flow as the quantity of money times its average velocity of circulation (MV), on the one hand, and the identically equal product of real final output times its average price level (PY), on the other. We combined the income-expenditure identity and the equation (identity) of exchange in one grand series, which we termed the Fundamental Identity of macroeconomics. It serves as a reminder that changes in one or more aggregate expenditure variables imply changes in money, velocity, and price or output variables.

Classical economists recognized that output creates the means to purchase itself and assumed that these means would be spent. Say's Law states that supply creates its own demand. Money saved is lent to investors and thus returns to the circular flow. If investment demand declines, savers bid the rate of interest down rather than hoard saving in money. This induces more investment and discourages saving, thus maintaining equality between production and spending. Wicksell argued that the failure of banks to reduce their interest rates

quickly would bring a decline in money and spending, but this view was not accepted in English orthodox thought.

Keynes attacked Say's Law with his *General Theory of Employment, Interest and Money*, published in 1936. He denied that saving is responsive to changes in the rate of interest, at least not in the short run, and held that it is chiefly determined by the level of real income. Interest is a reward for parting with liquidity and when interest falls, people hold more of their saving in money, bringing a decrease in the velocity of circulation and in spending. Finally, he denied that deflation of wages occurs quickly or that it can be expected to restore full employment. Keynes successfully overthrew Say's Law and established much of the content of the modern theory of aggregate demand.

The *General Theory* can be briefly summarized as follows: (1) consumption and, therefore, saving depend on the level of real income, (2) investment depends on expected returns and the market rate of interest, and (3) the rate of interest depends on the public's demand for money as a medium of exchange and a store of value, and on the supply of money available. Three behavioral "givens" are involved — the propensity to consume, the marginal efficiency of investment (expected returns), and the public's liquidity preference — together with the stock of money. We shall become much better acquainted with these in later chapters.

Reading and Research

General bibliographical sources are cited at the end of Chapter 1.

Say's Law and the General Theory. A penetrating interpretation of Say's Law is by Hans Neisser, "General Overproduction," *Journal of Political Economy*, vol. 42 (1934), pp. 433–665; reprinted in the American Economic Association, *Readings in Business Cycle Theory* (Philadelphia, Pa.: The Blakiston Company, 1944). Parts of *The General Theory of Employment, Interest and Money* (New York: Harcourt, Brace and Company, 1936) are difficult reading. Alvin Hansen has written *A Guide to Keynes* (New York: McGraw-Hill Book Company, Inc., 1953), which should be read in conjunction with Keynes' book. It is available in a soft-cover edition. Both the substance and the flavor of Keynes' thought are captured by Dudley Dillard, *The Economics of John Maynard Keynes* (Englewood Cliffs,

N.J.: Prentice-Hall, Inc., 1948). This book, which has gone through many printings, has no peer in explaining Keynes to the beginning student.

There is a great amount of literature on Keynesian theory. *The New Economics* (New York: Alfred A. Knopf Inc., 1950), edited by Seymour Harris, contains essays on Keynes, his theories, and his contributions to public policy. Lawrence R. Klein, *The Keynesian Revolution* (New York: The Macmillan Company, 1950) traces the birth and impact of the *General Theory*. It is available in a paperback edition. Look for books by Hansen and by Harris. A recent review of Keynesian and classical theory is Gardner Ackley, *Macroeconomic Theory* (New York: The Macmillan Company, 1961).

Much controversy has surrounded Keynes' theories. The following articles review the discussions and evaluate what survives or is likely to survive (listed in order of publication):

Wright, David McCord, "The Future of Keynesian Economics," *American Economic Review*, vol. 35, no. 3 (June 1945), pp. 284–307.

Williams, John H., "An Appraisal of Keynesian Economics," *American Economic Review*, vol. 38, no. 2 (May 1948), pp. 273–90.

Schlesinger, James R., "After Twenty Years: The General Theory," *Quarterly Journal of Economics*, vol. 70, no. 4 (November 1956), pp. 581–602.

Fellner, William, "Keynesian Economics after Twenty Years: What Is Surviving?" *American Economic Review*, vol. 47, no. 2 (May 1957), pp. 67–76.

Johnson, Harry G., "The General Theory after Twenty-five Years," *American Economic Review*, vol. 51, no. 2 (May 1961), pp. 1–17.

6 The Propensity to Consume & the Multiplier

In prosperous years, about two-thirds of spending for final output is personal-consumption expenditures. Consumption depends primarily on the income of households and increases as their income increases. The relationship between income and consumption, not the level of consumption alone, was termed as the propensity to consume by Keynes. (Propensity means tendency, desire, or inclination and refers to consumer psychology and habit.) Since an increase in income raises spending, and a rise in spending leads to a further increase in output and income, the propensity to consume creates a cumulative expansion (or contraction) of income once there has been some autonomous increase (decrease) in spending. This is Keynes' multiplier effect, which we shall also consider in this chapter.

Our discussion will be limited to presenting the consumption function and the multiplier as abstract tools of analysis. We shall not try to support them with statistical evidence until the next chapter.

The Consumption Function

"The fundamental psychological law, upon which we are entitled to depend with great confidence, both *a priori* from our knowledge of human nature and from the detailed facts of experience, is that men are disposed, as a rule and on the average, to increase their consumption as their income increases, but not by as much as the increase in their income."[1]

With these words Keynes succinctly stated what he meant by the propensity to consume. Our own experience tells us that when families enjoy an increase in income, they increase consumption spending. However, they also save part of the income increment.

Behavior in the aggregate There are exceptions, of course. A college student may spend every added dollar he can lay his hands on, being pressed to keep up with mounting expenses of education and social life. The very poor may also consume every increment. There are exceptional persons, at all income levels and circumstances of life, who are either spendthrift or miserly — the former consuming every increment and the latter, none.

Keynes was referring to households in the aggregate ("on the average"). The great bulk of households are in the middle income brackets and do increase both consumption and saving when their incomes rise. They may save one part of the increment by repaying debt and save another part by accumulating assets in the forms of cash, savings accounts, life insurance and pension rights, homes and business capital, or bonds, stocks, and other securities. On the average, when their incomes increase, they increase consumption, but not by as much as the increase in their incomes. This behavior is expressed by the *consumption function*, an example of which is shown in Figure 6-1 by the line *CC*.

Stability of the consumption function Keynes considered this function to be "fairly stable." This is what he meant by

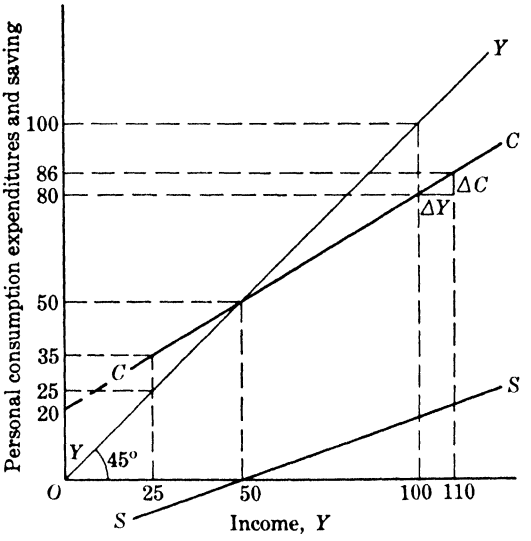
[1]John Maynard Keynes, *The General Theory of Employment, Interest and Money* (New York: Harcourt, Brace & World, Inc., 1936), p. 96.

"as a rule" in the previous quotation. He reviewed a number of "objective" and "subjective" factors which might be expected to alter the aggregate propensity to consume — that is, raise or lower consumption at each income level and thus shift the consumption function upward or downward.

In particular, he argued that changes in the rate of interest, unless they are extreme, do not materially affect the propensity to consume and to save in the short run. "There are not many people who will alter their way of living because the rate of interest has fallen from 5 to 4 percent, if their aggregate income is the same as before."[2]

We shall review a number of factors which may affect the propensity to consume in the next two chapters. We shall conclude that the propensity to consume is not so stable as Keynes thought. There are occasions when the aggregate demand of consumers is significantly affected by nonincome variables, such as price expectations. Nevertheless, income remains the principal determinant of consumption and the propensity to consume, expressed by the consumption function, is an acceptable tool of macroeconomic analysis. As a rule, consumption is predominantly determined by the income of households.

6-1 Consumption and saving functions
(Billions of dollars)



[2]*Op. cit.*, p. 94.

The average propensity to consume The consumption function in Figure 6-1, *CC*, denotes that consumption depends on or is a function of the level of income. The propensity to consume is likely to be most stable if the income we have in mind is confined to the income received by households after taxes. Thus, disposable personal income (*Y*) is measured along the horizontal axis. Personal consumption expenditures (*C*) and personal saving (*S*) are measured on the vertical axis. All are measured in constant dollars, to represent real income and consumption. The figures used in this example are not meant to be realistic; we shall consider statistical evidence on the propensity to consume in the next chapter.

The straight line *YY*, which passes through the origin (the lower left corner of the chart, at which point both consumption and income are zero), is a geometric device for measuring income vertically as well as horizontally. It has a slope of 45 degrees from the horizontal axis, and we shall often refer to it as "the 45-degree line." A given point on the 45-degree line is equidistant from both axes. Thus, if we trace vertically from the $100 billions income point on the horizontal axis to the 45-degree line and then trace leftward horizontally to the vertical axis, we intersect this axis at the figure $100 billions. In this way, any level of income can be plotted on both axes simultaneously.

The *average* propensity to consume (APC) is defined as the *proportion* of income consumed. At $100 billions income, we trace up to the consumption function, then over to the vertical axis to read that consumption is $80 billions. Thus, the APC is eight-tenths (.8). At lower levels of income, households spend a larger proportion. When aggregate disposable personal income is $50 billions, aggregate consumption is the same amount. Households, on the average, consume all they receive, so the APC is unity (1.0). At lower income levels, households spend more than income, in the aggregate, so that the APC is greater than unity. For instance, at $25 billions income, the average propensity to consume is one and four-tenths (35/25 = 1.4).

Dissaving in the aggregate. Households spend more than they receive as income either by borrowing or by selling assets and then spending the proceeds. A permanently poor family has little ability to do either, but a family which has saved in the past, or has prospects of being able to save and to pay off debt in the future, may elect to dissave in the present.

Even in generally prosperous years, some families dissave. Young couples, typically, go into debt as they set up housekeeping and finance the first baby or two. Most retired couples dissave by living on private pensions and past savings. Households in the middle age brackets do most of the personal saving, but even some of these are dissaving in any single year. They may have unusually large expenditures, such as a new car, a trip to Europe, financing a son or daughter in college, or paying for a serious illness. Alternatively, they may keep up consumption standards despite a fall in income due to changing jobs or a presumably temporary slackening of sales in an unincorporated business that they own.

However, when aggregate income is at prosperity levels (say, $100 billions in Figure 6-1) the dissaving of a few is more than offset by the saving of many households; in the aggregate the APC is below unity. It is during depression, when many households experience a rapid drop in income, that saving by some is overwhelmed by the dissaving of others, who are reluctant to cut living standards severely and hope that recovery is "just around the corner." In both of the years, 1932 and 1933, the APC for disposable personal income was greater than unity. By 1934, income had increased moderately and households broke even in the aggregate.

The average propensity to save. Since the 45-degree line measures total income vertically, the vertical difference between it and the consumption function measures saving. At an income of $100 billions, the average propensity to save (APS) is two-tenths (.2), since saving is $20 billions. At $25 billions income, the APS is *minus* four-tenths (−.4), because households dissave by spending $10 billions more than income. Since income equals consumption plus saving, the proportion of income consumed plus the proportion saved must equal unity:

$$\text{APC} + \text{APS} = 1.00 \qquad (6\text{-}1)$$

The line SS is a saving function. At any income, its height above the horizontal axis is the same as the gap between the 45-degree line and the consumption function at that income.

The marginal propensity to consume Besides the proportion of a given income households consume, we are also interested in how they divide a *change* in income between consumption and saving.

Keynes defined the *marginal* propensity to consume (MPC) as the change in consumption from a small change in income, divided by that change in income. Alternatively, we may describe it as the proportion of an income *increment* which is consumed.

The MPC is measured by the steepness of the slope of the consumption function. If this function is a straight line, as in Figure 6-1, the MPC is the same at every place on the function. When income increases from $100 billions to $110 billions, consumption increases from $80 billions to $86 billions. The capital Delta sign (Δ) means "change in" a variable. The change in income (ΔY) is $10 billions and the accompanying change in consumption (ΔC) is six billion dollars. Thus, the MPC is six-tenths (.6). Ten billions is hardly a small change in income, but, with a straight-line consumption function, it does not matter how large we make the increment.

The marginal propensity to save. The change in saving as a proportion of a small change in income is the marginal propensity to save (MPS). It can be measured by the slope of the saving function, SS. However, once we have the MPC, it is an easy matter to determine the MPS. Every *increment* in income can be divided only between consumption and saving. Consequently, $\Delta C + \Delta S = \Delta Y$. Dividing by ΔY to get the MPC and MPS we have:

$$\text{MPC} + \text{MPS} = 1.00 \quad \text{or} \quad \text{MPS} = 1.00 - \text{MPC} \qquad (6\text{-}2)$$

The marginal propensity to save is unity minus the marginal propensity to consume.

Formula for a straight-line consumption function The equation for a straight-line or linear consumption function is:

$$C = a + cY \qquad (6\text{-}3)$$

The small a is a constant and its value is that of the intercept of the consumption function, if we extend it, with the vertical axis. Thus, in Figure 6-1, it has the value $20 billions. This means that if CC were to extend all the way to zero income and remain straight all the way, consumption would be $20 billions.

In practice, we cannot measure a consumption function at very low aggregate incomes, because income does not fall enough, even in the worst depressions. The intercept does not tell us that households

would spend such-and-such if their income were zero. We cannot assume that the consumption function remains linear, instead of bending down (say), as income falls toward zero. The intercept is only a value that determines the height of the consumption function, which we draw as linear in the range of data that we have measured. The greater the value of a, the higher is the average propensity to consume at each income level.

The coefficient c is the marginal propensity to consume. The CC function in Figure 6-1 has the formula:

$$C = 20 + .6Y \tag{6-3a}$$

We can easily satisfy ourselves that c is the marginal propensity to consume by calculating consumption (C_1) for income of \$100 billions (Y_1) and subtracting this from consumption (C_2) for income of \$110 billions (Y_2). Symbolically, we have:

$$C_2 = a + cY_2$$

minus

$$C_1 = a + cY_1$$

equals

$$\Delta C = c\Delta Y,$$

since $C_2 - C_1$ is the change in consumption, $Y_2 - Y_1$ is the change in income, and $a - a$ is zero. Now divide the last equation by the change in income:

$$\text{MPC} = \frac{\Delta C}{\Delta Y} = c \tag{6-4}$$

The *average* propensity to consume is consumption, Equation 6-3, divided by income:

$$\text{APC} = \frac{C}{Y} = \frac{a}{Y} + c \tag{6-5}$$

Since a is constant, the APC declines as income increases. That is, at higher levels of income, households consume proportionately less and save proportionately more of their incomes. (The exception is if a is zero or less than zero in value.) Note, also, that the APC is greater than the MPC, but approaches the latter as income increases.

Since the marginal propensity to save, which we can symbolize

with a small s, is unity minus the marginal propensity to consume, we can rewrite Equation 6-2 as:

$$s = 1 - c \tag{6-2a}$$

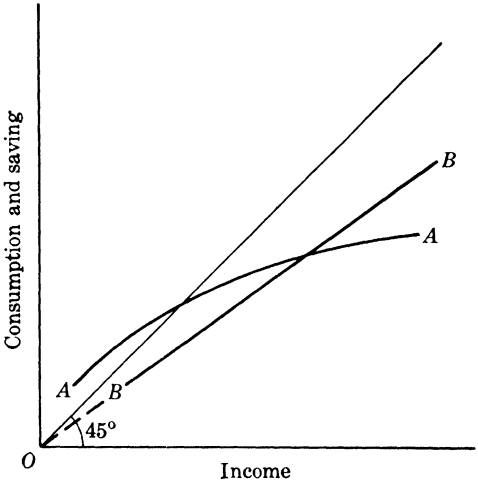
Other plausible consumption functions The consumption function need not be linear and we might imagine one shaped like AA in Figure 6-2. When income increases, the *marginal* propensity to consume, as well as the APC, declines. We can see this, because the slope of the function becomes less steep as income increases.

Note that for the APC to decline, it is *not* necessary that the MPC be lower at higher incomes. The APC declined on our CC function of Figure 6-1, although MPC was constant. If the MPC falls when income rises, then the APC will decline also. But a falling MPC is only a sufficient, not a necessary, reason for a declining APC.

The function BB is one we shall make use of in the next chapter. It is a straight line which would pass through the origin, if extended. Being linear, it has a constant MPC. Because it also would intercept the vertical axis at the origin, it has an APC which is both constant and equal to the MPC. Function BB is represented by Equation 6-3, except that the point of interception is zero; consequently, a is omitted:

$$C = cY \tag{6-6}$$

6-2 Two plausible consumption functions



Dividing both sides by income leaves:

$$\text{APC} = \frac{C}{Y} = c = \text{MPC} \tag{6-7}$$

The consumption function BB does not indicate that households, on the average, consume all their income. To show that, BB would have to be identical with the 45-degree line. Since it does not rise as steeply, the absolute amount of saving increases as income increases. It is important to note that BB meets the conditions of Keynes' "psychological law": consumption rises with income, but not as much as income.

Since the MPC equals the APC, we have the following for line BB

$$\frac{\Delta C}{\Delta Y} = \frac{C}{Y},$$

which easily transforms to:

$$\frac{\Delta C}{C} = \frac{\Delta Y}{Y}$$

That is, consumption and income increase in the same proportion. If we find in our historical data that a 10 percent increase in income has been accompanied by a 10 percent increase in consumption, a linear consumption function with a zero intercept, like BB, is indicated.

Equilibrium and the Multiplier

The consumption function represents one part of aggregate demand. The other part, in a closed private economy, is investment spending. This is determined by prospective returns to investment and the rate of interest. In this chapter, we shall assume that these determinants are given, so that we can postulate given levels of investment. That is, we shall want to say that aggregate investment is, first of all, such-and-such. Once we have seen what this implies, then we shall dictate that investment is some other value and see what this implies. We are really interested in discovering how the consumption function affects income. Investment is an extra in the play, needed to make the scene complete but otherwise neglected.

Let us initially assume that no business saving occurs in our closed private economy; so, disposable personal income and gross national income are the same thing. In Figure 6-3, we measure gross national income and, therefore, gross national product on the horizontal axis.

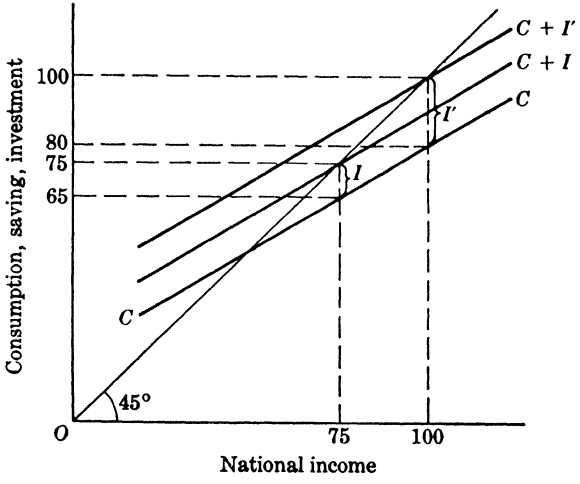
The 45-degree line now takes on added meaning. It represents GNP measured by expenditures or GNE. On the vertical axis, we shall now measure consumption and personal saving, as before, plus both intended and actual investment. We shall symbolize *intended* investment by I. We shall not need symbols for actual or unintended investment.

Equilibrium income In Figure 6-3, a given level of intended investment, I, is added vertically to the consumption function, resulting in the aggregate demand function labelled $C + I$ at the top. This line is parallel to the consumption function, because we posit, in this chapter, that intended investment is independent of income. Thus, it is whatever constant amount we say it is, and the gap between the aggregate demand and consumption functions, which measures intended investment in a closed private economy, is the same at every income level.

We have given I the value \$10 billions. At an income of \$75 billions, households consume \$65 billions. The consumption function here is the same as in Figure 6-1, and the value of consumption can easily be calculated with the aid of equation 6-3a.

The condition of equilibrium. At \$75 billions income total spending ($C + I$) equals total income (Y or $C + S$) and, therefore, spending equals total output or GNP. Intended investment equals saving.

6-3 Two income equilibria



This is true at no other income, as long as I remains \$10 billions and the consumption function does not shift.

Thus, income is in equilibrium at \$75 billions. There is no pressure on producers in the aggregate to alter output and there is no net leakage from the circular flow. This is, furthermore, a stable equilibrium, because if output were forced to depart from \$75 billions and then left free, it would return to \$75 billions. Suppose that output was briefly depressed below \$75 billions. The aggregate demand curve is above the 45-degree line at lower incomes, indicating that consumers and investors wish to purchase more than is produced for final sale or deliberate inventory accumulation. Thus, there is an unintended depletion of inventories and, if this continues, firms will be induced to increase production. At an output higher than \$75 billions, the reverse is true, and firms are discouraged, by mounting unsold stocks, into reducing output.[2]

The algebra of equilibrium. Equilibrium requires that spending equal income. Thus, we express the condition of equilibrium by the equation:

$$Y = C + I \tag{6-8}$$

Investment (I) is what mathematicians call a predetermined variable. That is, we have already assigned it a value and do not need to solve equations for it. Consumption (C) depends on the level of income as indicated by the consumption function, Equation 6-3:

$$C = a + cY \tag{6-3}$$

To discover the level of equilibrium income, we substitute Equation 6-3 in Equation 6-8, collect terms, and divide both sides by the coefficient of Y:

$$Y = C + I = a + cY + I$$

$$(1 - c)Y = a + I$$

$$Y = \frac{a}{1 - c} + \frac{I}{1 - c} \tag{6-9}$$

[2]Unless production is altered in step with spending, producers will end up with depleted or excessive inventories. Thus, adjustment from a higher output back to \$75 billions might cause producers to reduce output below the equilibrium level until they sold inventories that were accumulated while production outran spending. A symmetrical adjustment from an initial below-equilibrium income would be equally plausible.

Substituting the values for constants shown in Equation 6-3a, we solve for Y, given that I is 10 (billions of dollars):

$$Y = \frac{20}{1 - .6} + \frac{10}{1 - .6} = \frac{30}{.4} = 75 \text{ (billions of dollars)} \quad (6\text{-}9a)$$

That is, if investment is \$10 billions, equilibrium income is \$75 billions.

The multiplier Now, suppose that investment increases to \$20 billions (I' — read "eye prime"); consequently, aggregate demand shifts upward to the $C + I'$ position in Figure 6-3. At \$75 billions income, spending exceeds output by \$10 billions and producers expand production. Spending equals income at \$100 billions; so this is the new equilibrium income.

Note that an increase of only \$10 billions in investment raises equilibrium income by \$25 billions, or 2.5 times as much. The reason can be seen in the figure. When income increases from \$75 billions, households spend more for consumption and thus increase demand by more than the \$10 billions increase of investment alone. From the old to the new equilibrium, consumption rises by \$15 billions.

The power of a change in investment (or some other part of spending) to increase income by some multiple of itself is termed the *multiplier*. By inspecting Figure 6-3, we can see that the multiplier depends on the slope of the consumption function and thus, on the marginal propensity to consume — the higher the MPC, the greater the multiplier.

Algebra of the multiplier. We can discover how the multiplier and the MPC are related by solving Equation 6-9 for one value of investment (I_1), then for another value (I_2), and subtracting one from the other:

$$Y_2 = \frac{a}{1 - c} + \frac{I_2}{1 - c}$$

minus

$$Y_1 = \frac{a}{1 - c} + \frac{I_1}{1 - c}$$

equals

$$\Delta Y = \frac{\Delta I}{1 - c} \quad (6\text{-}10)$$

Thus, the value of the multiplier is the reciprocal of unity minus the MPC and Equation 6-2 reminds us that this is equal to the reciprocal of the marginal propensity to save. Let us symbolize the multiplier with a small m:

$$m = \frac{1}{1 - c} = \frac{1}{s} \tag{6-11}$$

By Keynes' law, the MPC is positive and less than unity — consumption increases with income, but not by as much as income. Thus, as the marginal propensity to consume (c) in Equation 6-11 grows larger, the denominator grows smaller, and the multiplier is increased. The multiplier is unity at one extreme, when c is zero, and approaches infinity at the other, as c approaches unity.

We can now rewrite Equation 6-10:

$$\Delta Y = m \, \Delta I \tag{6-10a}$$

The change in equilibrium income is the multiplier times the change in investment.

An increase in the propensity to consume An increase in the average propensity to consume brings the multiplier into play, in the same way as an increase of intended investment. We don't need a new diagram to show this; Figure 6-3, with new labels, will do. Suppose that initially income is in equilibrium at $75 billions. Then something causes households to desire to consume all their income, raising the APC from eight-tenths to unity. This raises the consumption function to the position of the $C + I$ line (relabel this line C', in order to indicate that it is the new consumption function). Assuming that investment remains $10 billions, the aggregate demand function is thus raised to the position of the $C + I'$ line (relabel this line $C' + I$).

Equilibrium income is now $100 billions. The increase in spending causes producers to increase output to this level. When they raise output above $75 billions, households receive larger incomes and spend more for consumption. This invokes the multiplier effect. At $100 billions income, households consume $90 billions worth of new goods and services, saving $10 billions of their income.

Note the paradox. Households elected to consume all their income, but in increasing their spending they generated an increase in aggregate demand. This raised income until households were again

willing to save as much as businesses invested. Households ended up by saving as much as businesses intentionally invested. This is a requirement of equilibrium. Only in this case is there no net leakage from the circular flow.

This so-called "paradox of thrift" works in the reverse direction as well. If households decide that they want to save more of a given income, while firms do not change their investment intentions, national income declines until the reduction in their incomes induces households to save no more than firms invest.

A Dynamic Multiplier

The multiplier has been presented in a manner known as comparative statics. We begin by specifying the conditions of the first equilibrium. Then a given change in investment is posited, and the new equilibrium position is determined. Nothing is said about how long it might take to move from one point to the other in response to the change in investment, nor the path that income and consumption might be expected to take through time.

It will help to understand the multiplier if we set forth a very simple dynamic model — one that explicitly includes time and traces the change in income and consumption, period by period, from the old

6-4 A dynamic multiplier model
(Billions of dollars)

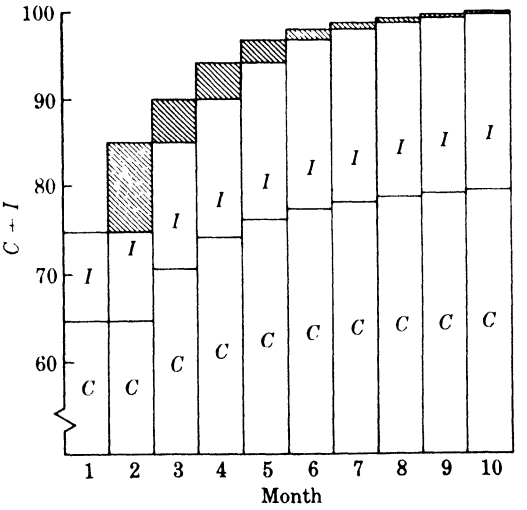
Month	*Production and income, Y*	*Consumption (20 + .6Y)*	*Intended investment*	*Total spending*
1	75	65	10	75
2	75	65	20	85
3	85	71	20	91
4	91	74.6	20	94.6
5	94.6	76.76	20	96.76
6	96.76	78.056	20	98.056
7	98.056	78.8336	20	98.8336
8	98.8336	79.30016	20	99.30016
9	99.30016	79.580096	20	99.580096
10	99.580096	79.7480576	20	99.7480576
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
Infinity	100	80	20	100

to the new equilibrium positions. In this model, we suppose that it takes one month for firms to alter production schedules in response to a change in sales. We shall assume that firms expect sales to be the same in the coming month as they have been in the current month. We shall use the same consumption function as before and begin with income in equilibrium at $75 billions. The history of output and spending is related in Figure 6-4 and is charted in Figure 6-5.

In the first month, intended investment is $10 billions and income is in equilibrium, with households spending $65 billions and saving $10 billions. In the second month, businesses increase intended investment to $20 billions and keep it at this level throughout the ensuing months. Consequently, in the second month, total spending is $85 billions and exceeds output by $10 billions. In the third month, firms advance production to $85 billions, the level of sales experienced in the second month, in order to be able to meet expected orders without further depleting inventories.

The increase in production raises income to $85 billions and this increases consumption to $71 billions. Investment remains at $20 billions, so spending again exceeds output. In the fourth month, pro-

6-5 Spending in the dynamic expansion*
(Billions of dollars)



*Cross-hatched areas indicate spending in excess of production.

ducers again expand production to meet sales which they forecast to be equal to the $91 billions spent the previous month. This expansion increases income, which induces still more consumption, which again raises spending above output, and so forth.

How long will the expansion go on? Note that the increase in production is smaller each month — specifically, it is six-tenths times the increase in the previous month. Mathematically, income approaches $100 billions in ever-smaller increments and never quite gets there. However, in a few months the increment is so small that we can consider the new equilibrium achieved. Income expands by less than one billion dollars after the sixth month, and after the 35th month, it increases by less than one dollar!

Simultaneous adjustment and induced investment This model explicitly requires — as our previous static analysis sometimes implied — that producers wait until they experience an unwanted depletion of inventories before deciding to expand production. Sometimes this does occur, but it is not inevitable and is not required for the multiplier effect. Firms may correctly anticipate a rise (or fall) of demand in advance and increase their production to meet it. Output increases along with spending and there is no unintended inventory disinvestment (or investment).

Surely after the third or fourth month of under-anticipating sales, the firms of our dynamic model should be expected to begin forecasting a rising market and should expand production accordingly. Moreover, if they have experienced unwanted inventory depletions, we should expect them to increase production by more than expected sales in order to restore their inventory positions. Finally, firms may further expand investment in order to maintain inventory-sales ratios and increase fixed-capital capacity in proportion to the increase in sales and output requirements.

Thus, the multiplier expansion is apt to induce a further increase of investment. To discuss this feedback adequately, we shall need to investigate multiplier-accelerator models, which are too complex to treat at this point. Our purpose in this chapter is to demonstrate the multiplier effect alone. This requires that we treat investment as an autonomously determined variable. Our models have been kept unrealistically simple just to show how income would change *if* intended investment were raised once-and-for-all to a new level.

Summary

Keynes' "fundamental psychological law" contains three theorems: (1) "as a rule and on the average," consumption is a stable function of income, (2) consumption increases as income increases, and (3) consumption increases by less than income; so, saving also rises. These characteristics are represented by the consumption function. The whole function or line represents the propensity to consume, not just a single point on it.

A point on the consumption function, at a given level of income, measures the average propensity to consume (APC) at that income. A change in the propensity to consume, represented by a shift of the consumption function, changes the APC at each level of income. The slope of the function measures the marginal propensity to consume (MPC), which is the *change* in consumption divided by an incremental *change* in income. According to Keynes' law, the MPC has a positive fractional value greater than zero and less than unity. The average and marginal propensities to save are equal to unity minus the APC and MPC, respectively.

If the consumption function is linear, the MPC is constant and is c in the equation: $C = a + cY$, where Y is income and C is consumption. If, in addition, the function intercepts the origin (a is zero), the APC is constant and equal to the MPC. If the function is linear and has a positive intercept with the vertical axis, the APC diminishes as income increases. If the function is curvilinear, with the MPC decreasing as income increases, the APC declines at a faster rate.

In a closed private economy, without business saving, spending equals output when consumption plus intended investment equals consumption plus personal saving. Thus, equality between investment and saving propensities is required for equilibrium in output and income.

An autonomous increase of investment raises aggregate demand and stimulates an increase in output. Consequently, consumption increases and spending is still greater than before. Thus, output rises further. Production continues to increase until saving again equals intended investment. The total change in equilibrium output from a given change in investment is found by the formula: $\Delta Y = m\ \Delta I$, where m is the multiplier and ΔI is the change of output and income. The multiplier is the reciprocal of $(1 - c)$ and increases from unity

toward infinity when the marginal propensity to consume increases from zero toward unity.

An autonomous increase in the propensity to consume raises income by the multiplier times this autonomous change in aggregate demand. Income declines in the same way — from an autonomous increase in the propensity to save. Income continues to change until households wish to save no more than firms are willing to invest.

Reading and Research

See suggestions at the close of the previous chapter. Keynes borrowed the multiplier from R. F. Kahn, who used it to analyse the effects of public works expenditures on employment in his article, "The Relation of Home Investment to Unemployment," *Economic Journal*, vol. 41 (June 1931), pp. 173–98. This article is reprinted in Alvin Hansen and Richard Clemence, *Readings in Business Cycles and National Income* (New York: W. W. Norton & Company, Inc., 1953). Gottfried Haberler criticizes Keynes' link between the multiplier and the marginal propensity to consume in "Mr. Keynes' Theory of the 'Multiplier': A Methodological Criticism," reprinted in the American Economic Association, *Readings in Business Cycle Theory* (Philadelphia: The Blakiston Company, 1944). Also, see the extensive bibliography by Harold Somers at the end of the latter volume.

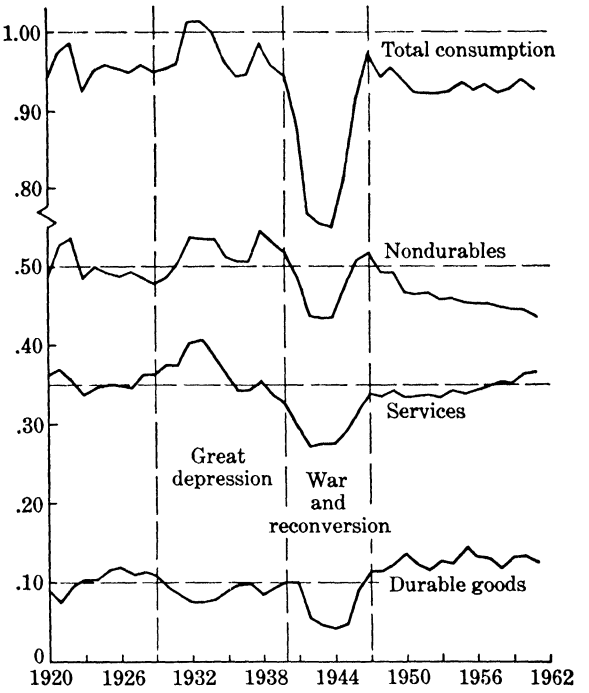
7 Evidence on the Propensity to Consume

We have introduced the theoretical consumption function and the multiplier. Now, let us look at the record on consumer behavior and see how well it supports theory. Figure 7-1 presents the ratio of personal consumption expenditures to disposable personal income from 1920 through 1961 in the aggregate and it is broken down by the three major divisions: (1) consumer services, (2) nondurable consumer goods, and (3) durable consumer goods. This is our evidence for the average propensity to consume.

Nearly-constant long-run average propensity to consume If we consider the over-all trend through peacetime years of prosperity, from 1920 through 1961, it is apparent that the ratio of total consumption to income has changed very little. In the prosperous years of the Twenties (1923–1929), households spent between 95 and 96 percent of income, whereas in the Fifties they consumed between 92 and 94 percent. Although average real disposable income per person nearly doubled over the period as a whole, households did not appreciably increase the proportion saved. While the percentage spent for nondurable goods shows a continual decline, spending for services rose at the same rate as income, and purchases of durable goods increased more than in proportion to income.

Private estimates by Simon Kuznets and Raymond Goldsmith

7-1 The average propensity to consume



Source: Survey of Current Business, March 1959 and July 1962.

have carried the saving-income ratio back nearly to the Civil War.[1] Significantly, the ratio does not have an upward trend over the century that was measured. As Americans have become more affluent, surpassing their contemporaries elsewhere in the world, they have increased their consumption in proportion to income over the long run in periods of peacetime prosperity.

Relative stability of consumption during depression

World War I was followed by a brief boom, and then collapse into a depression through 1920 and 1921. Industrial production did not recover to its previous high point until the fall months of 1922. The Great Depression included two declines and two recoveries. Business slid downward from mid-1929 through the spring of 1933 and then began a slow recovery. By the spring of 1937 industrial production and real disposable income were moderately above their 1929 levels when a sharp reversal set in. Decline continued to mid-1938; then, business again turned the corner toward recovery. Recessions occurred in 1924, 1927, 1949, 1954, 1958, and 1961, but their effects on disposable income and consumption were mild.

The average propensity to consume shows a marked tendency to rise during severe business declines and to fall during recoveries. This occurs because consumer spending changes less than income over the course of the fluctuation. From 1929 through 1933 disposable personal income in constant (1954) dollars declined by one-fourth, $134.9 billions to $102.1 billions, but real consumption expenditures declined only one-fifth, from $128.1 billions to $103.5 billions. Through 1932 and 1933 income fell below consumption, and households dissaved in the aggregate.

We can see that this relative stability of spending is true of purchases of nondurable goods and services, but not of durable goods. During the Thirties, on the average, a 10 percent fall in real income was accompanied by a 5 percent decline in services, a 7 percent fall in nondurables, and a 21 percent drop in durable-goods purchases.[2]

[1]Simon Kuznets, *Uses of National Income in Peace and War* (New York: National Bureau of Economic Research, 1942) and R. W. Goldsmith, *A Study of Saving in the United States, Volume I* (Princeton, N.J.: Princeton University Press, 1955), chap. 3.

[2]Louis J. Paradiso and Mabel A. Smith, "Consumer Purchasing and Income Patterns," *Survey of Current Business*, vol. 39, no. 3 (March 1959), pp. 18–28.

Transient variations in the average propensity to consume In times of general prosperity, the average propensity to consume has shown some variability. The huge dip during the early Forties followed by temporarily high consumption in the latter Forties is clearly due to World War II and its aftermath. During the war, households were cajoled and compelled to save at an extraordinary rate. Production of consumer durables was sharply curtailed, while food and other nondurables were closely rationed. Rent controls and other price controls kept down the cost of services. Nationwide government bond drives were launched with patriotic appeals to people to buy U.S. savings bonds. Many workers were induced to accept part of their wages in bonds. At any rate, with little available to buy, the fixed-redemption-value bonds seemed a good way to save money safely with an interest return.

After the war, there was both a backlog of need and the liquid means to purchase. Old automobiles and other durables needed replacement. The end of rationing seemed to call for a binge, and even the normally-stable consumption of food took a temporary jump. At first, the need to convert production facilities back to peacetime requirements curtailed supply, but by 1947, the stream of new output was large enough to permit an unusually high rate of consumption. After that, the average propensity to consume declined.

War also brought brief jumps in the propensity to consume during the second quarter of 1950 and the first quarter of 1951. However, these spurts are not apparent in the annual data of Figure 7-1. Outbreak of the Korean War sent many families to the store to buy goods which had been subject to rationing during the previous hostilities. They again rushed to buy ("before the hoarders did") when the Chinese entered the war early in 1951; this created a fear that hostilities would last longer and would put greater restraints on civilian production.

Other transient variations are apparent in Figure 7-1, particularly in consumer-durables purchases. The jump in the latter during 1950 may have been largely due to the Korean War, but the record automobile sales of 1955 require other explanations.

A statistical illusion. These data probably underrepresent the variability of consumption relative to income. In the last chapter, we noted that an autonomous increase in the average propensity to

consume brings the multiplier into play and raises national income. Consumption and income rise together, not because of the influence of income on consumption, but because of the effect of consumer spending on income. Cause and effect are turned around.

Reality is not as strict as our model. The autonomous change in consumption may be reversed before the multiplier is fully worked out. Or, investment and other nonconsumption parts of aggregate demand may change. Nevertheless, to some extent, an increase in consumption raises income, in most instances, and thus, the apparent change in the average propensity to consume is less than the actual change. What we should like to measure is the increase in spending at a given level of income, but income doesn't remain at a given level.

Questions asked by the evidence The propensity to consume appears to have a different form in the long run, during periods of peacetime prosperity, than it does in the short run, during declines and recoveries in business fluctuations. Furthermore, it is not highly stable even in generally prosperous times. Our statistical evidence poses three questions. First, why has the propensity to save not risen more than it has over the past century? Second, why has consumption been more stable than income during depression? Finally, what factors may account for fluctuations in the propensity to consume and what is their importance? In this chapter and the next, we shall try to answer these questions.

The Propensity to Consume in Prosperity and Depression

The propensity to consume probably depends on the direction and rate of change in aggregate income. If income increases slowly there is reason to believe that the average propensity to consume will be lower and change less over a period of time than when income declines rapidly from a previous high point. In recovery from a decline, there is reason to expect that the average propensity to consume will decrease. Once full employment returns and output is constrained, by capacity limitations, from rising as fast as its recovery rate, the average propensity to consume may be expected to change less rapidly and to remain lower than during the depression.

This statement is in accord with the data we have reviewed. What is now necessary is to develop plausible explanations for this behavior.

The propensity to consume in prosperity During periods of general prosperity, such as the Twenties and Fifties, most family heads are employed. Many families receive supplementary income from earnings of the wife or older children and from interest and dividends on personal wealth. Over the years, most families enjoy a fairly steady annual increment of income while the husband and wife are of working age. The increment comes partly from seniority in a job and partly because growth in productivity increases incomes of both young and old.

Couples who were in their twenties at the beginning of a decade are in their thirties at its close. During the decade, they advanced their living standards as they brought up their children, moved into more attractive and larger houses, enjoyed more luxuries, and acquired assets in the forms of a home, life insurance, and securities. They increased both consumption and saving in a planned way. They provided increasing satisfactions in the present and a means to repay debts as well as providing for expected future needs, particularly in the form of income after retirement. Let us call one such family the Joneses.

The propensity to consume in decline Now, suppose that a decline in business and employment sets in. In two or three years, average income per family declines to the same level it attained at the beginning of the previous decade. As aggregate demand falls, more and more family heads are laid off from work. The majority luckily keep their jobs, but many of these are compelled to accept a shorter work week, almost no overtime, and thus, reduced earnings.

Suppose that the Jones family experiences a reduction of income to the same level as at the beginning of the previous prosperity decade, before it had acquired so many children and advanced its standard of living. Can we expect this family to reduce its consumption to the same level as before? The answer to this rhetorical question is, of course, no.

First, there are more mouths to feed. Though family income is the same as before, per capita income is lower. Consumption could be reduced to the old level, unless the Jones couple was barely getting by previously, but this seems less likely with more children. Suppose that we change the problem. Let the Jones family income decline only to the same level per capita, adjusting for the lesser physical

needs of children, as before the decade of prosperity. Will these people reduce their consumption per person to its former level? The answer is, probably not.

Reluctance to reduce living standards. A particular way of life involves many expenses which are essentially fixed and may be regarded as the overhead costs of that living standard. A house of a certain size, quality, and location requires a minimum expense for utilities and upkeep. Transportation to work and for shopping continues to require almost the same outlay for transit fares, or fuel and maintenance of the family automobile. In order to cut its overhead, a suburban family must sell its home, accept a substantial capital loss in the depressed housing market, and move to smaller quarters close to work.

Such a move is not easily made, and the Jones family can be expected to resist it as long as there remains the prospect of better times ahead. In the meantime, it covers overhead expenses by saving less or, if necessary, spending liquid assets and borrowing. The degree to which saving may be reduced is limited by the need to continue payments on the mortgage and premiums on life insurance, which would otherwise lapse. This is saving compelled by contract, but other forms of saving can be reduced and even contractual obligations can be met by borrowing.

Reduction of nonessentials. Of course, Jones and his wife cut down on purchases that they view as nonessential. Replacement of the family car is postponed, unless it breaks down completely, and so are planned purchases of furniture and appliances. We have noted that consumers'-durables purchases fall rapidly in depression. Instead of travelling during vacation, Jones decides to cut out such transportation and away-from-home costs, stay home, and do the repairs on the house himself, in order to reduce his maintenance expenses. Cocktail parties are replaced by beer busts. Small items of daily purchase are cut out by budget-watching spouses, but the mainstream of food, clothing, and sundries purchases continues.

The Jones family is luckier than those laid off from work. Although their earnings collapse, they receive unemployment compensation or general relief. Some have liquid assets or can borrow for a while. The long-term unemployed eat up these resources and are forced to cut consumption so that it matches income. Fortunately, even in the worst depressions, there is a turnover in the ranks of the

unemployed. Workers are temporarily laid off, then resume work for a few weeks or months before being laid off again. They may be permanently discharged from one job, but they find one odd job or another and occasional employments. Some families live with relatives, perhaps back on the farm where food can be grown.

In one way or another, nearly all families defend their living standards as best they can. Consequently, if income, even in per capita terms, does fall to its level of a decade before, aggregate consumption per capita is not likely to fall to its former level. Consumption declines substantially less rapidly than personal income and the average propensity to consume rises.

Relative decline of proprietors' income A second reason for the greater stability of consumption, relative to personal income, is that proprietors, whose marginal and average propensities to save are relatively high, experience a more rapid fall of income than do other groups in the economy. Saving by proprietors is partly for future personal needs and partly for investment in their unincorporated businesses. The latter should be considered business saving, but national income accountants do not attempt to separate it from personal income and saving. Many businessmen do not clearly separate the two saving flows in their own minds.

During years of prosperity, farmers, retailers, independent professionals, and other proprietors save a larger proportion of their income than do others. It has been estimated that about half of personal saving in prosperous years is by proprietors, though they receive less than one-fifth of personal income.[3] Moreover, their *marginal* propensity to save appears to be greater than for nonproprietors. An increase of proprietors' income yields a greater increase in saving. Also, if proprietors' income declines by one billion dollars, the *decrease* in saving is greater than if nonproprietors' incomes decline the same amount.

When business is booming, proprietors plow back a large part of their net income increment in expanding facilities, so that they can meet rising sales. When business is depressed, there is little motive to enlarge the store, put in new equipment, or deliberately accumulate

[3]Irwin Friend and I. B. Kravis, "Entrepreneurial Income, Saving and Investment," *The American Economic Review*, vol. 47, no. 3 (June 1957), pp. 269–301. This section of the text is based on the Friend and Kravis article.

inventories. The net income that is left, after meeting business expenses, is needed to defend the family's standard of living.

In the short run, proprietors' income declines much more rapidly than the rest of personal income. From 1929 through 1933, in current prices, proprietors' income fell 62 percent, while the rest of personal income declined 41 percent. The reason for this occurrence is that business sales revenues drop more rapidly than costs. Interest and repayment of principal on business debts, and other overhead expenses, remain nearly fixed. Wages are apt to be inflexible in the short run and even manufacturers' prices may not be reduced sufficiently to maintain markups when retail prices decline.

An example to illustrate the effect on the aggregate APC. Suppose Jones' neighbor, Smith, is a retail druggist. During the last year of prosperity, Jones earned $10,000 after taxes, while Smith's net income was $12,000. Both families spent $9,000 for consumption, so their combined average propensity to consume was .82 (i.e., $18,000/$22,000). Of the $3,000 saved by Smith, $2,000 was invested in expanding the drug store.

By the third year of depression, Jones' income has declined to $6,000, while the Smiths' has fallen to $5,000. Both families reduce their consumption spending to $6,000, so that Jones breaks even and Smith dissaves by $1,000. The combined average propensity to consume has risen to 1.09 (i.e., $12,000/$11,000).

In this example, the Joneses have an MPC of .75, while the Smiths' is .43 (assuming a linear consumption function for each family). Thus, the Smiths have a much higher marginal propensity to save than the Joneses. The Smiths reduce saving by more, with each unit decline of income, and their income declines by more units than the Jones' income. Consequently, the combined saving of the two families is reduced by more than if the Smiths had the same MPS or the same income decline. The greater volatility of proprietors' incomes in the short run, given the fact that they have a higher marginal propensity to save, is a second reason for the relative stability of consumer spending during depression as compared with consumer incomes.

The propensity to consume in recovery When recovery of business begins, households do not quickly advance consumption.

Many remain unemployed and are not better off than before. Indeed, the long-term unemployed may be reducing consumption when they run out of liquid assets and credit. Workers who are reemployed have debts to be paid off and they are anxious to recoup their assets. The Joneses must pay back what they borrowed to live on during the depression and they want to restore the liquid assets they spent. But this is not enough. By the time Jones has gotten back to the personal wealth position he had at the beginning of the depression, he is (say) seven years older. By this time in his life, he had expected to have accumulated much more personal wealth than he held at the beginning of the depression. Consequently, he continues to save a larger part of each income increment than he would have if prosperity had not been interrupted.

With rising sales, proprietors' income recovers more rapidly than that of others. At first, proprietors feel little pressure to expand facilities, and their saving rate may not rise as rapidly as it would have with comparable increases of income during prosperous times. Nevertheless, Smith has Jones' motive for high marginal saving; in addition, he must pay off business debts and restore liquid working capital for the drug store. Proprietors' marginal propensity to save probably remains relatively high during recovery, and the more rapid rise in their incomes reverses the previous effect, causing the aggregate average propensity to consume to decline.

Return of prosperity. During recovery, the marginal saving rate remains high and consumption increases less than in proportion to income. The average propensity to consume declines toward its level of the previous period of prosperity. When real output approaches its full employment level, the rate of growth is reduced until output expands at the rate permitted by growth of the working population and its productivity. Most family heads are employed. Proprietors' income no longer increases faster than that of other groups. Once families restore their personal wealth positions to levels which they view as optimum for their age and income levels, then they are again willing to advance their standards of living more or less in step with the slow increase in their incomes. We are back to the picture we drew before the depression, and the aggregate average propensity to consume has settled down to about the same level as before.

Long Run and Short Run Consumption Functions

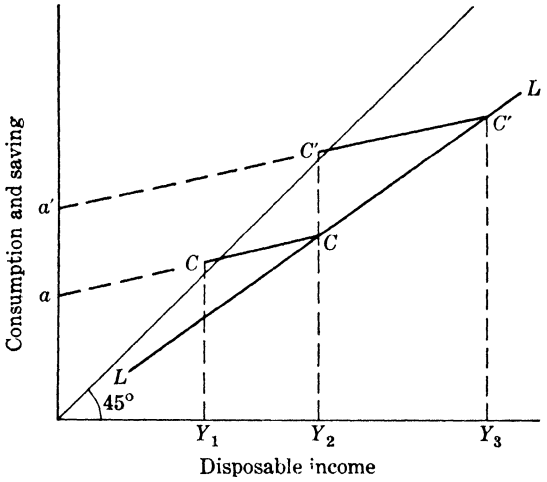
A single linear consumption function, of the type presented in the previous chapter, does not fit the behavior we have just described. However, we can represent the dependence of the propensity to consume on the rate of change in income if we distinguish between long run and short run consumption functions. The long run function describes consumer behavior over decades of peacetime prosperity, during which income and consumption grow at a relatively slow rate. The short run function represents the propensity to consume during periods when income changes more rapidly, as in the decline and recovery phases of a major depression.

The long run consumption function Over the long run, we have found, the average propensity to consume has been nearly constant. Living standards have apparently advanced at about the same rate as income during periods of peacetime prosperity. We shall not be much in error if we draw the long run function as LL in Figure 7-2. This is a straight line which would pass through the origin if extended. We learned in the last chapter that such a function has constant and equal marginal and average propensities to consume. A representative figure for both would be about .95. A 10 percent increase of income is accompanied by a 10 percent increase in consumption, with $950 millions added to spending with each billion-dollar increment of income. The formula for LL is Equation 6-6, with b used to represent the long run marginal propensity to consume:

$$C = bY \tag{7-1}$$

The short run consumption function Suppose that over a decade of general prosperity income increases from Y_1 to Y_2 in Figure 7-2. Then it falls during a three-year period as business declines into a depression. Instead of travelling back along LL, consumption decreases substantially less than in proportion to income and moves back along the short run consumption function, CC. This has lesser slope, indicating a *lower marginal* propensity to consume (and multiplier), and the *average* propensity to consume rises as income decreases.

Spending declines at a slower rate than income because the fixed



7-2 Long run and short run consumption functions

costs of living force households to spend more of each dollar to defend living standards and because the fixed costs of producing cause proprietors' incomes to fall more rapidly than wages, salaries, and other parts of aggregate disposable income. When income has fallen back to Y_1, its level at the beginning of the prosperity decade, households spend more than they receive as income in the aggregate.

Return to full employment. Income then begins to recover toward the Y_2 level again. We have no reason to assume that consumption will travel back along CC; it might rise with a somewhat higher (or lower) marginal propensity to consume. However, the need to restore wealth holdings and the more rapid recovery of proprietors' incomes prevent the MPC in recovery from being much different than during the decline. It makes our analysis simpler to assume that consumption travels back along CC. What is important is that the MPC is lower in the short run than in the long run.

When income has returned to Y_2 households are nearly fully employed, and their incomes are back to pre-depression levels. With the return of full employment, national income grows at a slower rate. After households have built their personal wealth back to desired levels, they once again are willing to advance living standards in step with their growing incomes, and the average propensity to consume

stabilizes at its long run level. Consumption moves forward along LL again.

The transition from short run to long run functions is not quite so abrupt as this simple presentation implies. During depression, the population, the labor force, and productivity all increase to some extent. Thus, Y_2 represents less than predepression income per capita and less than the output which will provide full employment. Households may continue to save at a higher-than-usual marginal rate for some months after prosperity returns, until they build wealth to the holdings they hoped to hold at this stage in their lives. Finally, recovery forces may continue so strongly that they create a boom after full employment arrives. This is apt to raise proprietors' share of income and to provide windfalls to labor from overtime and extra employment. These events may also raise the propensity to save.

Our consumption functions iron out all such transitional behavior. Our defense for simplifying in theory is that it preserves the essentials — the lower short run MPC than the long run MPC — while discarding what is nonessential to the inquiry at hand. If transitional behavior becomes important at a later point, we can modify our theory accordingly.

The ratchet effect Suppose that prosperity continues long enough for income to grow to Y_3. Then, another business decline sets in. Instead of returning to the CC function, consumption now declines along $C'C'$. Households have higher living standards to defend than before. Income declines back to its Y_2 level, but consumption remains much higher than it was when income was Y_2 earlier. (Of course, income need not decline all the way to Y_2 — or it could decline further.)

The short-run consumption function has shifted vertically, from CC to $C'C'$, during prosperity. Algebraically, this means that the value of its intercept with the vertical axis increases over periods of prosperity. This provides a *ratchet effect*. Even if income falls in the second depression as much as in the first, consumption remains higher.

The ratchet effect is of great importance in preventing downswings of business from developing into far worse depressions. Consumption, the principal part of aggregate demand, proves resistant to decline and spending remains at higher levels in every succeeding depression, given the same fall in aggregate income. This ratchet

effect is one of the "built-in stabilizers" of our economy; we shall discover others in later chapters.

A Highest-Income Consumption Function

Both long-run and short-run consumption functions may be combined in one composite function:

$$C = (b - c)\hat{Y} + cY \tag{7-2}$$

The capital Y with a roof on it, $\hat{Y}$, is the highest level of income that households have received. The small b is the long-run marginal propensity to consume, while c is the short-run MPC, the slope of the short-run function.

Suppose that income is increasing year by year during prosperity. The highest level achieved and the current level of income, Y, are the same. Consequently, Equation 7-2 simplifies to Equation 7-1:

$$C = bY$$

This is the formula for our long-run consumption function and consumption travels along the LL line in Figure 7-2.

Now, suppose a decline in income sets in. Income is less than its previous high point each year, so $\hat{Y}$ is both constant and greater than Y. Since it is constant, the whole first term to the right of the equation sign in Equation 7-2 is a constant. We may substitute the symbol a for this, i.e., we define a as equal to $(b - c)\hat{Y}$; so, Equation 7-2 becomes Equation 6-3:

$$C = a + cY \tag{6-3}$$

This is represented by CC in Figure 7-2.

Once income has again recovered to its previous high level, Equation 6-3 is again transformed to Equation 7-1 and consumption increases in proportion to income. When another depression occurs after a period of prosperity, $\hat{Y}$ is larger than before (Y_3 in the figure), so that the new constant value in Equation 6-3 is above the old one. Let us symbolize this new value by a'. This gives us the $C'C'$ equation in Figure 7-2. An increase in the highest-income level shifts the short-run consumption function upwards over periods of prosperity.

Many economists prefer to use the highest previous level of consumption, $\hat{C}$, in place of $\hat{Y}$. They reason that this is the more direct

measure of consumption standards. Replacing $\hat{Y}$ with $\hat{C}$ gives essentially the same results — a short run function which shifts upward in the ratchet effect over the long run.

A lagged-income consumption function In recent years, economists have employed lagged functions to represent consumer behavior. An example is:

$$C_t = dY_t + eY_{t-1} \tag{7-3}$$

This posits that consumption depends not only on current income, Y_t, but also on income one period ago, Y_{t-1}. The subscript t is for time and is the "date" of current income. If annual values are employed, Y_t might represent income in 1960 and Y_{t-1}, income in 1959. Consumption in the current year, C_t, is influenced by both current and past incomes.

Such a function may be supported by reasoning that it takes one period for households fully to adjust their spending to a change in income. That is, consumption tends to lag behind income. Current income affects consumption, by the coefficient d, but the whole effect of an income change is not realized for one period.

The propensity to consume, with this equation, depends on the direction and rate of change in income. Thus, it fits the requirements of our previous discussion. To see why, we first convert Equation 7-3 to the following equivalent form:

$$C_t = (d + e)Y_t - e(Y_t - Y_{t-1}) \tag{7-3a}$$

Now, divide both sides by current income to find the current average propensity to consume:

$$\frac{C_t}{Y_t} = (d + e) - e\frac{(Y_t - Y_{t-1})}{Y_t} \tag{7-3b}$$

The right-hand fraction is the change in income from the previous period divided by income of the current period. This is the rate of growth in income, where the rate is expressed as a proportion of current income. If income was \$97 billions last period and is \$100 billions this period, the fraction is three-hundredths or 3 percent. The expression $(d + e)$ is, of course, a constant.

Equation 7-3b thus indicates that the average propensity to consume depends on the rate of change in income. The greater the rate

of growth of income, the lower is the average propensity to consume. Thus, as recovery from depression picks up speed, the APC declines. If income declines, the rate of change has a negative sign; so, the whole right-hand expression is positive, and the average propensity to consume rises as income falls at an increasing rate.

Lagged consumption. Often, consumption is lagged on itself:

$$C_t = fC_{t-1} + gY_t \tag{7-4}$$

It is argued that last period's consumption sets standards which substantially influence spending for the present period. The algebra is more complicated in this case, but the results are broadly equivalent. If income rises over many periods at a constant proportional rate, the average propensity to consume settles to a constant value. When income declines in depression, the APC rises, and when income recovers, the APC falls.

Econometricians have investigated how well various plausible consumption functions fit or "explain" historical data. (See Reading and Research at the end of Chapter 8 for some references.) In general, equations similar to 7-2, 7-3, and 7-4 have been found to fit the data most closely. Such equations, sometimes including one or two nonincome variables as well, have been used to obtain acceptably accurate projections of consumption beyond the years for which they have been fitted to historical data.

Summary

Historical evidence indicates that the average propensity to consume disposable personal income has (1) been nearly constant over decades of prosperity, (2) risen during business declines and fallen during the ensuing recoveries, and (3) varied from time to time, apparently independently of income. In this chapter, we have discussed why households apparently have a different propensity to consume during fluctuations in business than during the slow and fairly steady growth of output in prosperity.

In prosperous times, households seem to advance living standards at about the same rate as their incomes slowly grow. When their incomes decline rapidly during a business downswing, they are reluctant to abandon living standards already achieved. Instead, they

postpone saving plans and perhaps dissave. During recovery, they hold a rein on spending until they have repaid debts and accumulated enough assets to achieve the wealth positions they wish to hold at that point in their lives.

A second reason that consumption declines less rapidly than disposable income is that proprietors' income drops more rapidly. Owners of unincorporated businesses save for both personal and business purposes. They have higher marginal propensities to save than do other groups. Consequently, when aggregate disposable income declines, proprietors have a smaller share of income and reduce their saving by more than others. During recovery, the reverse effect retards the increase in spending.

We distinguished between the long-run and short-run propensities to consume. The former is represented by a linear function intercepting the origin, while the other appears as a spur on the long-run function whenever a business depression occurs. The short-run function has a continual upward drift; consequently, consumption remains higher in each successive depression, given the same decline in output. This is the ratchet effect.

Reading and Research

Literature on the consumption function is reviewed at the end of the next chapter.

8 Change in the Propensity to Consume

The first part of this chapter is devoted to the question: Why has the average propensity to save not increased appreciably as income per capita has grown over the long run? In the second half of the chapter we confine our attention to the short-run consumption function and seek answers to the question, What things cause the propensity to consume in the short run to rise and fall temporarily from its average level? Of special interest in theory is the question: Can deflation be expected to maintain or restore full employment? Professor Pigou has provided an important affirmative answer to this question, and we shall pay particular attention to the Pigou effect.

Historical Stability of the Average Propensity to Save

The historical near-constancy of the long-run average propensities to save and consume has created considerable discussion in economic literature, both because of its importance to the theory of aggregate demand and because it seems to be patently in conflict with cross-section data and with what we might expect of a population growing in affluence. We may suspect that upper-income families save a larger proportion of their incomes than lower-income families and this belief seems to be supported by cross-section budget studies, which show spending in each income bracket during a single year. Why is it that, although the average income of all families has increased over decades, they have saved very little more of each aggregate income dollar?

Saving and stagnation Suppose that this were not the case and that the proportion of aggregate income consumed declined over the long run. In order to offset saving at full-employment output, investment would have to grow more rapidly than output. But this would probably not occur unless producers found it profitable to use more and more capital for each unit of production. This would require technology to trend toward less output per unit of capital and, though the evidence is not clear, this trend does not appear to be present.[1]

Thus, it is likely that if the aggregate average propensity to save should tend to rise substantially over the long run, under conditions of full employment, the problem of maintaining prosperity itself would be greater. More often, intended investment would fall short of saving, and business would be driven into depression, unless strong action were taken by government. Booms would become fewer and briefer; depressions would occur more frequently and last longer.

In the late Thirties some economists held that such a condition of stagnation should be expected in our mature and affluent economy. The *stagnation thesis* was based in part on the belief that consumption

[1]Among other places, the aggregate capital-output ratio, showing a downward trend, is presented in L. R. Klein and R. Kosobud, "Some Econometrics of Growth: Great Ratios of Economics," *Quarterly Journal of Economics*, vol. 75 (May 1961), pp. 173–98. P. S. Anderson argues that the apparent downward trend may be a statistical illusion in his "The Apparent Decline in Capital-Output Ratios," *loc. cit.*, vol. 75 (November 1961), pp. 615-34.

would rise less than in proportion to income and that the trend of technology would be capital-saving. The evidence we have reviewed, showing an almost equiproportional rise, became available afterward and its failure to support the stagnation thesis was a major blow to this pessimistic outlook.

Budget studies evidence Estimates of saving by urban families in various income brackets during 1950, based on a sample survey of 12,500 urban households by the Bureau of Labor Statistics, are presented in Figure 8-1. Less than 10 percent of these families, who had disposable incomes of $7,500 or more, accounted for 80 percent of personal saving. Nearly 40 percent had incomes below $3,000 and spent more than they received. The last column clearly shows a substantially higher average propensity to save by upper-income families. In the aggregate, urban families saved 8.2 percent of their income; so, their average propensity to consume was nearly .92.

Suppose that disposable incomes of all households were to double, while the relative distribution among households remained the same as in 1950, and each increased its saving to the proportion shown by this cross-section data for its new income position. For instance, households receiving $2,500 in 1950 now receive $5,000 after taxes and save 5.6 percent of their income, the approximate proportion saved in 1950 by households with $5,000 income.

8-1 Saving by urban families, by income class, 1950

Income after taxes (dollars)	*Family distribution (percent)*	*Saving distribution (percent)*	*Average propensity to save (percent)*
Under 1,000	8.9	−13.2	−81.7
1,000–1,999	14.2	−4.0	−6.2
2,000–2,999	16.5	−2.1	−1.7
3,000–3,999	18.3	4.6	2.4
4,000–4,999	15.2	9.1	4.5
5,000–5,999	17.2	10.0	6.5
6,000–7,499		15.1	10.0
7,500–9,999	5.6	22.8	16.3
10,000 and over*	4.0	57.7	30.7
All	100.0	100.0	8.2

*Average (mean) income after taxes of families in this class was $16,767 in 1950 (*Historical Statistics of the United States, Colonial Times to 1957*, p. 165).

Source: I. Friend and S. Schor, "Who Saves?," *Review of Economics and Statistics*, vol. 41, no. 2, part 2 (May 1959), pp. 216, 232.

However, to deliberately err on the conservative side, let us suppose the highest-income households, though their average income also doubles, continue to save only the 30.7 percent shown for 1950. Nevertheless, the aggregate average propensity to save would increase to .20 and the average propensity to consume would fall to .80.[2]

This is a much greater fall in the average propensity to consume than the modest decline shown in Figure 7-1 for the early Twenties to the late Fifties, a period over which real disposable income per capita nearly doubled. Either disposable income has been substantially redistributed away from the high-saving income classes, or the propensity to save has diminished within most or all brackets with the passage of time, or both. Statistical evidence suggests that both factors have been responsible.

Changes in the distribution of income In the Twenties, the highest-income 5 percent of the population received about 30 percent of aggregate disposable income. In the late Forties, their share had dropped to about 17 percent. This was partly due to income taxes and partly due to a marked decline in their share of personal income before taxes after 1940.[3]

In the first decade of this century, proprietors of unincorporated businesses received 24 percent of national income; in the Twenties they received 18 percent and in the Fifties, 13 percent.[4] Much of this decline was in farm income, since food expenditures rose less than in proportion to consumers' incomes. The declining shares of the wealthy and of proprietors, both high-saving groups, have probably played a major role in maintaining a high aggregate average propensity to consume.

[2]Estimated by the equation: Sum fys/Sum fy, where f is the proportion of families in a given group, y is their average income in thousands of dollars, and s is their estimated average propensity to save, derived from the equation: $s = -.0931 + .0298y$. This is a least-squares equation fitted to the 1950 data, after excluding the lowest- and highest-income classes. The remaining observed average propensities to save lie closely along this regression line, with a standard error of estimate of .0099 (five degrees of freedom). This procedure gives an estimate of .086 for the aggregate APS in 1950. Interpolating $-.432$ for the lowest-class s and retaining .307 for the highest-class s, it yields an aggregate APS of .213 after incomes are doubled for all households.

[3]*Historical Statistics of the United States*, pp. 166–167.

[4]*Ibid.*, series 51, p. 141; Fifties data from the *Survey of Current Business*.

Decline in saving by each income class Within each income bracket the average propensity to consume seems to have risen over decades. In Figure 8-1 it is apparent that families with somewhere between $2,500 and $3,500 disposable income in 1950 broke even, spending all they received. Evidence from earlier budget studies suggests that families with the equivalent purchasing power in earlier decades were able to save, and their rate of saving increases as we trace further into the past.[5] This seems to have been true in all income brackets. A family earning, say, $5,000 in 1926 saved an appreciably larger part of its income than a family earning the same real income in 1960.

A statistical difficulty. Unfortunately, the statistical evidence of cross-section studies may be misleading. Milton Friedman[6] and others have pointed out that surveys, such as the one that serves as the basis for the data of Figure 8-1, usually include the lucky and the unlucky along with the just average. That is, some of the low-income households are only temporarily in reduced circumstances. Expecting to return shortly to their normal or "permanent" income (for this point in their lives), they defend their living standards by saving much less than usual or by dissaving. The presence of these families in the low-income brackets reduces the measured saving in these brackets under what it would be if only the permanently poor were included.

On the other hand, some families are enjoying windfalls at the time of the survey. An example is an industrial worker who is gaining more overtime pay than he normally expects to earn. Friedman maintains that, on the average, such families do not increase consumption in proportion to their windfall but save most of it. Indeed, there is evidence to suggest that many families of normally moderate means do most of their saving from such occasional windfalls. The presence of such families in the higher-than-average income classes raises the measured average propensity to save in these classes over what it would be if only the permanently affluent were included.

The permanent-income hypothesis If the survey were confined to households which are enjoying what they regard as their

[5]See the budget studies in the *Historical Statistics of the United States*, pp. 179–81; remember to deflate income with a consumer price index.

[6]Milton Friedman, *A Theory of the Consumption Function*, (Princeton, N. J.: National Bureau of Economic Research, Princeton University Press, 1957).

normal incomes, the difference between the saving rates in low-income and high-income brackets would probably be less. This much most economists are probably willing to admit, but Friedman goes much further. He reasons that the average propensity to save in each permanent-income bracket is the same. If the permanently wealthy save 20 percent of their incomes, so do the permanently poor!

Friedman argues[7] that most saving is for the purpose of providing future income for the saver, particularly after retirement. The motive for such saving is to even out consumption over the family's life. To be able to spend in retirement an amount each year equal to the amount spent annually during the earning years, both rich and poor must save about the same proportion of the income they receive in the earning years. Friedman assumes they do this.

Consequently, it is no surprise that the aggregate average propensity to consume is virtually constant and apparently independent of the level of income. During years of prosperity, the over-saving by those with windfalls should about offset the under-saving of the temporarily poor. The rest of the population consumes the same proportion of its permanent income no matter what its aggregate level.

It is difficult to believe that the permanently poor, even if they desire to maintain the same living standards in their retirement years, feel able to save at the same rate as the permanently affluent. Moreover, many of the rich couldn't consume all they've saved even if they tried. The motive to amass a fortune and to perpetuate it by bequeathment to heirs or charitable foundations is certainly important to some people — and a few succeed. Friedman and his supporters have backed up the permanent-income hypothesis with much statistical evidence. Critics have brought forth data to contradict it and the debate is not resolved. (A few of these contributions are listed in Readings and Research at the end of this chapter.)

The relative-income hypothesis An urban family with $5,000 income in 1926 stood much higher on the income ladder, relative to other families, than did a family with equivalent pur-

[7] *Op. cit.* A similar hypothesis is presented by Franco Modigliani and Richard Brumberg, "Utility Analysis and the Consumption Function: An Interpretation of Cross-Section Data," in K. Kurihara (ed.), *Post-Keynesian Economics* (Rutgers, N.J.: Rutgers University Press, 1954).

chasing power (about $3,000) in 1960. The fact that such a family saved much less in 1960 may be due to its being *relatively* poorer, compared with other families. James Duesenberry has suggested that the propensity to consume is mainly determined by a relative, rather than an absolute, income position.[8]

Thus, the poorest fifth of the population increases its consumption over decades in proportion to the increase in its income, consuming the same proportion in 1960 as in 1926. The next-poorest fifth, though it consumes a smaller proportion of income in any year, also advances living standards at the same rate as its income grows. The same is true in each of the other fifths (or tenths, etc.). Each class in the income distribution consumes less of each income dollar than the next lower class, and more than the next higher class, but all increase consumption in step with the growth in their absolute incomes. Consequently, the aggregate average propensity to consume remains constant.

Duesenberry argues that a family's living standards are strongly influenced by those of its relative-income peers. The family of a semiskilled worker lives in a neighborhood where other semiskilled workers' families live, as well as other households of similar relative-income rank. If one family buys a new car or a motor boat the neighbors feel a greater desire to buy such durables. It may be a question of "keeping up with the Joneses" or simply that when Adam's friend and neighbor, Baker, offers Adam a ride in the new Baker family automobile, Adam's latent wish to have a new car is aroused to the point of purchase. When Adam, six months later, puts in new carpeting, it is Baker's turn to be impelled to extravagance. Each family may wish to save a larger proportion of its growing income, but the part spent by one sets higher standards for its neighbor — and the increment spent by its neighbor reacts back on the first family's plans.

New goods and services. Some economists have suggested that the invention and marketing of new types of consumer goods and services raises consumers' spending and thus keeps it at the same proportion to aggregate income. Mass advertising may perform a like function. The new-goods hypothesis dovetails well with Duesenberry's relative-

[8]James Duesenberry, *Income, Saving and the Theory of Consumer Behavior* (Cambridge, Mass.: Harvard University Press, 1949).

income hypothesis. Comparison with peers provides the motive, whereas new goods provide the means.

Duesenberry's position is that a family's living standards are mainly raised by intraclass comparisons. The rising standards of highest-income families may also lead the next rank to raise spending in the desire to emulate, and so forth down the income ladder. This interclass comparison and response is a central theme of Thorstein Veblen's delightful classic, *The Theory of the Leisure Class*.[9] The long-run stability of the aggregate average propensity to consume may be partially due to both intraclass and interclass comparisons, aided and abetted by new goods and advertising.

Other possible explanations Some writers suggest that the long-term accumulation of personal wealth accounts for this stability. However, this seems to involve circular reasoning, except for the portion of wealth inherited by succeeding generations. When each generation grows up, it acquires the assets possessed by its elders. Apart from inheritance, it does this by saving in its younger years while the older generation dissaves. Assets sold by retired couples are bought with the saving of families in their middle and earlier years.

Of course, each generation adds a net accumulation of its own, so that the amount to be transferred to the next generation grows. The wealth acquired by each is the result of its own saving (aside from inheritance) and it is circular to describe this wealth as the cause of saving. We must return to the basic question, which may be restated in this form: Why doesn't each generation, more affluent than the one before, elect to save a larger proportion of its income and, therefore, hold a larger ratio of personal wealth to income?

Consumer credit. Another explanation may be the increasing availability of consumer credit. However, this is subject to circular reasoning as well. Consumer debt is the result, rather than the cause, of spending-saving decisions. We need an additional explanation why consumer credit has led people to save less.

One possibility is that some families in the Twenties wished to dissave, but weren't able to find credit, and that families in the same circumstances today are able to borrow. Although debt must be re-

[9]Available in the inexpensive Modern Library series (No. 63) published by Random House (New York) and also in still-cheaper paperback.

paid by later saving, consumption is advanced relative to the income which pays for it, and the aggregate average propensity to consume is greater each year than it would otherwise have been.

Long-run accumulation of personal wealth and broader availability of credit do play an obvious role in the ratchet effect. Howsoever great the desire of households to defend living standards in depression, their means to dissave is limited by the value of their wealth and credit resources.

A demographic factor. The aggregate average propensity to consume is affected by the age composition of the population to the extent that households save in their younger years in order to dissave in their older years, particularly after retirement. If all personal saving were for this purpose and the population were stationary, we should expect aggregate saving to be negligible. The saving of the young, in any year, would be offset by dissaving of the old. However, if the population is growing, there are more young households than old ones and, thus, there is positive saving in the aggregate.

Over the past century, population has grown at a diminishing rate and its average age has advanced. Thus, there are relatively fewer young, from one generation to the next, and this should serve to reduce the aggregate saving-income ratio relative to what it would otherwise be. The diminishing rate of population growth may thus be a factor in the long-run constancy of the average propensity to consume.

Legal and institutional factors. There are other explanations as well. Social security probably has replaced some private saving for retirement. Contributions to social insurance are treated as taxes and so do not appear in our figures for personal saving, though they serve the same function.

The spread of private life insurance and pension funds may have reduced the need to save by distributing risk among many families. Perhaps high inheritance and gift taxes have discouraged accumulation of fortunes. Maybe the ambitious young of today are more apt to join corporations rather than to save toward a business of their own. Perhaps social attitudes toward thrift have changed. These are untested suggestions and many others might be offered.

Most of the explanations we have reviewed are plausible and not contradictory. They may all have played a part. Different forces

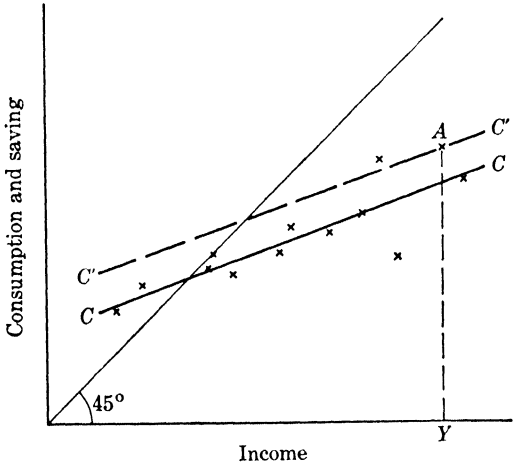
may have been more predominant in some decades than in other decades. We cannot be sure that the future will repeat the past. If the permanent-income or relative-income hypotheses are correct, then it seems likely that consumption will continue to rise in proportion to income, but the forces of redistribution, credit-liberalization, and demographic change may have run their course. The importance of the subject will continue to draw the attention of economists who are interested in the theories of aggregate demand and business fluctuations.

Shifts in the Consumption Function

Now we turn our attention to the forces which are apt to cause temporary fluctuations in the short-run propensity to consume. A consumption function, such as the short-run function *CC* in Figure 8-2, represents only the relation between income and consumption. If no other factors influenced household spending, consumption would be measured precisely by *CC* (assuming it has the true shape and position of the income-consumption relationship). Certain nonincome variables do affect consumption. However, if these are constant in value while income changes, the consumption-income points will still fall on a given *CC* line.

In reality, other things do not remain constant and our measured consumption function appears only as an average locus of experienced

8-2 Shifts in the consumption function



points, shown by small x's. If we say that the consumption function is stable, we mean that nearly all the x's fall very close to CC. This would happen if the other factors did not change very much or if their changes had little effect on consumption.

In the period when income is Y, as in Figure 8-2, consumption is at the height shown by the x labelled A. How do we account for this? Some nonincome variable has changed in such a way as to raise consumption to a higher figure. If this other variable now remains constant at its new value, while income changes, consumption moves along the function in $C'C'$ position (assuming other determinants of consumption also remain constant). In other words, the change in a nonincome variable has shifted the consumption function upward.

Each of the x's represents a point on the consumption function after it has been shifted up or down from its average position (CC). In the remainder of this chapter, we review the nonincome variables that are apt to shift the consumption function upward or downward, raising or lowering the average propensity to consume at a given income. We shall try to assess the importance of each. We should remember that an upward shift in the propensity to save is equivalent to a downward shift in the consumption function and vice versa.

Unplanned Changes in Personal Wealth

An unplanned change in the proportion of real personal wealth to disposable personal income is apt to affect the propensity to consume in the short run, particularly if the change is substantial and households do not expect it to be reversed. Families ordinarily save according to their plans and their expectations concerning future needs and means. The slow accumulation of wealth, which occurs according to plan, is not a factor altering consumption or saving propensities.

Suppose that some outside, unforeseen event should raise the value of wealth above the level that households had planned to hold at this point in their lives. Being wealthier than expected, households are apt to save less and perhaps dissave. The anticipated needs-means gaps of the future are more adequately provided for; so, people yield to the desire to enjoy more present satisfactions. Consequently, the propensity to consume is increased. If, on the other hand, the value of wealth unexpectedly falls, the propensity to consume is apt to be depressed.

Saving and consuming habits may not change because of a modest windfall or loss in wealth. A substantial change may be required before many households become aware of their new positions so that they alter consumption habits. Moreover, if they believe the present capital gain will soon be offset by an equal capital loss (or vice versa), they are not likely to save less or reduce wealth holdings absolutely. By the time the anticipated future spending needs occur, the accumulated means will be no greater than planned.

Wartime forced saving The clearest case for this wealth effect relates to the forced saving of World War II. During the war, households were compelled to save at a much higher rate than they would have done from the same income in the absence of war. Rationing, shortages, price controls, and patriotic saving appeals all combined to this end. People not only restored their net asset positions, depleted by the previous depression, to planned levels, but accumulated net assets substantially in excess of these levels.

The fact that a large part of this wealth was held in liquid forms — U.S. savings bonds, savings accounts, and money — facilitated the extraordinary postwar spending. However, nonliquid wealth served as security for borrowing and consumption financed by consumer credit also increased materially.

The backlog of needs for replacing durables was an important factor in the binge, but this doesn't appear to be the whole explanation. Even expenditures on food and other single-use goods temporarily rose above their historical trends relative to income.[10] Apparently, households did use a substantial part of their unplanned accumulations to enjoy higher consumption for the first few years after war and reconversion, until wealth-income ratios were returned to desired levels.

Capital gains Personal wealth may increase unexpectedly through capital gains, which are revaluations of existing assets. Such gains sometimes occur rapidly in real estate and securities markets. A notable case was the speculative bull market in stocks that began in earnest early in 1927 and reached its peak in the fall of 1929. When stock prices climbed, speculators, who included people from all walks

[10]Louis J. Paradiso and Mabel A. Smith, "Consumer Purchasing and Income Patterns," *Survey of Current Business*, vol. 39, no. 3 (March 1959), pp. 18–28.

of life, enjoyed the heady feeling of being richer than they had ever expected to be, at least at this point in their lives.

It would not be surprising to learn that the man whose 100 shares of Radio Corporation of America (RCA) went from $85 to $420 apiece in 1928 felt rich enough to buy a new car early in 1929, even if he didn't cash in his stocks to finance it. It does no good to argue that these paper gains were transitory. People viewed them as permanent. They talked of a "new era" of prosperity and of a "permanently high plateau" supporting stock prices.

Our data on the average propensity to consume, Figure 7-1, do not show a marked increase during the bull-market years. The APC was modestly high in 1928, but dropped back in 1929. These annual data may disguise high-spending rates early in the year, offset by reduced rates once the recession and crash occurred. At any rate, the bull market did not create a substantial rise in the propensity to consume; if it had, even the annual data would reveal it.

Deflation and liquid assets The real value of wealth, its purchasing power, increases if the price level of goods and services declines while the money value of assets remains fixed or declines less than prices. This phenomenon has been so important in macroeconomic theory, in connection with the Pigou effect, that we shall devote the next section to it.

Deflation and the Pigou Effect

A decline in prices reduces aggregate money income in the same proportion — given the level of real output — since total income is the sum of prices times quantities produced: GNY in current prices equals PY in our Fundamental Identity. If producers induce labor to accept a cut in money wages and then reduce prices in the same proportion, the flows of money incomes to labor and property owners are reduced in the same proportion as prices. Real incomes thus remain unchanged. (We shall ignore, for the time being, redistributional effects that occur if wages are more or less rigid than prices.)

Redistribution of property incomes Whereas real property returns in the aggregate are not affected in this case, their division between creditors and debtors is altered. Debts, and the interest that must be paid on them, remain virtually fixed in money values. To be

sure, the interest rate on new borrowing may decline, but the bulk of interest payments are for past borrowing and remain fixed by contract. Thus, deflation favors creditors at the expense of debtors.

The real income of creditors is raised, while that of debtors is lowered, by payments of interest in dollars that now have more purchasing power. It may be that private creditors, in the aggregate, have a different propensity to save than private debtors. If creditors have a higher *marginal* propensity to save, they will consume less of each added real dollar received from debtors than the debtors would have spent had they kept the dollar. This would reduce the aggregate *average* propensity to consume.

However, we have no clear evidence on this point. Defense of living standards by debtors may give them a higher marginal propensity to save, so that they reduce their saving more than creditors increase theirs. On the other hand, fear of bankruptcy may cause debtors to save more of each income dollar in order to build up liquid reserves. At any rate, their MPS's would have to be very different and the deflation very great to have any appreciable effect on spending in real terms.

Redistribution of real wealth Let us turn our attention now from income flows to stocks of wealth. To the creditor, debt is an asset and the real value of this asset rises in deflation. That is, his money claim remains the same, but the purchasing power of this claim increases. Deflation has made him more wealthy, relative to his income, then he intended to be. If he believes the price level will remain depressed, the bond or mortgage holder is apt to increase his consumption spending for the same reason that a speculator, enjoying a windfall in stocks during the late Twenties, was willing to consume more. In this case, the real capital gain arises because prices of goods and services decline while the money value of the asset remains stable, rather than the reverse.

But for every creditor there is a debitor or, more exactly, the value of claims to payment is exactly offset by the value of debts to be paid. If creditors feel richer, debtors feel poorer. If the average propensity to consume of creditors rises, shouldn't the average propensity to consume of debtors decline?

If we confine our attention to private debt, the only plausible answer to this question is yes. Again, we have no evidence to show

whether debtors will reduce spending by more or less than creditors increase theirs.

One important exception should be noted. In a severe depression, so many debtors may be forced to default that the bond market panics, and bonds fall drastically in price. Debtors are poorer to begin with, and their poverty is transmitted to creditors. The consumption of both is apt to be depressed. Such a drop in the bond market occurred in 1931 and 1932. Bank failures in these years and through the spring of 1934 probably also depressed spending. Depositors, who are the creditors of banks, lost substantial portions of their cash holdings.

Public debt One important debtor is immune to bankruptcy and is not expected to alter its spending behavior because the real value of its indebtedness grows. This debtor is the Federal government. The interest-paying debt of the government consists of savings bonds, marketable bonds, and other securities held by the public. This is familiar. What is not so apparent is that coin, currency, and bank reserves are government debt. They are obligations of the Treasury and the Federal Reserve System. These noninterest-paying debts are held as assets by commercial banks in the forms of reserves and till currency, and by the public at large in the forms of currency and coin.

Government spending policies are designed to serve the public welfare and, during deflation or depression, they continue or may be increased to offset the decline in private demand. The real burden of taxes needed to pay interest on public debt increases, but government can borrow to make interest payments or to finance its other expenditures.

The Pigou effect These considerations lead us to the revised version of the Pigou effect.[11] This hypothesis holds that if wages and prices are reduced, preferably by a once-and-for-all cut, and are expected to remain at their new level indefinitely, the aggregate average propensity to consume will be raised. Given the level of intended real investment, there is a degree of deflation which will be sufficient to restore (or preserve) full employment. That is, the propensity to consume will be raised enough to increase aggregate demand to equal aggregate output at full employment.

[11]Revised by Don Patinkin, "Price Flexibility and Full Employment," *The American Economic Review*, vol. 38, no. 4 (September 1948), pp. 543–64.

The reason that consumption rises is that the decline in prices raises the real value of government debt. Most of these claims are highly liquid and can either be spent directly or can be readily sold for money to spend. Households holding these liquid assets are richer than before in purchasing power and, believing prices will remain deflated, they increase their spending. They save less or dissave by spending their liquid assets.

The theoretical importance of the Pigou effect can be easily understood if we recall the Keynes-classical controversy discussed in Chapter 5. Keynes argued that deflation could not be expected to restore full employment unless it somehow serves to increase either the propensity to consume or intended investment. He doubted it would do either, except under special circumstances. The Pigou effect stands as a victory, in theory, over Keynes' hypothesis of underemployment equilibrium. If prices fall far enough, the economy will automatically adjust back to full employment (or never leave it). The *General Theory* is in fact a special theory, dependent upon the assumption of wage-price rigidity.

Expectations and other difficulties Though a victory in theory, the Pigou effect is not widely accepted as a prescription for policy. Pigou himself eschewed it as a government policy guide. There are many difficulties.

First, suppose prices are permitted to take their natural course once aggregate demand begins to decline. In reality, prices do not decline quickly and smoothly. Concentrated and collusive industries try to retain their administered prices — until secret "chiseling" by maverick firms forces them all to openly announce a price cut. Organized labor bitterly resists wage cuts and strikes may break out, which further depress the incentive to invest. It might take years before prices drop low enough to restore full employment. In the meantime, the unemployed and debtors suffer ills not of their own making.

Second, the process of deflation is apt to create anticipations that swamp the Pigou effect until prices have fallen very low. People come to expect a further slide of prices and incomes. They hold off buying, both to store up precautionary reserves and to await better bargains on things they intend to buy.

This is the reason that the best case for the Pigou effect is made if we posit a once-and-for-all wage-price cut. Government would have

to do this, decreeing an across-the-board slash without advance warning and with the earnest announcement that no further cuts are contemplated. It would be an interesting problem for government economists to decide exactly what cut in prices will do the trick.

Collapse of equities. Third, while creditors feel richer, stockholders and owners of tangible assets do not. In fact, they may feel even poorer than debtors. Stock and real estate prices are apt to collapse early in the depression. The man who viewed his capital gains in 1928 as a pretext for buying a new car probably regretted his folly in 1932, when the stock market finally stopped its plunge. From a peak of 452 in September 1929, *The New York Times* index of industrial stock prices dropped to 58 in July 1932. We should also recall that creditors were feeling the pinch, too, as banks closed and the bond market panicked temporarily.

Prices of "securities," tangible assets, goods and services cannot fall below zero. Realizing this, people sooner or later decide that prices have gone about as far as they can go. Those who have awaited better bargains now buy, and the Pigou effect may also come into play. However, if prices begin to rise and (or) people expect them to recover to about their old levels, the Pigou effect falters and fails. When people expect recovery of prices, they do not consume their wealth, for to do so will leave them too low a ratio of real wealth to income when prices have returned to their old level.

Altering the composition of wealth. Although people keep their total wealth intact, they may alter its composition in a way which raises aggregate demand. For instance, the family which has been accumulating liquid assets to buy a new home in later years may make the purchase now while construction costs are still low. Once the acute need to store liquid precautionary reserves has been overcome, firms may decide to obtain plant, equipment, and inventories before costs of these things recover. Such motives do serve to promote recovery, but they are due to price expectations rather than to the Pigou effect.

An easier solution. Finally, if all that is needed is an increase in the real value of liquid public debt held by private creditors, this can be achieved easily and quickly without suffering the burdens of deflation. Bank reserves and other public debt can be created at will by govern-

ment through deficit financing and Federal Reserve open market operations. Although prices don't fall, the real value of total liquid assets rises simply because there are more of them.

If the Pigou effect is a potent force for recovery, we can bring it into play quickly and almost painlessly. The only pain is the increased tax burden in order to service a larger interest-bearing public debt, but this burden pales in comparison with the real economic costs and human suffering of deflation and depression. At a later date, when private demand recovers and presses against aggregate supply capacity limits, bank reserves can and should be reduced, and interest-bearing debt can and should be repaid from government surpluses. This gets us into the theory and policies of inflation, which we are not yet prepared to discuss.

Other consequences of price changes Deflation may stimulate or depress aggregate demand in other ways. It may alter the distribution of income between labor and property owners, and between both groups and government (taxes). In an open economy, it may serve to stimulate exports and discourage imports. It may promote investment by reducing the rate of interest. Changes in price expectations may either discourage or encourage investment. We shall deal with these points when we have prepared the necessary framework of analysis later on.

The Pigou effect might work as an offset to inflationary pressures. Inflation reduces the real value of liquid government debt and creditors feel poorer. This should induce them to consume less, provided that they expect prices to remain at their new levels. There is an important difference from the deflation case, however. While prices cannot fall below zero, they *can* rise indefinitely. Thus, people may accelerate buying for this reason, and the Pigou effect may never come into play.

Interest Rates and the Propensity to Save

Little statistical evidence has been found to suggest that the propensities to save and to consume are sensitive to moderate short-run changes in the rate of interest. Most households probably pay no attention to such changes. Those that do are apt to respond in opposite ways.

People who save for the purpose of earning interest and would not save if interest were absent can be expected to save more of a given income when interest rates rise. On the other hand, households that save to fill an anticipated needs-means gap in the future should save less if interest rates rise. The family saving for retirement would save even if interest rates were zero. However, the higher the rate of interest, the less it must save in order to accumulate a given retirement fund.

Suppose that a person wants to have $1,000 from this year's saving at the time of his expected retirement 10 years hence. If interest is zero he must save $1,000 this year. If the interest rate is 5 percent per annum, he must save $614. At 6 percent interest, he need save only $558. The reason saving is reduced is that, as the years go by, the amount that has been saved grows by the interest it earns and accumulates.

Large changes in interest rates Substantial changes in the values of securities mean substantial changes in the rate of interest. Suppose that a bond, which pays an annual coupon of $50, has been selling at par for $1,000. Its rate of interest is 5 percent. If this bond now drops in price to $500, the *rate* of interest is automatically raised to 10 percent (not counting the later return from appreciation back to its maturity value). The coupon continues to pay $50 a year, but this is 10 percent of the new purchase price. Firms wishing to borrow by floating new bonds in this market will have to offer higher interest rates to attract lenders willing to pay par price.

Capital gains and losses in securities markets mean opposite movements in interest rates. The propensities to save and to consume may be altered, because of the real wealth effect we have already discussed and not because of the interest rate changes which are their inevitable byproducts.

Changes in absolute saving It is important to realize that we are here concerned with the *propensity* to save, i.e., the *proportion* people elect to save of a given income. The aggregate amount of saving in the short run is sensitive to changes in the rate of interest, but in the opposite direction to that assumed by the classical economists. A rise in the rate of interest discourages intended investment and causes a drop in aggregate demand, income, consumption, and

saving. The fall continues, via the multiplier, until income has dropped to the point where savers no longer wish to save more than investors willingly invest. This is a movement along the saving function, not a shift in it.

Consumer Durables Purchases

Spending for consumers' durables, which amounts to about a fifth of total personal consumption expenditures in prosperous years, is more unstable than other types of consumer spending. There are several reasons for this. First, durables are large-ticket expenditures for most households. Thus, they are more likely to be planned in advance and budgeted to occur when households are better able to afford them. If the income-price outlook changes, families are apt to advance or postpone their purchase plans.

Second, many families finance durables, in part, by borrowing. Thus, they are apt to be influenced by a change in consumer credit terms. Households seem to pay little attention to interest rates on consumer debt; most don't seem to know what the true interest rates are. However, they are concerned with the size of the downpayment and of the monthly payments.

If downpayment requirements are raised or if repayment periods are reduced, some households are priced out of the market. Both measures were used by government to restrict consumer buying during the Korean War. An apparently spontaneous easing of credit terms in 1955 may have played a significant role in the record automobile sales that year.

Third, most households already have automobiles and other durables. Purchases are for replacement and are generally more easily postponed for this reason. Older equipment can still be used, though it is less convenient, less attractive, and entails higher maintenance costs.

Finally, once consumers have been led to stock up on durables in one year, sales for the next few years are apt to decrease until wear and tear have created need for replacement. Of course, durables do not have the same average lives. Moreover, units of a particular type do not all serve for exactly the same period. The first replacement wave is likely to have longer duration and less amplitude than the initial-purchase wave. Third and later replacement waves are likely to be

ripples or disappear entirely. Nevertheless, 1950 was a strong year in automobiles and the strength of 1955 may have been partly due to a bunched replacement demand.

Summary

The historical long run near-constancy of the average propensity to consume seems to be in conflict with cross-section evidence that upper-income families save more of each income dollar than lower-income families. The permanent-income hypothesis holds that households in all income brackets save the same proportion of their permanent incomes (given age and other things equal). Cross-section data fail to reveal this, because at the extremes of the income distribution they include the temporarily poor, who have low-saving rates, and the temporarily affluent, who save most of their windfalls.

The relative-income hypothesis states that the average propensity to consume is determined by relative position in the income distribution, rather than by absolute income. From one decade to the next, each rank increases spending in proportion to income, while maintaining a lower spending ratio in higher-income brackets. Duesenberry explains this in terms of comparison with intraclass peers, to which may be added Veblen's interclass emulation effect. Invention, marketing, and advertising of new goods and services provide the means for comparisons and emulation.

Other reasons may also be advanced: (1) redistribution of income from high-saving groups, (2) growth in personal wealth, (3) increased availability of consumer credit, (4) diminishing population growth rates, and (5) various legal and institutional changes that discourage saving or encourage consumption. Most of these suggestions are consistent with each other and may have worked together, with changing relative importance, over the past century.

The short-run propensity to consume may change temporarily because of an unplanned alteration in real wealth, relative to real income, that is *expected* to be permanent. Forced saving during World War II and the stock gains of the late Twenties are examples. Deflation also raises the real wealth-income ratio for creditors, while lowering it for debtors.

Creditors of the government, enjoying an increment in the real value of their liquid assets, may be willing to spend more of their in-

come, while public purchases are not predicated on the real value of government debt. This Pigou effect is theoretically capable of restoring full employment, but the slowness of adjustment, adverse expectations effects, and other factors lead most economists, including Pigou, to reject it as a policy guide.

Small changes in interest rates probably have small and offsetting effects on the propensity to save, while large changes act through their concommitant capital gains and losses effects. An increase in the rate of interest is apt to cause a fall in total saving, which is in contrast to the propensity to save at each income level, since it discourages investment and thus reduces aggregate demand and income. Consumers' durables purchases are particularly subject to fluctuation because, (1) they are planned in advance, (2) they are often financed with credit, (3) they can be easily postponed, and (4) they are subject to replacement waves once purchases have bunched up in a year.

Reading and Research

A thorough review of the theory and evidence of consumer behavior has been made by Robert Ferber in his article, "Research in Household Behavior," *American Economic Review*, vol. 52, no. 1 (March 1962), pp. 19–63. This has an extensive bibliography, which makes it unnecessary to mention any but selected contributions here.

The permanent-income and relative-income hypotheses. The books by Duesenberry and Friedman cited in footnotes are the major discussions of these hypotheses. Duesenberry's book also presents the ratchet effect. Friedman musters a good deal of sophisticated statistical evidence to support his position. Also see the August 1956 and May 1957 numbers of the *Bulletin of the Oxford Institute of Statistics*, where several economists discuss the evidence. Two statistical inquiries that appear to contradict the permanent-income hypothesis are contained in Irwin Friend and I. B. Kravis, "Consumption Patterns and Permanent Income," *American Economic Review*, vol. 47, no. 2 (May 1957), pp. 536–55 and Ronald Bodkin, "Windfall Income and Consumption," *American Economic Review*, vol. 49, no. 4 (September 1959), pp. 602–14.

Empirical consumption functions. The following publications contain empirically-derived consumption functions, found by fitting formulas to aggregate historical data with the techniques of statistical inference:

T. M. Brown, "Habit Persistence and Lags in Consumer Behavior," *Econometrica*, vol. 20, no. 3 (July 1952), pp. 355–71 (Canadian data).

Robert Ferber, *A Study of Aggregate Consumption Functions*, Technical Paper 8 (New York: National Bureau of Economic Research, 1953).

L. R. Klein and A. S. Goldberger, *An Econometric Model of the United States, 1929–1952* (Amsterdam: North-Holland Publishing Company, 1955).

Arnold Zellner, "The Short-run Consumption Function," *Econometrica*, vol. 25 (1957), pp. 552–67 (U.S. quarterly data).

The Pigou effect. Professor Pigou presents his case in "Economic Progress in a Stable Environment," *Economica*, new series, vol. 14 (1947), pp. 180–88, which is reprinted in the American Economic Association, *Readings in Monetary Theory* (Philadelphia: The Blakiston Company, 1951). Don Patinkin's article, cited in a footnote, is also reprinted in this volume. In addition, see his book, *Money, Interest and Prices* (Evanston, Ill.: Row, Peterson and Company, 1956). A recent text emphasizing the Pigou effect is Martin J. Bailey, *National Income and the Price Level* (New York: McGraw-Hill Book Company, Inc., 1962).

9 Government & Foreign Transactions

Up to this point, we have been content to confine discussion to the propensity to consume disposable personal income. Consequently, we have employed a closed private economy model without business saving in order to demonstrate equilibrium and the multiplier effect. Now, we are ready to take on the more complex economy of reality.

We shall begin this chapter with statistical evidence of the division of gross national income between disposable personal income, gross business saving, and taxes net of government transfer and interest payments. Then, we shall derive long-run and short-run consumption functions for the propensities to consume and to save gross national income (GNY).

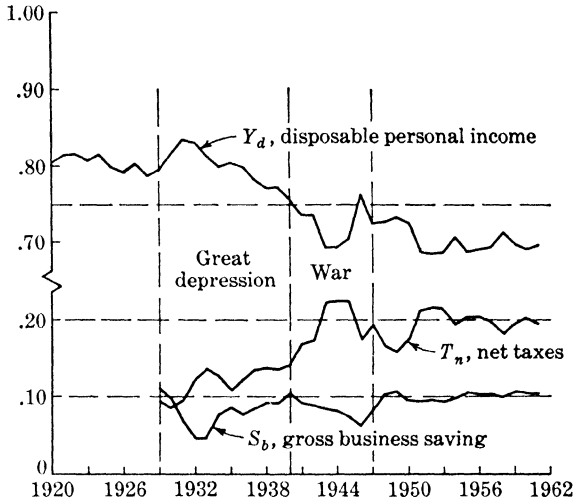
Throughout, we shall continue to deal with real income and consumption, rather than money flows, so that output and consumption are measured in constant dollars. Changes in the price level bring shifts in the propensity to consume — if there are any effects — rather than movements along the consumption function. We shall discover some more reasons why deflation may restore full employment.

Historical Shares in Gross National Income

Gross national income includes gross business saving (S_b) and net tax receipts (T_n) of government in addition to disposable personal income (Y_d). Proportional shares in GNY, from 1920 through 1961, are shown in Figure 9-1. Gross business saving consists of capital consumption allowances, undistributed corporate profits and inventory valuation adjustment, and wages accrued but not yet disbursed (zero in most years). Net tax receipts are all business and personal direct and indirect taxes, including social insurance contributions, *minus* (1) government transfer payments to domestic persons and foreigners, (2) net interest paid by government to households, and (3) subsidies less the current surplus of government enterprises. We shall call this figure *ne* ° for short.

Shifts in the long run consumption function Comparing the Twenties with the Fifties in Figure 9-1, we can easily see that the ratio of disposable income to GNY was lower in the latter period of prosperity than in the former period. On the average, disposable income was about 80 percent of gross national income in the Twenties and about 69 percent in the Fifties. We don't have figures for the business saving and net tax shares before 1929, but other evidence suggests they were about the same as in 1929. That is, business saving and net taxes were each about 10 percent of GNY during the Twenties.

The reduction in disposable income relative to GNY, in the Fifties, also meant a reduction in consumption relative to GNY. Figure 9-2 indicates two ways we might view the long-run consumption function relative to GNY. Income Y_1 represents GNY in one year of the Twenties. Consumption that year might be thought of as being determined by the line AA, which has a positive intercept, or by the line LL, which would pass through the origin if extended. In a year of the Fifties, income Y_2 was produced If we accept AA as the

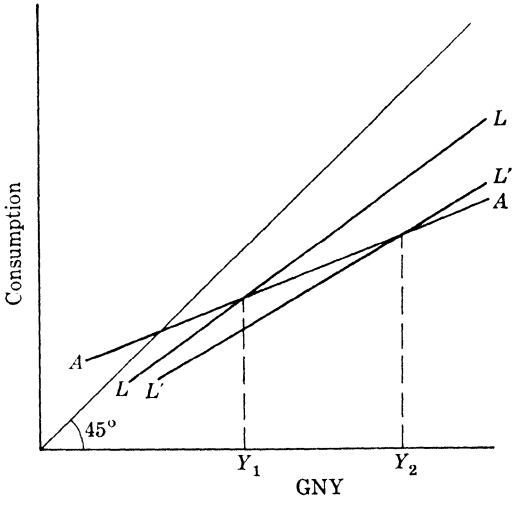


9-1 Net taxes, business saving and disposable income ratios to GNY

Source: 1920–28, *Historical Statistics of the United States*, p. 139; 1929–61, *U.S. Income and Output* and the *Survey of Current Business*.

consumption function, it is adequate to indicate consumption this second year. However, if we view LL as the function, then, it must have shifted, by rotation around the origin, to the position $L'L'$.

9-2 Two views of the long run consumption function



Should we view the change in the average propensity to consume GNY as movement along a given function (AA), or as a shift in the consumption function (LL to $L'L'$)? There is reason to prefer the latter interpretation. The lower average propensity to consume GNY in the Fifties was due to a marked increase in the net tax share of GNY. This was partly due to the expanding welfare services provided by government to an increasingly urbanized population, but it was mainly due to the extraordinary costs of maintaining a large defense establishment during the Korean War and the cold war.

It is difficult to construe rising defense requirements as being due to the increase in gross national income. Yet, AA implies a systematic relation between the two. It is more reasonable to treat the cold war as an outside force that caused a shift in the proportion of disposable income to GNY and, thus, a shift downwards of the long-run consumption function LL to the $L'L'$ position.

Behavior during business fluctuations During the Great Depression, the disposable income share clearly rose. That is, disposable income fell less rapidly than gross national income and production. Increases can also be seen during the recessions of 1953–54 and 1958. Prior to 1949, the share was increasing because of a major cut in tax rates; consequently, any further rise during the recession of 1949 is difficult to pick out. In the postwar recessions, it is apparent that this increase was largely due to reduction in the share of net taxes. We shall see that this is to be expected, given existing taxes and rate schedules. In the early Thirties, the net-tax share rose because, at first, government increased tax rates in its attempt to balance the budget.

The disposable-income share rose in the early Thirties because the business-saving share declined sharply. We shall argue that this, too, is to be expected during a business decline. In 1949, this share increased, principally because of the cut in profits taxes after the war. In the recessions of 1953–54 and 1958, the business-saving share declined slightly.

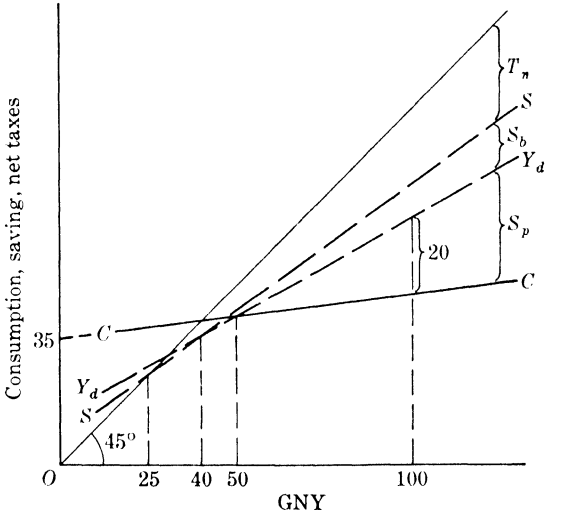
Changes in the disposable income share From time to time, the disposable income share rises and falls because of forces not connected with business declines and recoveries. During World War II, it was reduced by high taxes, whereas in the immediate postwar

period it rose when taxes were cut. After the outbreak of the Korean War, tax rates were again raised, and disposable income was forced back down again, relative to GNY. We shall consider factors that are likely to raise or lower the share of disposable income at a given level of gross national income and thus, given the propensity to consume disposable income, shift the consumption function on GNY upwards or downwards.

Business Saving and Net Taxes in the Short Run

Let us now consider how gross business saving and net taxes affect the short-run consumption function on GNY. Such a function appears as a spur on *LL* when national output declines in recession or depression and then recovers. As in the case of the functions that relate consumption to disposable income, the short-run function rises over the long run, so that there is a ratchet effect. This continual shift is not only caused by the upward drift of the short-run consumption function on disposable income, but also by disposable income itself, which tends to remain at higher levels, relative to GNY, in succeeding recessions. In this section, we shall see why.

9-3 Consumption function for an open economy with government
(Billions of dollars)



The marginal propensity to consume GNY Figure 9-3 presents a short-run consumption function on GNY. The saving gap is divided between personal saving (S_p), gross business saving (S_b), and net taxes (T_n). Disposable income and total private saving are indicated by dashed lines, the latter being the gap between the SS line and the consumption function (CC). The relationship between CC and Y_dY_d is exactly the same as in Figure 6-1 and is determined by Equation 6-3a, with the symbol Y_d in place of Y:

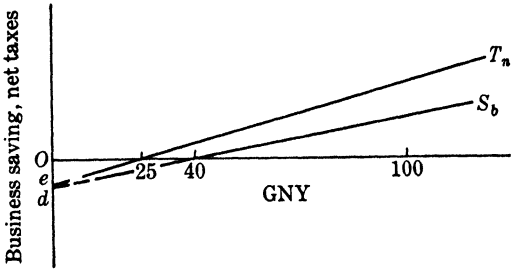
$$C = 20 + .6Y_d \tag{6-3a}$$

However, the consumption function on GNY is not very steep, indicating that the marginal propensity to consume gross national income is much less than six-tenths, which is the MPC for disposable income in this example. Since disposable income rises less than gross national income, the remaining part of an increment in GNY is added to business saving and net taxes.

For example, suppose GNY increases by $10 billions, of which three billions is taken in net taxes and two billions is retained by businesses. Disposable income thus increases only by five billions. The MPC for the latter is six-tenths; so, consumption increases by three billion dollars. Consequently, the marginal propensity to consume gross national income is only three-tenths ($3 billions/$10 billions). (These figures are not intended to be realistic.)

The business saving function In Figure 9-3, net taxes and business saving not only increase with national income, they increase more than in proportion to GNY. That is, at high levels of income, each is a larger proportion of income than at low levels. Since we have

9-4 Business saving and net taxes functions



assumed in drawing this figure that both are linear functions of GNY, this statement can be easily verified. At $40 billions income, business saving is zero. This is apparent in Figure 9-3 but may be seen more easily in Figure 9-4, where the business saving and net tax functions of the first figure are redrawn to scale and measure both variables from the horizontal axis. At lower incomes, business saving is negative (dissaving) and at higher incomes, it is positive. If it increases from nothing to a positive amount when income increases, then it must increase as a proportion of income. The same reasoning applies to net taxes. At $25 billions income, they are zero; at higher incomes, they become positive.

Of course, we must justify the assumption that business saving rises more rapidly than national income in the short run — and falls more rapidly when output declines in recession or depression. We have seen the statistical evidence that this happens, but we still ask, What are the reasons?

In depression, corporate profits fall rapidly for the same reasons we gave for the drop in proprietors' income. Sales revenues decline while overhead costs of debt, basic utilities, salaried personnel, and so forth remain virtually fixed. At reduced operating rates, some equipment and labor are less efficiently utilized, and unit operating costs may rise. (Falling prices, if they fall more rapidly than wages, compound the cut in profits, but we shall deal with deflation separately at a later point.)

Relative stability of dividends. While profits decline more rapidly than GNY, dividends are apt to decline less rapidly. Thus, the drop in undistributed profits is still more rapid relative to gross national income. Corporations are reluctant to reduce dividends since management may be subject to direct pressures from stockholders. Moreover, it is important to maintain a fairly stable dividend record so that new stock issues will find a ready market at attractive prices in later years, when firms again wish to sell stock. Finally, there is less reason to retain earnings for internal investment, since reduced production rates leave idle capacity in existing capital.

In 1929, gross business saving was 11.0 percent of GNY. By 1932, it had dropped to 4.6 percent and remained at that figure in 1933. By 1940, when there was still a substantial margin of unemployment, gross business saving had recovered to 10.3 percent.

The net taxes function There are also cogent reasons to expect net taxes to vary more than in proportion to GNY in the short run, given the number and rate schedules set by law. (A change in tax laws shifts the short-run function in ways we shall consider later in this chapter.) In recent years, nearly half of government receipts have been personal income taxes. These are progressive, increasing and decreasing more than in proportional to personal income.

About a quarter of receipts are corporate profit taxes. Although these are proportional (52 percent for most firms) to profits, they decline as a percent of GNY when profits decline more rapidly than national income. Whereas some other taxes, particularly those on property, are apt to decline less rapidly than GNY, we should expect gross tax revenues to decline more rapidly than national income, since the direct taxes are such a large proportion of the total.

Transfer payments will certainly increase as output and employment diminish. Unemployment compensation rises and so does general relief, which provides for unemployed families who are not eligible under the unemployment compensation laws. Interest on public debt remains nearly fixed in dollar amount, when GNY declines in the short run. Increase in transfers and constancy of interest payments means that net taxes decline even more rapidly than gross tax receipts.

The built-in stabilizers We mentioned earlier that defense of living standards and the relatively greater decline in proprietors' income, which combined to keep consumption from falling as fast as disposable income, were two built-in stabilizers of the economy. Now we have two more. Disposable income declines less than in proportion to GNY and production, because of the more rapid declines in gross business saving and net taxes. These factors come into play automatically in the short run, given tax laws and the corporate saving propensity, and serve to maintain consumer spending at a higher level during a business decline. Thus, the decline in aggregate demand is less severe.

During recovery, the more than proportional increase in net taxes (unless government cuts rates) and gross business saving causes disposable income to rise more slowly than gross national income. Consumption rises less rapidly than disposable income when households save to restore net asset positions and when proprietors' income rises

more rapidly than other incomes. Consequently, aggregate consumption recovers less rapidly than GNY.

Once full employment returns and output grows at a slower pace, gross business saving is likely to grow at about the same pace as total sales. If tax rates remain the same, net taxes may continue to expand somewhat more rapidly than GNY because of the progressive personal income tax. However, if government activities increase in the same proportion as GNY, tax rates will be scaled down over the long run.

In any case, business saving and net taxes no longer increase along the functions shown in Figures 9-3 and 9-4. Instead, the disposable income function drifts upwards over the long run; consequently, disposable income increases about in proportion to GNY and along the long-run LL function of Figure 9-2. When a new decline of business sets in, disposable income retreats back along a higher function than before, giving us the ratchet effect again.

Algebra of the consumption function on GNY The logic of our discussion can be demonstrated by the simple algebra of linear functions. We have the following equations:

$$Y = Y_d + S_b + T_n \qquad \text{(composition of GNY)} \qquad (9\text{-}1)$$

$$C = a + cY_d \qquad \text{(consumption function)} \qquad (6\text{-}3)$$

$$S_b = d + bY \qquad \text{(business saving function)} \qquad (9\text{-}2)$$

$$T_n = e + tY \qquad \text{(net taxes function)} \qquad (9\text{-}3)$$

The constant terms in the business saving and net taxes functions (d and e) have negative values. See Figure 9-4. This must be true if business saving and net taxes are to rise more than in proportion to gross national income (Y). For convenience, we may refer to coefficient b as the marginal business propensity to save and to coefficient t as the marginal net tax rate.

The disposable income function. We obtain disposable income as a function of GNY the following way:

$$Y_d = Y - S_b - T_n \qquad \text{(9-1 rearranged)}$$

$$Y_d = Y - (d + bY) - (e + tY) \qquad \text{(by substitution)}$$

$$Y_d = -(d + e) + (1 - b - t)Y \qquad \text{(terms collected)} \qquad (9\text{-}4)$$

Since d and e are both negative values, the constant term is positive, indicating a positive intercept with the vertical axis (extend Y_dY_d in Figure 9-3).

This disposable income function tells us that for every billion dollars increase in national income, disposable income increases by $(1 - b - t)$ billion dollars. In our example on page 180, we gave b the value two-tenths and t, three-tenths. Thus, the increase in disposable income for a $10 billions increase in national income was five billion dollars: $5 = (1 - .2 - .3)10$.

The consumption function on GNY. Now we substitute the disposable income function (9-4) in Equation 6-3 in order to obtain the consumption function on gross national income:

$$C = a + c[-(d + e) + (1 - b - t)Y]$$

$$C = [a - c(d + e)] + c(1 - b - t)Y \qquad (9\text{-}5)$$

The constant term in brackets is positive, since d and e are both negative.

The marginal propensity to consume is $c(1 - b - t)$ and increases when, (1) the MPC for disposable personal income (c) *increases*, (2) the marginal business propensity to save (b) *decreases*, or (3) the marginal net tax rate (t) *decreases*. To simplify our expression of this consumption function let us symbolize the constant term by a' and the MPC by c':

$$C = a' + c'Y \qquad (9\text{-}5a)$$

The Multiplier in an Open Economy with Government

Total spending in an economy that involves government and foreign transactions includes, along with consumption and private investment, government purchases (G) and net exports (X_n) of new goods and services. Net exports is gross exports (X) minus imports (Imp).

We shall treat government purchases and gross exports as autonomous or given variables. Government may alter its spending as it sees fit to influence economic behavior. Gross exports are determined by foreigners' incomes and willingness to buy American products. They are influenced by tariff and other trade policies of foreign governments. The ability and willingness to buy from the U.S. is partly

determined by the value of U.S. imports, which supply dollars and stimulate income expansion abroad. We ignore this feedback in treating gross exports as independent of imports and, therefore, of domestic income.

The import function Assuming changes in imports can be adequately represented by a linear equation, we have the import function:

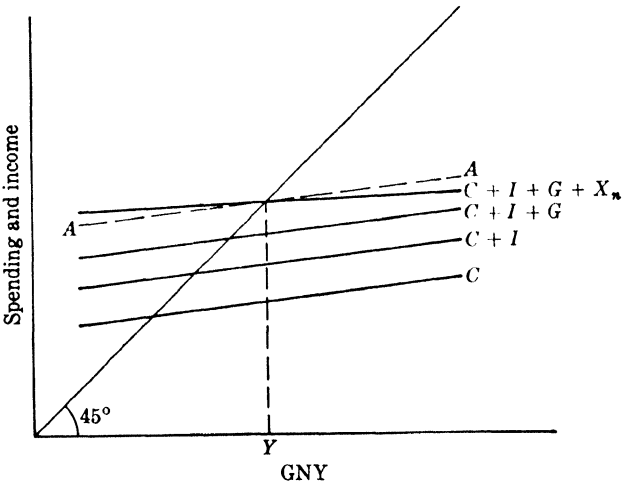
$$\text{Imp} = g + fY \tag{9-6}$$

The constant term may be positive, negative, or zero. It is not necessary for us to decide whether spending abroad rises less than, more than, or is equal in proportion to GNY. We can term the coefficient f the marginal propensity to import.

Given the value of gross exports, the value of net exports declines when income rises and imports increase. This is the reason that the aggregate demand function ($C + I + G + X_n$) in Figure 9-5 is less steeply sloped than the consumption function. If this were not true, the aggregate demand function would be the same as the dashed line labelled AA, where the constant value of net exports equals the vertical gap between it and the $C + I + G$ line.

Effect of imports on the multiplier The increase of imports as income rises has the same effect on the multiplier as the

9-5 Equilibrium in an open economy with government



propensities to save or the marginal net tax rate; the greater the marginal propensity to import, the less the multiplier. As income increases, a part of each increment leaks into purchases of foreign, instead of U.S., products.

The multiplier for our open economy with government can be easily derived. The condition of equilibrium — spending equals income — is given by the equation:

$$Y = C + I + G + (X - \text{Imp}) \tag{9-7}$$

Substituting from Equations 9-5a and 9-6, collecting terms, and dividing by the coefficient of Y gives the income function:

$$Y = a' + c'Y + I + G + X - g - fY$$

$$(1 - c' + f)Y = a' - g + I + G + X$$

$$Y = \frac{a' - g}{1 - c' + f} + \frac{I + G + X}{1 - c' + f} \tag{9-8}$$

If we subtract one level of income from another in order to represent a change in income, the constant term cancels out, and we have:

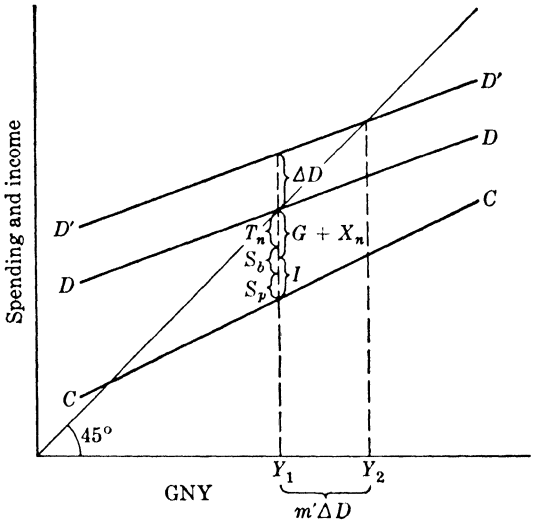
$$\Delta Y = \frac{1}{1 - c' + f} \Delta(I + G + X) \tag{9-9}$$

The coefficient is the multiplier (compare this equation with equation 6-10). Symbolizing it by m' we have:

$$\Delta Y = m' \Delta(I + G + X) \tag{9-9a}$$

Note that a decrease in the marginal propensity to import (f) increases the value of the multiplier. Income will change by the multiplier *times* any change in the total of investment, government purchases, and gross exports.

The aggregate demand function In Figure 9-6, the line DD is identical to the line labelled $C + I + G + X_n$ in Figure 9-5. Relabelling it simplifies notation and emphasizes the generality of the aggregate demand function. Note, too, that at equilibrium income Y_1, private saving ($S_b + S_p$, personal saving) is greater than investment. However, government purchases *plus* net exports exceed net taxes by the same difference; so, total spending equals income and



9-6 A change in aggregate demand

output Y_1. Equilibrium does not require that saving equal investment or that net taxes equal government purchases. It only requires that the sum of net taxes plus private saving equal the sum of government purchases, net exports, and domestic investment. Any net leakage by excess private saving must be offset by a net pumpage in the forms of government deficit spending and net exports.

When we speak of a change in aggregate demand, we shall mean a shift in DD, not a movement along it. In Figure 9-6, aggregate demand increases by ΔD. This may be due to (1) an increase in the propensity to consume, in which case we should also shift CC upward an equal amount, (2) an increase of intended investment, (3) an increase in government purchases, or (4) an increase in net exports. Any one or a combination of these may account for ΔD. An increase in net exports may be due to an increase in gross exports or a reduction in the average propensity to import at income Y_1. The latter would mean a shift downward of the import function (Equation 9-6; g declines).

A change in aggregate demand changes equilibrium GNY and national output via the multiplier:

$$\Delta Y = m' \Delta D \tag{9-10}$$

Thus, Y_2 is greater than Y_1, in Figure 9-6, by the amount $m' \Delta D$. (Equations 9-9 and 9-10 are equivalents. Consumption and imports were omitted from 9-9 because it was assumed there would be no autonomous change in either; only movements along given consumption and import functions.)

Deflation and Aggregate Demand, Again

Now that we have a complete-economy spending model, we are ready to go further into the matter of changes in wage and price levels. Suppose that output has settled down to Y_1 in Figure 9-6, as a result of a decline in investment demand. Will a fall in prices raise the consumption function sufficiently to increase equilibrium output to Y_2, which we posit is the full-employment output? (Deflation may raise or lower investment, but we shall consider this after developing the theories of investment and the rate of interest.)

The net tax effect The Pigou effect is one affirmative answer to this question, but we have already discussed it sufficiently. Another answer is that the net tax share of GNY declines as the money value of income falls, given tax laws constant. To isolate this effect, let us assume that wages and prices are reduced in the same degree, so that there is no redistribution of income between labor and property owners.

Tax-rate schedules set taxes according to the money value — not the real value — of incomes and outputs. The fall in money income reduces the proportion of personal income claimed by the progressive personal income tax. Interest payments on public debt remain fixed in money, so that they rise as a proportion of the declining money national income. Both effects work together to increase the proportion of disposable personal income to GNY. Consequently, the consumption function in Figure 9-6 shifts upwards and aggregate demand is raised.

The net tax effect is subject to some of the same objections as the Pigou effect as a practical matter. In particular, expectations of a continued fall in prices may be more than offsetting. However, it would be possible for the net-tax effect to restore full employment via deflation. During inflation, it works in reverse, increasing gross tax and reducing interest shares of GNY, so that disposable income and consumption are pushed downwards.

The net export effect Deflation at home, relative to price levels abroad, stimulates exports and discourages imports. Foreign buyers find that U.S. goods and services are becoming cheaper than before and are less expensive than their own products and those of other countries. On the other hand, domestic buyers discover that imports are becoming more expensive and reduce their purchases of imported goods and services.

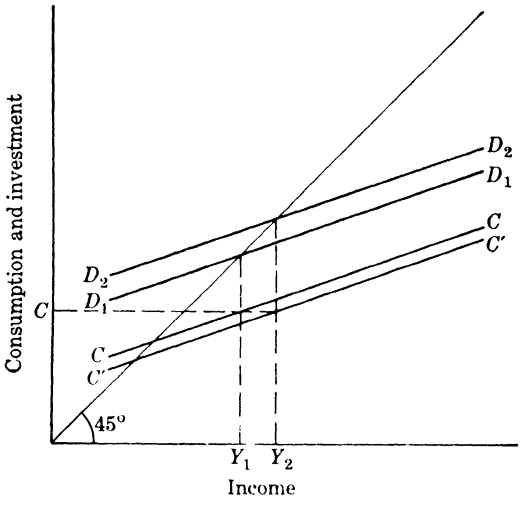
The gain in the U.S. balance of payments is matched by deterioration in the buying countries. When their citizens buy more from us, and we buy less from them, the American deflation and depression is transmitted to their own countries. To guard against this, foreign governments may raise tariff walls or put other barriers in the way of American exports. The net export effect may thus be neutralized or even reversed.

At any rate, foreign trade is such a small part of the value of U.S. national income and output that the stimulating effects of relative deflation are likely to be secondary in importance as a cure to depression. The net export effect is much more important for a country such as Great Britain.

The business saving effect Suppose that market prices drop more than in proportion to wages. Corporate profits fall more than total money income; so, we expect the business saving gap to narrow. Moreover, the income of proprietors of unincorporated businesses also declines more rapidly than total money income. The second effect raises the propensity to consume disposable income and the first raises the share of disposable income in GNY. Both work to shift the consumption function upwards.

If investment remains constant, deflation may restore full employment along this road. However, our assumption of given investment is particularly hard to accept in this case. Unless entrepreneurs expect profits to return soon to their old rate, they are likely to be still less prone to invest. Even if they do expect this in the future, the reduction in current profits reduces the flow of funds they have available for financing investment. Thus, the reduction of business saving by deflation may be accompanied by a further reduction in investment.

A cut in wage rates Suppose that labor agrees to wage-rate cuts and that the rates are reduced more than in proportion to prices. To make the reasoning more apparent, let us assume that prices re-



9-7 A fall in wage rates

main constant and that government purchases and net exports are zero. Aggregate demand is confined to consumption and investment. The depressed level of income, Y_1, can be viewed as both real and money income in this case.

The short-run effect of the wage-rate cut is to lower the consumption function by increasing corporate profit and proprietors' shares of GNY. This is shown in Figure 9-7. Aggregate demand needed for full employment is D_2D_2, while demand, after investment has decreased, is D_1D_1. When wage rates are cut, the consumption function (CC) shifts down to the $C''C''$ position. This shifts D_1D_1 down in the same measure, but the shift is not shown, in order to simplify the graph.

Increased hiring. Wage reductions are apt to occur piecemeal, in one industry after another; so, employers may not expect a decline in their own markets when their employees' wage rates are reduced. Their employees purchase an insignificant share of their own output. Since wage costs per unit of output are reduced, employers may hire more labor and expand output. Indeed, they may do this to the extent that the total wage bill (wage rates times units of labor) is restored to its aggregate value before the wage rate reduction (or never leaves this aggregate value).

Suppose that this happens, and the greater employment increases

output to the full employment level, Y_2. Is this equilibrium? Not unless investment increases. Having the same total wage income as before the wage rate cut, labor may be expected to consume the same amount. That is, it spends C again. However, for total spending to equal output, investment must be not only greater than when income is Y_1 — it must be greater than the level it was unable to retain when income was Y_2 before!

If firms were unwilling to invest enough to fill the saving gap when output was Y_2 before, so depression to Y_1 occurred, is there any reason to believe that they will want to invest still more now? Profits per unit of output are higher than before, but consumers buy a smaller proportion of output. It is possible that investment fell, prior to the wage-cut, because of low profit margins and that the larger share of profit in full-employment income (Y_2) will even raise investment demand to the higher level now needed to maintain full employment. However, this seems unlikely in view of the fact that the market for consumer goods, at full-employment output, is less than before the depression. Moreover, just to maintain consumption at its depression level we assumed that firms would increase employment proportionately to the fall in the wage rate, so that the total wage bill would remain the same. Can we expect the demand for labor to be this elastic in the short run? Wage cutting seems an unlikely road back to prosperity.

Fiscal Policy

Government fiscal policy is concerned with taxes, purchases, and transfer payments. Congress and the President have a fiscal policy, whether or not they deliberately change the laws governing these transactions. Merely standing pat is a policy. The built-in stabilizer effects of tax revenues and transfer payments, as well as subsidies to farmers when crop prices decline, constitute nondiscretionary fiscal policy for reducing the severity of a business decline. They do their work without any deliberate action by government.

However, the built-in stabilizers only cushion a decline; they do not prevent it or restore full employment. Discretionary fiscal policy may be needed to bring back prosperity — or to overcome inflation if the problem is too much aggregate demand. This means changing the law or administrative rules.

An increase in government purchases The effect of increased government purchases (G) is quite apparent. In Equation 9-10, ΔD increases and income grows by a multiple of this. Let's consider an example. Let the marginal propensity to consume gross national income (c') be six-tenths and the marginal propensity to import (f) be one-tenth. According to Equation 9-9, we see that this gives a multiplier of two. If government purchases increase by \$10 billions, national income and output increase by \$20 billions:

$$\Delta Y = m' \Delta D = 2(10) = 20$$

A reduction in net taxes The consumption function may be raised, increasing aggregate demand, either by a reduction in personal taxes or by an increase in transfer payments to households. In either case, disposable income is increased relative to GNY. Suppose that the marginal propensity to consume *disposable* income (c in Equation 6-3) is eight-tenths. A reduction in net personal taxes by \$10 billions increases disposable income the same amount and raises consumption by eight billion dollars:

$$\Delta C = c \Delta Y_d = .8(10) = 8$$

The upward shift in consumption brings the multiplier into play, and income increases by \$16 billions:

$$\Delta Y = m' \Delta D = 2(8) = 16$$

Output and employment may be increased either by increasing government purchases or by reducing net personal taxes. However, the reduction in taxes must be greater than the increase in purchases in order to raise output by the same amount. The reason is that part of the remitted taxes is saved by households (two billion dollars in our example).

An increase in purchases and taxes Suppose that government elects to increase purchases and to cover them by an increase in taxes, so that the budget remains balanced. Many people believe that this will have no expansive effect, because government takes from the private sectors with one hand what it gives back with the other. They are wrong.

Suppose that purchases and net personal taxes are increased by \$10

billions. The increased taxes reduce disposable income by $10 billions, but consumption decreases only by eight billion dollars. There is, therefore, a net increase in demand of two billion dollars. Because of the multiplier effect, gross national income is increased four billion dollars.

The algebra of this case. The effect of an equal change in government purchases and net personal taxes is generalized as follows:

$$\Delta Y = m' \Delta D$$

$$\Delta D = \Delta C + \Delta G$$

$$\Delta C = c \Delta Y_d$$

$$\Delta Y_d = -\Delta T_n = -\Delta G$$

Combining equations:

$$\Delta D = -c \Delta G + \Delta G = (1 - c) \Delta G$$

$$\Delta Y = m'(1 - c) \Delta G$$

If the MPC for gross national income equals the MPC for disposable income, and the marginal propensity to import is zero, the multiplier is equal to the reciprocal of $(1 - c)$. In this case, output increases by the same amount as government purchases and taxes, no matter what the value of the common MPC! However, in reality, we should expect the increase in output to be less, because the marginal propensity to consume GNY is lower than that for disposable income and imports increase as national income rises.

In order for the increase in government purchases not to have an expansive effect, net personal taxes must be increased by more, creating a budget surplus (if the budget was balanced before). In our example, taxes should be increased by $12.5 billions (i.e., .8(12.5) = 10). This is important to remember during periods when inflation threatens. Too often, it is argued that by balancing the budget, government avoids adding to excessive demand when enlarging its outlays.

Summary

Our review of income shares in GNY showed (1) a long-run decline in the disposable income share, which we interpreted as a shift in the long-run function due to the cold war, (2) a rise in the disposable in-

come share during business declines and a fall during recoveries, and (3) some other fluctuations in this share that seem to have been independent of the level of GNY.

The average and marginal propensities to consume gross national income are lower than those for disposable income, because portions of each level and change in GNY are absorbed by business saving and net tax receipts. In the short run, more than proportional changes in business saving and net taxes, relative to gross national income, provide important built-in stabilizers.

Aggregate demand now includes, besides consumption and investment, government purchases and exports net of imports. The multiplier in an open economy that includes government transactions is lower both because the MPC is below that for disposable income and because there is a net leakage from additional imports when national income increases. Equilibrium requires that private saving plus net taxes be equal to investment plus government purchases plus net exports; it does not require equality of saving and investment, net taxes and government purchases, and imports and exports, though simultaneous equality of all these is sufficient for equilibrium.

Besides the Pigou effect, there are added reasons why deflation might raise equilibrium output and employment. Deflation (1) reduces the net taxes share of real income, (2) stimulates exports and discourages imports, and (3) reduces the business saving share if wages fall less than prices, though this is apt to have an adverse effect on investment. If wage rates fall more than prices, the propensity to consume is depressed in the short run and a still greater increase in investment is needed to restore full employment.

Nondiscretionary fiscal policy serves to cushion a decline by the built-in stabilizers, but it neither prevents decline nor restores full employment. Discretionary fiscal policy can increase aggregate demand either directly, by government purchases, or indirectly, by raising consumption through a cut in net taxes. An equal increase in purchases and net taxes is not neutral but has an expansive effect, even though the government budget remains balanced.

Reading and Research

See the general bibliographic sources listed at the end of Chapter 1. There are many algebraic models of national income determination.

Thomas Schelling uses this approach in his *National Income Behavior* (New York: McGraw-Hill Book Company, Inc., 1951).

Built-in stabilizers and fiscal policy. The influential Committee for Economic Development (CED) has proposed implementation of the built-in stabilizers in two pamphlets, *Taxes and the Budget* (New York: CED, 1947) and *Monetary and Fiscal Policy for Greater Economic Stability* (New York: CED, 1948). For a related program of fiscal policy carried out in Sweden see Gunnar Myrdal, "Fiscal Policy in the Business Cycle," *American Economic Review, Supplement,* vol. 39, no. 2 (March 1939), pp. 183–93.

10 The Marginal Efficiency of Investment

Besides serving future rather than present needs, investment differs from consumption in another important respect. Purchases of housing, plant, equipment, and inventories rise and fall with greater relative amplitude and appear to be less dependent on the level of income and more dependent upon various other factors. In 1933, consumption had declined to 80 percent of its 1929 value in constant dollars, but investment had fallen to 10 percent of its former level. In 1954 dollars, consumption declined $25 billions; investment fell $31 billions. Although the propensity to consume income is not completely stable, as a rule it is a change in intended investment which plays the predominant active role in initiating short-run fluctuations in national income, output, and employment.

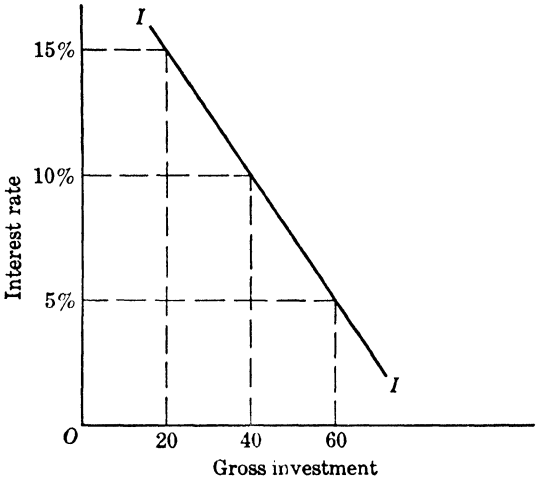
Expected returns and costs Expectations play a more important part in determining investment. Inventories are accumulated in the expectation that they will return, in a few months, more than they cost. Equipment must be expected to return its cost plus profit over several years of employment, whereas structures may take decades to cover their costs. Before committing funds to investment, management must peer into the future and make the best guess it can about gross returns, operating costs, taxes, costs of finance, the trend of technology, and other factors that will determine the net returns actually realized from an investment. The only thing certain about the future is its uncertainty, and the best estimates and capital plans are subject to change without notice.

A firm decides to undertake an investment project if it expects the new asset to return more during its operating life than it costs. There are two elements of cost, besides the expected operating expenses deducted in estimating net returns. First, there is the supply price of the capital good, which we shall term the present cost of the investment. (For instance, a machine may be available for $20,000, or the lowest bid on a construction project may be $250,000.)

Second, there is the interest which must be paid or imputed for funds used to finance the investment. Even if a firm employs its own depreciation allowances or profits, it should assign them a interest-cost equivalent to what can be obtained by an alternative use of these funds. We shall figure interest cost as a *rate*, rather than an absolute expense, such as 5 percent a year. If a firm borrows $100 today and must repay $110 a year from now, the absolute interest cost is $10 and the rate of interest is 10 percent.

Aggregate demand for investment In any year, firms have many possible investment projects under consideration. Some are soon rejected or postponed, because they are not expected to return as much as their present cost. Many do promise to be profitable if interest rates are low, whereas at higher rates, fewer have expected returns that exceed costs.

Given the state of expectations and current supply prices, we can construct a demand function for aggregate investment which relates total capital outlays to the market rate of interest. This is *II* in Figure 10-1 and is the same function we met in connection with the Keynes-classical discussion of Chapter 5. Measured along the hori-



10-1 The aggregate investment demand function
(Billions of dollars)

zontal axis is gross private domestic investment, which is the sum of new assets bought in a given period valued at their supply prices. If the interest rate is 5 percent, firms invest $60 billions. At 10 percent interest, investment spending is reduced to $40 billions and at 15 percent, it is only $20 billions. (A linear function may not be appropriate, but it will do for the time being.)

We shall measure gross private domestic investment in constant dollars, so that values on the horizontal axis represent real purchases and change only when quantities of capital goods bought during a period of time change. If price changes (other than the rate of interest) have any effect on investment, they cause demand to shift. For instance, a decrease in capital-goods prices, not offset by a decrease in expected returns, shifts this function to the *right*. At any given rate of interest, firms are willing to buy more capital goods.

This function, of course, represents only intended investment. It is important to realize that it is by no means as stable as the consumption function. Changes in technology, labor costs, sales and production requirements, the stock of capital, competitive practices, taxes, and other factors provide real bases for shifts in *II*. Moreover, it is anticipations of such changes that directly affect investment plans, and the psychology of expectations adds a subjective variable

that is as important in shifting the function as changes in these objective factors. Whatever the true state of affairs, if businessmen expect changes, the investment function shifts and investment, at a given rate of interest, is either increased or decreased.

Plan of the chapter In this chapter, we shall first consider capital budgeting by an individual firm. We shall then consider investment demand by an industry and, finally, by firms in the aggregate. Our discussion will be mainly concerned with purchases of plant and equipment. Later, we shall mention some of the unique factors determining inventory investment and residential construction.

Our discussion will relate to gross investment — capital outlays for both replacement and expansion of real assets and capacity. The calculation of returns from replacement does not differ materially from that for expansion, and many firms do not make the distinction. In fact, a new capital good is generally of an improved type, relative to its predecessor, and the outlay necessarily results in increased capacity.

In this chapter, our attention is directed to demand for investment. We shall treat the rate of interest as a given or predetermined variable, as we did investment in previous chapters. We shall also make the implausible assumption that firms can obtain as much finance as they desire at the going rate of interest. In the next chapter, we shall abandon this assumption and consider limitations of finance.

Present Value

Let us imagine that we are considering a proposed investment project and wish to decide whether to accept or reject it. We should first calculate its present value, which is a sum that already makes allowance for interest costs as well as expected additional operating expenses (except depreciation) that are incurred by the new asset. We compare its present value with its present cost. If the present value is greater, the investment promises to be profitable; if it is less, we should discard the project proposal or put it off until conditions change to make it appear profitable.

Single outlay, single return cases Suppose that the proposal is to buy goods for inventory that we expect to sell in a year

for $10,000. In order to finance this, we must borrow from a bank at 5 percent interest. The present value of this project is the sum of money which, if it grows 5 percent a year, will amount to $10,000 in a year's time. Using V to represent present value, we have:

$$V(1.05) = \$10{,}000$$

or

$$V = \frac{\$10{,}000}{(1.05)} = \$9{,}524$$

If we can buy these goods for less than $9,524, we will be able to make a profit, provided that our expected sales materialize. Suppose that we can buy them for $9,000. From the $10,000 received a year from now, we must repay $9,000 plus 5 percent interest, or $9,450, to the bank. We are left with a profit of $550. If we must pay $9,524 for the goods, we shall have to repay $10,000 to the bank ($9,524 plus 5 percent of itself equals $10,000) and the project does not promise to be profitable.

Return after two years. Now let us try another case. Suppose that we are considering purchase of goods which we expect to sell for $10,000 after two years. Again, we must borrow at 5 percent from the bank. The present value in this case is the sum of money which will grow to $10,000 in two years at 5 percent a year:

$$V(1.05)(1.05) = \$10{,}000$$

or

$$V = \frac{\$10{,}000}{(1.05)^2} = \$9{,}070$$

If we can buy these goods for less than $9,070, the project promises to be profitable, but not otherwise.

Single outlay, multiple return cases Now, let us imagine undertaking both these projects, buying goods for sale at $10,000 in a year, and others for sale at the same figure after two years. The present value is simply the sum of our previously computed present values:

$$V = \frac{\$10{,}000}{(1.05)} + \frac{\$10{,}000}{(1.05)^2} = \$18{,}594$$

A new plant or machine is expected to yield returns over several years of operation; so, it is like our last case for inventories. Generalizing, we have the formula:

$$V = \frac{R_1}{(1+i)} + \frac{R_2}{(1+i)^2} + \frac{R_3}{(1+i)^3} + \ldots + \frac{R_n}{(1+i)^n} \quad (10\text{-}1)$$

The capital R's are expected annual returns, net of any added operating costs and taxes, and the subscripts represent years in the expected life of the asset. Thus, R_3 is the expected net return in the third year. These returns need not be the same each year and may be zero in some years. The small i is the rate of interest. Our asset is expected to last through n years, after which it will be scrapped or sold. Part of R_n, the net expected return in the last year, may be receipts anticipated from resale or scrappage.[1]

Net present value In deciding whether to accept or reject a project, we compared V with its present cost, K. If V minus K is positive, the project promises to be profitable; if the difference is negative, it does not. We can term the difference between these two totals the net present value of the project (V_n):

$$V_n = V - K \quad (10\text{-}2)$$

Our rule now becomes: if net present value is positive, the project promises to be profitable; if it is negative (or zero), the project does not promise to be profitable.

A firm's demand for investment When the rate of interest declines, gross present value of a project increases, and more and more of the projects that our firm has under consideration come to have positive net present values. Suppose that we are considering five proposals for investment this year. Project A has such high expected net returns, compared to its present cost, that it has a positive net present value at interest rates below 20 percent. This project entails an immediate outlay of $20,000.

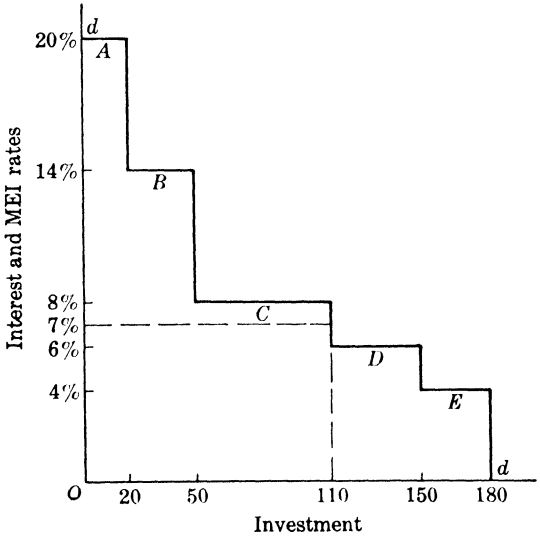
[1]Equation 10-1 can easily be solved by logarithms. Tables of the present value of a dollar at various rates of interest and durations of returns are available in financial handbooks or texts on corporate finance. For example, see Harold Bierman, Jr. and Seymour Smidt, *The Capital Budgeting Decision* (New York: The Macmillan Company, 1960), appendix B.

Project B is expected to be profitable at interest rates below 14 percent and requires an immediate expenditure of $30,000. Project C will be undertaken if we can borrow for less than 8 percent. The latter is a construction project requiring an immediate outlay of $60,000 and another $40,000 next year. If we accept this project, only the $60,000 is part of this year's investment. Project D promises to be profitable at interest rates below 6 percent and entails an immediate outlay of $40,000. Project E, which entails the purchase of equipment at a supply price of $30,000, has a positive net present value at interest rates below 4 percent.

In Figure 10-2, we array these projects to form a demand function (*dd*) for our firm, indicating the amount of investment it is willing to undertake at each rate of interest. Suppose that the going rate is 7 percent. At this rate, projects A, B, and C promise to be profitable, and the combined immediate outlays for these projects amounts to $110,000. This is the value of the firm's investment at 7 percent interest.

This function proceeds by steps, like a descending staircase, from upper left to lower right, because only five projects are being con-

10-2 Investment demand for an individual firm
(Thousands of dollars)



sidered, and each involves a large sum of money. A small reduction in the rate of interest, say from 7 percent to somewhat less than 6 percent, literally induces our firm to take a big step. It increases investment, in this case, by $40,000 or by nearly 40 percent of its former value. When we turn to very large firms, industries and finally aggregate demand, these steps become very tiny compared to total investment, and they can be disregarded.

The Marginal Efficiency of Investment

There is an alternative way of deciding which projects to accept. This involves calculating the *rate* of return over present cost — a figure termed the marginal efficiency of investment. (Keynes, who introduced this term, used it synonymously with the marginal efficiency of capital, and many writers prefer the latter term.) If the MEI of a project exceeds the rate of interest, it promises to be profitable; if not, it does not promise to be profitable.

The marginal efficiency of an investment project is that rate of discount (r) which makes the gross present value equal to present cost:

$$K = \frac{R_1}{(1+r)} + \frac{R_2}{(1+r)^2} + \ldots + \frac{R_n}{(1+r)^n} \qquad (10\text{-}3)$$

The marginal efficiency of investment may also be defined as the rate of discount which makes *net* present value zero.

If $9,000 is spent for goods to be sold for $10,000 in a year's time, the marginal efficiency is 11 percent (i.e., $9,000(1.11) = $10,000). If the rate of interest is 5 percent, this project promises to be profitable.

By comparing Equations 10-3 and 10-1, we can easily see that whenever gross present value exceeds present cost, the marginal efficiency of investment (r) exceeds the rate of interest (i). When the net present value is negative, the MEI must be below the market rate of interest. Thus, we reach the same decisions whichever rule we employ.[2]

[2]This is not true for mutually exclusive projects, where choice of one precludes the other. The MEI indicates whether both are profitable, but it does not show which is the more profitable after deducting interest costs. Also, since present value is generally easier to compute or to obtain from tables, it is the preferred method of evaluating projects in practice. For an excellent manual addressed to the businessman, see Bierman and Smidt, *op. cit.*

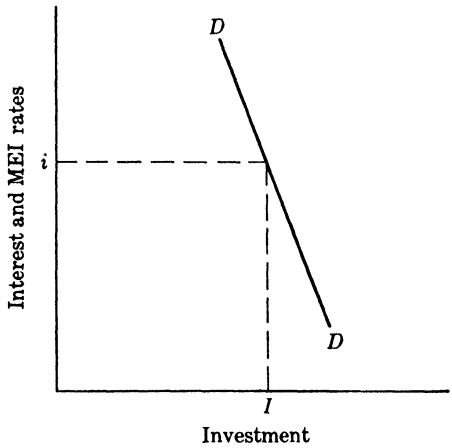
An industry investment demand function The height of each step in Figure 10-2 measures the MEI of the project. We can obtain an industry function by summing horizontally the investment demand functions of all firms in the industry at each rate of interest. (Horizontal summing is inadequate if the investment opportunities facing each firm are dependent upon the investment expenditures of its competitors, which is often the case, but this complication may be ignored for the present.) The steps occur at different heights from firm to firm; so, in the aggregate, they appear as tiny steps roughly equally spaced. Without important error we can smooth these out, to give the industry investment demand function (DD) of Figure 10-3.

The height of any point on DD represents the marginal efficiency of investment at the corresponding investment level measured on the horizontal axis. Thus, we measure the MEI (r) on the vertical axis along with the rate of interest. At the interest rate i, investment less than I has a higher marginal efficiency, and an investment greater than I has a lower marginal efficiency. Firms increase investment until the MEI equals the rate of interest, so I is the equilibrium level of industry investment.

Determinants of a Firm's Investment Demand

The position of a firm's investment demand function depends on the net returns expected from investment projects, and the supply

10-3 An industry investment demand function



prices of capital goods. The expected net return (R) for a project in each year is the difference between what it adds to revenues and what it adds to operating costs (not including depreciation) and taxes. A machine may not be expected to add revenues but only to reduce costs of labor, materials, and other inputs for a given level of output. The annual saving in operating costs is the expected net return for such an investment.

Net returns to investment, thus, depend upon (1) demand conditions for the firm's products, which govern additional (marginal) revenues, (2) wage rates and prices of other current inputs to be used with or replaced by capital, (3) the state of technology and knowledge of production techniques, (4) the stock of capital already possessed by the firm and its age composition, and (5) taxes and tax rate schedules.

Demand conditions The profitableness of investment is limited by demand for the firm's products. If demand increases, then output can be increased without cutting prices, and the firm will find it profitable to invest an amount in each period that will increase capital about in proportion to output. (This assumes that current input and capital prices, technology, and tax rates are constant and also neglects equipment indivisibilities, expectations, and financing difficulties that we can take up later.)

It is important in this connection to realize that an equal increase in demand each year only serves to maintain investment at a constant level. It does not increase investment demand. Investment at a constant level increases capital each year by the amount of the investment, and investment will be maintained at a level that increases capital, year by year, just enough to maintain the least-cost ratio between output and capital. Only if demand grows by greater increments each year, will it induce an increase of investment demand each year over that of the previous year.

The existing stock of capital If demand is constant (and so are input prices, technology, and taxes), a firm may still have reason to invest for expansion of capital in one or more periods. This is true if it does not yet have the capital capacity that maximizes profits under the given demand conditions. However, sooner or later, the firm does achieve sufficient capital, and its demand for investment is

then reduced to simple replacement of units in the existing stock that wear out or suffer damage (or become obsolete).

Of course, the size of replacement investment demand depends on the age of existing capital, and the capital-output ratio that the firm wishes to maintain. In any one year, a relatively large proportion of equipment may be due for replacement. Bunching up of net investment in one year may generate a later replacement wave or two, though these waves soon disappear, as in the case of consumers' durables purchases. In sum, investment demand depends, in part, on the size and age composition of the stock of existing capital.

Relative input prices A rise in wage rates has two conflicting effects on investment demand. One is the substitution effect and the other is the scale effect. Management can always reduce annual operating expenses by substituting machines for men, but this entails added capital costs. Given equipment prices and the rate of interest, when wage rates rise, management will find that it can reduce the increase in operating expenses by substituting capital for labor. This tends to increase investment demand.

Nevertheless, substitution cannot be expected to return costs to their level before the wage rise (else management could have cut expenses by making the substitution before). Marginal firms are forced out of business, and the others must raise prices and reduce output. This serves to reduce investment demand. On balance, whether a rise in wages (given other things constant) increases or reduces investment depends on the elasticity of product demand, economies of scale and the elasticity of substitution. These differ from industry to industry.

Diminishing returns to substitution. Suppose that wages rise by a certain amount and then remain at their new level. The process of substitution is subject to diminishing returns. When workers are replaced by machines, the added saving in labor costs becomes less and less until finally, the marginal efficiency of investment for more substitution is no greater than the rate of interest. This is another case of the stock of capital governing the demand for investment.

The firm is now employing more capital per unit of output, and we should expect replacement demand each period, in the long run, to be larger for this reason. Also, when demand increases, the size of

investment needed each period to maintain the optimum capital-output ratio is greater.

A reduction in wages. Substitution and scale effects also work in opposite directions when wage rates fall. Management is led to substitute labor for capital, but reduced costs enable output and capacity to be increased with profit. Use of labor-intensive methods often requires machines of a different type; so, substitution may actually add to investment in the short run. In the long run, the capital-output ratio is reduced, so that replacement and expansion capital requirements are lessened.

Change in capital-goods prices. Changes in prices of materials and other current inputs have effects analogous to wage rate changes. A decline in capital-goods prices (given other things constant) reduces the money value of investment needed to acquire the same physical addition to capital. However, this is apt to be more than offset by substitution and scale effects, which both serve to increase investment demand in this case. An increase in capital prices has the opposite effects.

A reduction in the rate of interest also induces positive substitution and scale demands for capital, but this is movement along the investment demand function rather than a shift in it. As before, diminishing returns limit substitution investment, and both diseconomies of scale and given demand conditions limit scale effects. After a given decline in unit capital costs, net investment will increase or be maintained only until the growth of capital exhausts profitable opportunities.

Changes in technology To be accepted, a new technique of production must promise to lower costs in some way. Thus, improvements always have a positive scale effect on investment. Technological change may favor substitution of capital for labor or materials, or vice versa. Even if it reduces the desired capital-output ratio, technical change may stimulate investment in the short run. New techniques generally require new types of capital goods. In the long run, gross investment demand, relative to output demand, will be increased or decreased in proportion as the trend of technology is capital-using or capital-saving.

Compensating innovations. There is reason to believe that if wages and materials prices are trending upward, relative to capital-goods

prices and the rate of interest, firms will be conditioned to favor laborsaving and materials-saving changes in technology.[3] In any particular year, two new techniques may offer the same cost saving at current input prices. However, if wages are expected to rise, the improvement which requires more labor inputs will soon become the more costly method of production. A recent history of wage increases is apt to lead management to expect further increases and to prefer the laborsaving improvement. A very large firm, which employs such a large share of a given type of labor that its hiring directly affects wages in a tight labor market, will be directly prompted to choose the laborsaving improvement.

Technological change rarely occurs by unguided inspiration. When equipment producers find their customers are favoring laborsaving technology, they direct their engineers to seek more ways of reducing manhours needed to operate machines, even though this entails more expensive machinery and greater materials inputs per unit of output.

The same type of reasoning applies when materials prices and unit capital costs trend upwards relative to wages or to each other. In sum, relative scarcities of particular inputs, which cause their prices to advance more rapidly, tend to induce compensating innovations that economize on the relatively scarce resources at the expense of a relative increase in other inputs.

Other innovations. Innovations may occur in other ways. Knowledge of management techniques may improve. New products are developed, which increase a firm's demand or lead to creation of entirely new industries. Improvements may occur in marketing procedures, and new markets may be discovered for old products. By reducing costs and creating product demands, these innovations generally increase the demand for investment at each rate of interest.

Changes in taxes A reduction in taxes or a liberalization of accounting depreciation practices permitted by law is likely to stimulate investment demand. Suppose that a firm expects added net operating profits of $10,000 a year from an investment project. It must then deduct estimated additional taxes. It is a fine art of corporate management to pick a legally-permitted depreciation for-

[3]Cf. William Fellner, *Trends and Cycles in Economic Activity* (New York: Henry Holt and Company, 1956), pp. 220–22.

mula which minimizes accounting profits and thus profit taxes. We shall not go into this.

Suffice it to suppose that $3,000 is expected to be taken each year by taxes of all types. This leaves $7,000 a year as the expected net return to the investment project. Either a reduction in tax rates or permission to use depreciation formulas that leave smaller accounting profits will serve to increase expected net returns and to stimulate investment. In the next chapter, we shall see that these changes have important stimulating effects on the financing side of investment as well.

Industry and Aggregate Investment Demand

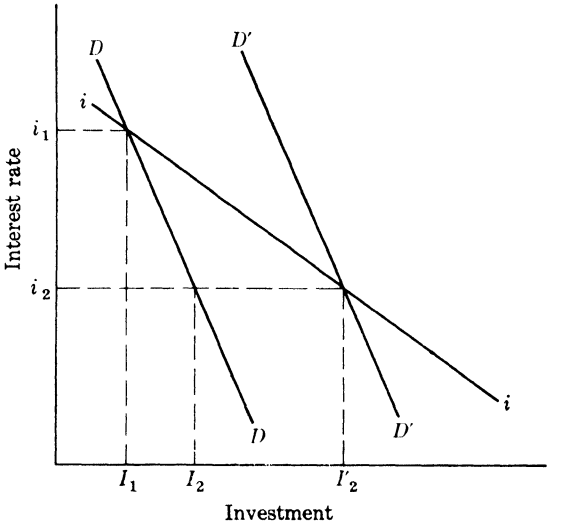
Factors determining an industry's demand for investment are the same as those for its constituent firms, with one exception. If entry is fairly easy, internal diseconomies of scale are not a substantial constraint on industry demand for investment.

When a single firm grows very large, it suffers increasing difficulties of management and rising transportation costs for products and supplies. It can reduce transportation costs by disbursing plants, but only at the expense of increased managerial costs and inefficiencies. However, in the industry, this is no limitation on capacity. If there are opportunities for expansion that existing firms cannot profitably exploit, new firms will enter the industry to take advantage of them.

We are now ready to switch from firm and industry to the total economy. Determinants of investment that could be treated as autonomous givens, such as product-demand conditions, now become interconnected with the demand for investment itself.

Interdependence of industry demands We cannot derive the aggregate investment demand function simply by adding horizontally the values of investment demanded by each industry, taken separately, at each rate of interest. An industry investment-demand function is dependent on a given demand for the industry's products. It shows investment by a single industry, acting alone, when the rate of interest changes.

When all industries act together, the combined increase in their investment raises product demand for all, through the multiplier



10-4 Shift of the industry investment demand function

effect. With a given stock of capital (and other determinants of investment), the increase in product demand causes an increase in investment demand for all industries. Thus, investment feeds back to stimulate more investment.

An example. Consider Figure 10-4. Function DD is the demand for investment by a single representative industry when the propensity to consume its product and the level of investment in all other industries are constant. If these givens remain constant, a decline in the rate of interest from i_1 to i_2 increases investment from I_1 to I_2.

However, when the market rate of interest falls, these things do not remain constant. The other industries begin to move down their own investment-demand functions and, when they do, aggregate investment rises, consumers have more income and spend more, and aggregate demand for gross national product expands. This shifts the investment function of our representative industry to the right ($D'D'$) when interest declines, until the industry invests I'_2 at interest rate i_2.

The resulting investment-interest relationship is the line ii, which is more elastic at each rate of interest than DD. The aggregate

investment-demand function, *II* in Figure 10-1, is the horizontal sum of *ii* lines for all industries at each rate of interest.

Elasticity depends on the multiplier What determines the elasticity of the aggregate investment demand function? First, it is affected by the elasticity of investment demand in each industry. If *DD* were more elastic (in all industries), a given fall in interest would generate more investment and, given the propensity to consume, this would shift *D'D'* and its intercept with i_2 further to the right. We shall discuss the elasticity of industry investment demand in the next chapter.

Second, elasticity depends upon the multiplier and thus, upon the marginal propensity to consume gross national income. Aggregate investment demand becomes more elastic when the marginal propensity to consume increases, since a given increase of investment generates a larger rise in demand for output.

Capital supply constraints Third, an increase in aggregate investment also affects relative input prices when full employment is approached. Wages tend to rise when employers bid for employees, and unions exploit their sellers' markets. The rise in wages and materials' prices also increases capital-goods prices, since equipment is made with labor and materials. Thus, capital goods do not become relatively cheaper than labor.

In fact, the reverse is likely to be true in the short run. When equipment orders increase beyond a certain point, they confront capacity limitations in the equipment producing industries. Some equipment firms begin rationing output, putting customers on a first-come-first-served basis. Order backlogs pile up, and this is one of the statistical indicators commonly employed to predict business conditions.

Construction contractors and some equipment producers meet orders when they come, but only by raising prices to cover the extraordinary expenses of employing overtime labor, reactivating obsolete standby equipment, and running machines at faster than optimum rates with fewer shutdowns for preventive maintenance. Whether by rationing or by price increases, equipment buyers are compelled or induced to limit their purchases. Capacity limits in capital-goods industries impose an important short-run constraint that makes aggregate investment demand less elastic.

Shifts in Aggregate Investment Demand

We shall deal at length with the forces which cause the aggregate demand curve to shift when we get to the chapter on economic growth. For the present, it will suffice to give a brief enumeration of them.

Increases in the stock of capital First, aggregate demand for investment declines (or shifts to the left; it doesn't matter which way we think of it) if the stock of capital grows relative to the level of national output, given other determinants of investment constant. When the capital-output ratios of firms reach optimum levels, these firms reduce investment to the point where capital will grow no faster than output if output continues to grow at the same pace. But, the very act of reducing investment causes aggregate demand to fall, making the demand for investment decline still further.

Growth in aggregate demand Second, demand for investment increases if output grows by increasing increments each year. Investment may be induced to expand each period sufficiently to maintain the desired capital-output ratios of producers. This condition, we shall find, plays a vital role in growth theory.

Diminishing returns Third, aggregate investment demand declines if capital increases relative to the supply of labor (or materials), given the state of technology. This is a long-run process, because the supply of labor is also growing, and the annual increment from investment is relatively small compared to the total stock of capital. Nevertheless, diminishing returns to capital occur when the amount of equipment used per worker increases.

Diminishing returns will be offset in their effect and investment will be maintained if the rate of interest falls sufficiently, relative to wages (and materials' prices). This reduces the cost of capital, relative to labor, and induces firms to continue adopting more labor-saving and capital-using methods. The investment demand curve still shifts to the left, but interest simultaneously moves down the curve by enough to offset this shift. If diminishing returns are not offset by a decline in the rate of interest, investment decreases and depression results.

Changes in technology Third, changes in technology shift the investment-demand curve to the right, or may keep it from

falling when capital grows relative to labor (and materials). The latter effect is apt to occur. When employers attempt to man their increasing equipment from the diminishing pool of unemployed, wages tend to be bid up. We have argued that when firms elect to adopt laborsaving improvements, it is likely to bring compensating changes in technology.

If technological change proceeds in this direction and at the right pace, returns to capital do not diminish and investment demand is not reduced. Innovation of this type seems to have been a major factor in our own economic growth, because capital used per worker has continually increased while returns to capital do not appear to have diminished materially over the long run.[4]

Schumpeterian waves. Major innovations create new industries, such as steam power and railroads, Bessemer and open-hearth steel, electric power and communications, automobiles and aircraft, organic chemicals and plastics, and radio and television. Joseph Schumpeter pointed out that such great innovations came in waves, rather than continuously, during the nineteenth and early twentieth centuries.[5] Invention of steam power and its application to water and rail transportation greatly expanded opportunities to invest, not only directly in these things, but also in supplying industries. When the boom developed, increased demand for consumer goods induced investment to expand capacity in consumer-goods industries as well.

Successful innovation by a few daring entrepreneurs led other businessmen to try innovations on their own. Schumpeter pointed out that a single basic idea may be applied in many directions. Steam power could not only be used in textile mills and transportation but could be applied in other types of manufacturing as well. Thus, there tended to be a "swarm" of related innovations.

In time, railroads were built as far as profitable present and forecasted future markets extended. The more easily discovered applications of steam power in other lines were applied to production, and the remaining investment opportunities diminished. While investment began to flag, firms maintained saving to pay off bank debts incurred to finance innovation and capital formation.

[4]Cf. Fellner, *op. cit.*

[5]See his classic theory of business growth and fluctuations, *The Theory of Economic Development* (Cambridge, Mass.: Harvard University Press, 1951). His theories are greatly extended, with historical illustrations, in his two-volume work, *Business Cycles* (New York: McGraw-Hill Book Company, Inc., 1939).

The result was depression. In time, panic would subside, prices and output would level and perhaps would increase somewhat when population and needs for capital replacement grew, but business would remain dull. A new boom would be ushered in when new innovational opportunities accumulated from invention, and new entrepreneurs of sufficient foresight and daring arose to take advantage of them.

Institutionalization of entrepreneurship. There are reasons to believe that innovation will not create such massive waves of investment in the future. For one thing, a new industry's investment is a much smaller portion of aggregate capital purchases in our affluent economy. Development of television would have been far more unsettling to aggregate demand in the nineteenth century than it has been since World War II.

Second, in Schumpeter's own words:

> . . . innovation itself is being reduced to routine. Technological progress is increasingly becoming the business of teams of trained specialists who turn out what is required and make it work in predictable ways. The romance of earlier commercial adventure is rapidly wearing away, because so many more things can be strictly calculated that had of old to be visualized in a flash of genius. . . . Thus, economic progress tends to become depersonalized and automatized.[6]

Not only is invention an ordered activity, but the act of introducing it in commercial and industrial activity — for which Schumpeter reserved the term innovation — is becoming automatic and continuous. Giant corporations not only schedule the inventions, they launch them in the market as they are perfected. No longer do inventions wait until a Carnegie or a Ford appears on the scene to use the foresight and daring that new enterprise demanded. Finally, Schumpeter held that the consuming public has become conditioned to accept readily and even seek out new products; so, innovation finds a more responsive market than in a custom-bound population. These things are apt to make technology's impact on investment demand more stable in the future.

Fiscal policy In ways we have made clear at the level of the individual firm, changes in business-tax and legal-depreciation rates

[6]Joseph Schumpeter, *Capitalism, Socialism, and Democracy, Third Edition* (New York: Harper & Brothers, 1950), pp. 132–33.

alter the demand for investment. So do changes in government purchases. In the first place, by raising aggregate demand they create the need for more equipment in industries in general. Second, these purchases often take the form of contracts with private producers, which raise their capacity needs directly.

Finally, public projects can be designed to make private investment more profitable by lowering costs of production and by expanding particular markets. Examples are highway construction, multi-purpose river valley development projects, and government research in applications of atomic energy in business. An equal increase in business taxes and government expenditures can be designed to have a net stimulating effect on private investment.

Expectations and Confidence

The businessman knows very little when he buys capital goods. He knows the current supply prices of equipment and contractors' bids on construction. He can ascertain present interest rates, though he must guess about their future levels. He is aware of the present state of technology, wages and materials prices, and demand for his product. Unfortunately, it is the future development of these things, during the life of the proposed new asset, that govern its profitability.

The present as a guide to the future We can make a few generalizations about the psychology of business expectations. First, businessmen tend to project into the future trends in output as well as prices and technology that they have experienced in the present and recent past (unless they have specific reasons to expect a change). Second, whatever they project as their best or most conservative guess, their confidence in this projection is an added dimension. Even though a businessman may expect a project to be profitable, market conditions may have been so unsettled recently that he has little confidence in this projection. He is apt to adopt a wait-and-see attitude, postponing the project for the time being.

Long- and short-term expectations Third, the businessman probably distinguishes between the long-term and the short-term outlook. Failure of sales to meet month-by-month expectations, or a general recession in business, is apt to be viewed as a temporary lull.

Firms cut back on orders for inventory and production schedules to avoid building up excessive stocks. However, their long-range capital plans are not disturbed, and they are apt to continue scheduled fixed-capital outlays.

There is an important exception to this last statement. The timing of fixed investment may be altered by a few months even though long-term expectations remain the same. This will be worth doing if management expects a current recession to reduce interest rates, so that financing is cheaper, or to make equipment available at lower supply prices.

The influence of speculation Fourth, long-term expectations may be held with reduced confidence at first and then, revised downward by events external to the firm. Businessmen are alert to indicators of change in over-all business conditions. A favorite indicator is stock market prices. The stock market is subject to powerful speculative movements and a bull market is apt to occur and then collapse for reasons that have very little to do with the long-term profit outlook.

Collapse of speculation provides some objective reasons for reduced confidence. The propensity to consume may diminish, as we have seen, and some investment spending is directly affected by inability to sell new shares at high prices. (High stock prices, relative to earnings, reduce the cost of investment financed by share issue, as we shall see in the next chapter.) Besides these, collapse of stock prices is widely viewed as a harbinger of depression, and this subjective element undermines confidence. Collapse of speculation in inventories or even real estate may have the same effect.

Optimism and pessimism Finally, business expectations and confidence may tend to run to extremes. When business is good and projects prove profitable, businessmen may become more optimistic than cold calculation would justify. On the other hand, when business has been in decline for many months and few signs of recovery have appeared, businessmen may grow overly pessimistic and may pass up investment opportunities that would normally be viewed as promising profits.

Real bases for reduced demand Students often come to think of depression as a purely psychological phenomenon, due only

to a loss in confidence. In some instances, this has probably been true. The short-lived depressions of 1907 and 1920–21, both apparently initiated by collapses in speculation, are cases in point. Opportunities for fixed investment seem to have remained favorable to prosperity and were soon exploited again once confidence in long-term expectations was regained.

However, there can be objective reasons for investment to remain below the level needed for full employment. Technological progress may fail to open up sufficient new opportunities. Diminishing returns to capital may occur when the stock rises relative to the labor force and supplies of raw materials. These problems can be rectified by sufficient changes in the propensity to consume and in the relations between wage rates, materials' prices, and the rate of interest. But, in real life, there are frictions and even barriers in the way of such adjustments.

Restoration of confidence is not enough to restore investment demand to the level which will support full-employment output. The slow deterioration of capital and growth in the labor force during depression also remedy the problem, at least for a few years, if given sufficient time. But these remedies, as well as the consumption and relative price adjustments remedies, take years to be effective, and, meanwhile, the depression persists as an awful reality. Appeals to businessmen to "have confidence in our future" fall on deaf ears.

Summary

The aggregate investment-demand function associates real investment with the rate of interest. Shifts in this function occur frequently and are apt to be more important than movements along it. Investment increases when a fall in the rate of interest occurs because the present value of each potential project rises relative to its present cost or supply price. A project promises to be profitable if gross present value exceeds present cost or if net present value is above zero.

The marginal efficiency of investment is the rate of return over present cost, and a project promises to be profitable if the MEI is above the rate of interest. A firm's investment-demand function represents the value of capital outlays expected to be profitable at each rate of interest. The height of this function, at every point, measures the MEI of the least promising project included, up to that point, in investment.

A firm's demand for investment is determined by (1) the demand for its product, (2) the stock of capital it possesses, (3) wage rates and other input prices, including the supply prices of capital goods, (4) the state of technology, and (5) tax rates and rules for depreciation. The industry's demand for investment is governed by the same factors, except that diseconomies of scale do not substantially limit demand if entry is fairly easy.

The elasticity of aggregate investment demand is partly dependent on elasticities of industry investment-demand functions, a topic we shall discuss in the next chapter. It also depends upon the multiplier, because an increase of investment, as interest falls, raises aggregate product demand via the multiplier and thus creates still more opportunity for investment. Finally, in the short run, rationing and rising equipment prices limit the increase of investment from a fall in the rate of interest.

The aggregate demand for investment changes with (1) changes in aggregate product demand, (2) changes in the stock of capital, (3) diminishing returns to capital when it grows relative to labor and natural resources, unless offset by change in technology and relative resource prices, (4) improvements in technology, and (5) changes in fiscal policy. Periodic major disturbances of investment demand and national income arose in the nineteenth and early twentieth centuries from swarms of innovational activities. However, Schumpeter, who stressed these waves, believed that innovation would be a more even force in the future.

Business expectation and confidence play independent roles in determining investment activity. Expectations seem to be largely based on recent experience and generally distinguish between the short-term and long-range outlooks. They are subject to change by outside events, such as speculation in the securities markets, and they may be prone to overoptimism and overpessimism. A depression may occur merely because of a shock to confidence, but it may also be due to inadequate returns to capital.

Reading and Research

General bibliographic references are given at the end of Chapter 1.

Capital budgeting. Techniques of capital budgeting are lucidly discussed in the book by Bierman and Smidt cited in footnotes. The

theory of capital valuation is discussed in articles in Ezra Solomon, ed., *The Management of Corporate Capital* (New York: The Free Press of Glencoe, 1959). See part 2 and the separate article by Jack Hirschleifer. This volume contains an extensive appendix bibliography.

Determinants of investment demand. Much of this discussion, particularly concerning relative input prices and diminishing returns, is Classical and neoclassical. See Adam Smith's *Wealth of Nations* (esp. Books I and II), David Ricardo's *Principles of Political Economy and Taxation*, John Stuart Mill's *Principles of Political Economy* (esp. Books I and IV), and Alfred Marshall's *Principles of Economics* (esp. Books IV and V, and Chapters XI–XIII).

Schumpeter's writings on innovation are cited in footnotes. Another famous theory of investment waves, due to overbuilding in boom, is Spiethoff's. See his article, "Overproduction," in the *Encyclopedia of the Social Sciences*, Vol. II (New York: The Macmillan Company, 1933), pp. 513–17; it is reprinted in Alvin Hansen and Richard Clemence, *Readings in Business Cycles and National Income* (New York: W. W. Norton and Company, Inc., 1953).

The effect of speculation on business expectations is brilliantly portrayed in Chapter XII of Keynes' *General Theory*. It is easy and delightful reading. See articles in M. J. Bowman, ed., *Expectations, Uncertainty, and Business Behavior* (New York: Social Sciences Research Council, 1958). Empirical materials are provided in E. Cary Brown, "Some Evidence in Business Expectations," *Review of Economics and Statistics*, vol. 31, no. 3 (August 1949) and Charles F. Roos, "Survey of Economic Forecasting Techniques," *Econometrica*, vol. 23, no. 4 (October 1955).

11 Investment Finance & the Accelerator

We shall consider three topics in the theory of investment behavior in this chapter. First, we abandon the assumption that investible funds are in unlimited supply at a constant rate of interest. Instead, we investigate sources of finance and their costs to management. This leads to an important modification in the theory of investment behavior.

Second, we take up another topic postponed in the previous chapter — the apparent elasticity of industry investment demand. Finally, we consider investment as induced by the relation between income and capital. This is formulated in the acceleration principle and, more broadly, the capital-adjustment principle. The accelerator

and multiplier are often linked together in dynamic models of growth and fluctuations. We shall set forth one such model and discuss its characteristics.

Costs of Finance

There are two principal sources of investible funds available to a firm. First, it has internal funds, which consist of current depreciation allowances and profits flows. In a particular year, they may also include stocks of cash and liquid assets in excess of those needed to facilitate week-by-week transactions and to provide contingency reserves. In this chapter, we shall assume our firm holds just the amount of liquidity it desires for these purposes and, furthermore, that its existing debt is not so large that it must allocate funds to advance repayment or build up liquidity to reduce the effective risk of this debt.

Second, the firm may finance investment with external funds. These are of two types: credit and equity (ownership). Credit funds are obtained by borrowing from banks, insurance companies and other financial institutions, and by issuing bonds for sale to the general public. If the firm is incorporated, it can obtain equity funds by issuing new shares of stock.

The lending rate of interest Internal funds are valued, by imputation, at the lending rate of interest. At a minimum, this is the going rate on government bonds. This rate is the minimum opportunity cost of funds for internal investment, because it is the income available if profits and depreciation were loaned by buying government bonds.

Government bonds are the safest securities and entail less risk than internal investment by the firm. Consequently, management is apt to impute a lending rate higher than interest on government bonds to allow for the greater risk. This may be equal to the going market rate on other securities which management views as equal in risk to internal investment.

Dividend payments. Instead of lending or investing profits internally, management might disburse them in dividends. However, as a rule upper-income stockholders are better served by retained earnings. The reason is the personal income tax. Suppose a stockholder must

pay 50 percent taxes on an additional $100 in dividends. Suppose our firm is able to lend this $100 at 5 percent. To obtain an equivalent gain, the stockholder must be able to lend his after-tax $50 at 10 percent.

Lending opportunities available to the firm are likely to be at least as lucrative as those available to the stockholder. Consequently, the stockholder, particularly if he is in a high tax bracket, does better to let the firm invest his earnings for him. The value of the stock rises to reflect increased assets and earnings. When the stockholder eventually needs cash, he can sell the stock and be taxed at the lower rate on capital gains.

Why should a firm pay dividends at all? Some don't. Middle-income stockholders may desire dividends for two reasons. First, they are in a low tax bracket; consequently, the income tax on dividends is no higher than the tax on capital gains. Second, they may wish to receive a steady stream of income for consumption. (They could get this by selling shares as they appreciate, but this entails brokerage fees and inconvenience.) To broaden its share market, the firm may elect to pay dividends, in order to attract such stockholders. For the same reason, it tries to maintain a stable and continually rising dividend record. Thus, we can treat dividend policy as a given factor in the short run and ignore it as a decision variable in allocating internal funds.

The borrowing rate of interest The price of external funds is the borrowing rate of interest. This is also apt to be an imputed price, to cover risks and inconveniences. In this context, we use the term "borrowing" to cover both credit and equity funds.

Credit rates vary according to whether debt is short or long term; secured by specific assets or unsecured. Equity costs depend upon whether stock is preferred or common and upon the rights it gives to stockholders. It is a fine art of corporate financial management to obtain funds in such mixture that combined costs are minimized. We shall assume that the firm does this. By the borrowing rate, we shall mean a weighted average of market and imputed interest rates on the various types of external funds that make up the bundle of finance.

For various reasons, the borrowing rate ordinarily increases as the firm seeks more external funds. For modest amounts of short term credit, the borrowing rate may be below the lending rate. In this case,

the lending rate governs in evaluating investment projects, since the firm has the option of lending what it has borrowed.

Costs of credit. When we turn to large-scale borrowing and equity financing, the borrowing rate ordinarily rises above the lending rate. Even the minimum borrowing rate may be above the lending rate.

First, lenders charge higher rates as the risk of default grows with greater indebtedness. If the lender and borrower were of one mind concerning the risks involved, the borrowing rate would not rise above the lending rate. They would both rise together in view of the increasing risk of default and forced liquidation of the business. However, outside lenders are apt to put the risk higher, since they do not operate the enterprise and do not share management's optimism and self-confidence.

Second, creditors inspect the books and place limitations on management's prerogatives. They may require that the firm store up more liquidity. They may expect to be represented on the board of directors. Their consent may be required in later financing, investment, and production decisions. Such interferences cause management to impute a higher cost to credit.

Costs of equity. Third, if voting stock is issued, there is added danger that insiders (current owners and management) may lose control to outsiders (new owners). Unless present majority stockholders are able and ready to buy the new issue, a firm is apt to be reluctant to take this risk. Also, government requires publication of financial records when stock is issued for public sale, which management may prefer to keep secret from competitors, unions, stockholders, and federal trust-busters.

Fourth, even if it is willing to issue new stock, management should evaluate the cost high enough to avoid diluting earnings and wealth of present stockholders. It must expect to earn at least as much per share on the new stock as it would earn per share on the old if no new shares were issued. As a rate of interest, this cost is the required earnings per share divided by the net proceeds expected per new share sold. For instance, if a new share must earn one dollar and net receipts from issue are 10 dollars, the cost of equity funds is 10 percent.

Finally, there is the cost of issuing the shares. A small and relatively unknown corporation, selling shares in the over-the-counter market, is likely to find costs of equity very high, both because buyers

pay a low price relative to earnings and because underwriting and other costs of issuance are comparatively high.

The effect of speculation If the stockmarket views the risks and returns of the enterprise the same as management, the market price-earnings ratio will be the same as the lending rate. Thus, the interest rate on equity funds will be the same, except for issuance costs. However, under normal circumstances stockholders are removed from management and do not share the same outlook for the enterprise. The market may undervalue the risk of such a giant corporation as General Motors or International Telephone and Telegraph Corporation. It is apt to overrate the risk for small and lesser-known firms. This serves to raise borrowing rates for the latter above lending rates (in addition to the effects of control-risk and issuance costs).

There is an occasionally important exception. When a speculative bull market develops, stockholders lose sight of long-term earnings and concentrate on short-term capital gains. The more they buy, the higher prices go, and the more they buy. Very risky stocks are raised to record levels when caught up by the buying fever. New issues, even by entirely new enterprises, are oversubscribed before they reach the market. The cost of equity finance falls and may decline below the lending rate for large firms. During the bull market of the late Twenties, some manufacturing firms issued stock in order to lend the proceeds to borrowers who wished to speculate in the market!

The rising cost of funds When a firm seeks increasing amounts of external funds, the borrowing rate ordinarily rises. Consider a small unincorporated firm, first. It cannot issue stock and must depend upon credit. Furthermore, being small and local, it has access to only a few banks and other lending institutions. The more it borrows, the greater are the risks of default. The borrowing rate soon rises with increasing steepness until lenders refuse to extend more credit at any price. This is an absolute barrier to the firm's ability to finance investment.

At the other extreme is the giant corporation. It, too, will run into rising credit rates if it increases debt substantially, though it is able to borrow from lending institutions throughout the nation and sell bonds to the public. However, it has the option of selling stock. Its assets are huge, its operations are well diversified, and it is well known and

respected by the public. Consequently, the price of its shares is high relative to earnings, and costs of issuing stock are negligible.

Division of ownership and control. Moreover, our giant is apt to be management-controlled. Since ownership is so widely dispersed among small stockholders, there is little danger of any one person or group corralling a majority of shares. Issuing more stock simply disperses ownership further, and there is no reluctance to do so. For this firm, the borrowing rate is very little, if at all, above the lending rate. It is, like our firm in the previous chapter, able to obtain as much finance as it desires at a single rate of interest.

Most corporations fall somewhere in between. A small and (or) closely-held firm finds stock issuance both costly and risky. Its investments are nearly as closely limited by credit constraints as in the case of the small unincorporated firm. Few corporations are so large and widely-held that the borrowing rate is not materially above the lending rate and rises when more external funds are sought. The rate rises because there is an increasing danger of control loss when larger blocks are issued, and shares command lower prices when the number of interested buyers is limited.

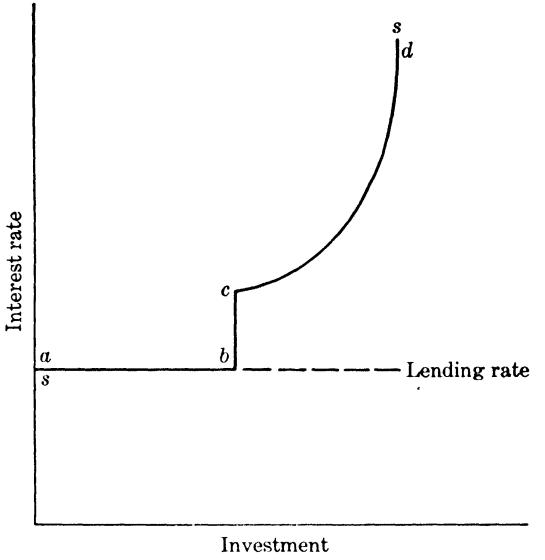
The Marginal Cost of Funds

We shall now introduce another measure of the cost of finance, which is different from the lending or the borrowing rates of interest, though it may be equal to one or the other. This is the marginal cost of funds (MCF), which is expressed as a percentage rate. The MCF is the change in the cost of funds associated with an incremental change in the supply of funds.[1]

Suppose that a firm can borrow $100,000 at 6 percent. If it wishes to borrow an additional $20,000, the lender sets the interest rate higher for the whole $120,000, since the added risk is borne by the whole debt. Suppose that the lender sets the rate for $120,000 at 7 percent. Thus, the total interest charge on $100,000 would be $6,000 a year, while the total on $120,000 would be $8,400.

Borrowing an additional $20,000 will thus subject the firm to an additional $2,400 in annual interest charges. Consequently, the

[1]Cf. Albert G. Hart, *Anticipations, Uncertainty, and Dynamic Planning* (New York: August M. Kelley, Inc., 1951), p. 43.



11-1 The supply of investible funds

marginal cost of funds is 12 percent ($2,400/$20,000). Note that the MCF is greater than the higher borrowing rate. This will be true as long as the borrowing rate is rising.

The supply of funds curve Figure 11-1 shows a supply curve (*ss*) of investible funds faced by a firm. The height of this curve at every point is the marginal cost of the funds measured along the horizontal axis. From point *a*, at the vertical axis, to point *b*, the MCF is constant and equal to the lending rate. This distance represents the supply of internal funds from depreciation and profits (and perhaps modest short term bank borrowing for which the rate of interest is below the lending rate).

If our firm were a giant corporation, the supply of funds might continue as a horizontal function beyond *b* and off the page. Instead, we have pictured the case for a small firm, which might be either unincorporated or a closely-held corporation reluctant to issue stock.

Credit rationing. The step up from *b* to *c* occurs because the lowest borrowing rate for fixed-capital long-term financing is above the lending rate. The height of this gap will vary from firm to firm, depending upon the amount of existing debt, lenders' assessments of

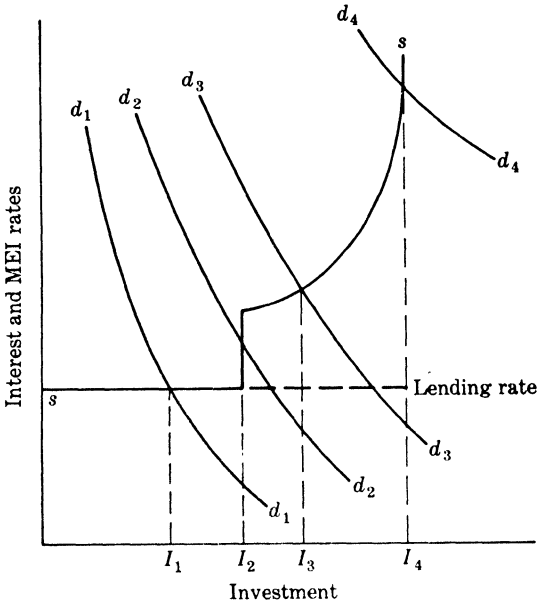
risk, the firm's willingness to go into debt, and other factors we have mentioned. In some firms there may be no gap, but most managements appear to view the lowest borrowing rate as above the rate on internal funds. Many firms have a policy of limiting capital outlays each year to the flow of depreciation and profits (in excess of other commitments), except in extraordinary cases.

From c to d, the marginal cost of funds rises at an increasing rate until the supply curve becomes perfectly inelastic. This is due to increasing risk when debt grows. In the case of a corporation, management refuses to issue unlimited shares because it fears losing control of the corporation and because larger blocks of stock must be sold at lower and lower prices. The less elastic the supply curve, the greater the constraint it imposes on investment. Perfect inelasticity means an absolute constraint or, in other words, rationing. The step-up zone from b to c is also a case of credit rationing, which may be partly self-imposed by management's reluctance to borrow.

Equilibrium investment We must now amend our previous rules for accepting investment projects. The new MEI rule is: if the marginal efficiency of investment is greater than the marginal cost of funds, the project promises to be profitable; if it is less, the project does not promise to be profitable. In order to finance an investment, a project must promise a rate of return over present cost that exceeds the increase in interest costs, expressed as a rate. The present value rules are: accept a project if its gross present value, discounted at the marginal cost of funds, is greater than its present cost or if its net present value is positive. Reject the project if this is not true.

The investment-demand function of our firm is shown in four different positions in Figure 11-2. A continuous function is used, instead of the more realistic step function of Figure 10-2, to simplify the chart and because the steps are of negligible importance in analysis of aggregate investment behavior. With demand at d_1d_1, our firm should invest I_1. At less investment, the MEI, measured by d_1d_1, is greater than the MCF, which is equal to the lending rate in this case. At greater investment, the MEI would fall short of the MCF.

Effect of credit rationing. With demand in position d_2d_2, the firm should invest I_2. The last project accepted, in this case, has a marginal efficiency well above the marginal cost of funds. However, one



11-2 Investment equilibria

more project would have an MEI well below the MCF, because of the jump when external funds are obtained. Investment I_2 is also entirely financed with internal funds. Note that d_2d_2 can shift to left or right in some degree without changing the equilibrium level of investment.

Demand d_3d_3 crosses the supply curve in the borrowing range. Investment is I_3, at which point the marginal efficiency of investment has declined to equality with the marginal cost of funds. The more inelastic the supply of funds curve, the less will investment increase when the demand curve shifts to the right by a given amount.

At position d_4d_4, investment is fixed at I_4. There is absolute credit rationing and no more investment can be financed, even though the demand curve should shift further to the right.[2]

[2]It may be replied that if expected returns to investment are extremely lucrative, funds will be made available at high rates even to a small unincorporated firm. This may be, but in practice, opportunities are rarely spectacular for such firms, and credit rationing by lending institutions is a reality facing most small businessmen. Up above the page, at some place, ss may turn a corner and point east, but this is irrelevant to most firms.

Stabilizing Effects on Investment

Now let us see how financial constraints affect aggregate investment behavior. First, let us consider the effects of an increase in the marginal efficiency of investment, as might occur with technological change. In our representative firm, the investment demand function (dd) shifts to the right.

Change in the marginal efficiency of investment If the demand function shifts within the zone between the lending rate and the lowest borrowing rate, there is no change of investment. The marginal project is still not expected to be sufficiently profitable to warrant borrowing. If demand shifts in the zone around d_3d_3, there will be some increase of investment, but this will diminish when the supply curve becomes less elastic. In the d_4d_4 zone, additional projects cannot be financed at all.

Backlogging of projects. Even though projects may promise high enough returns to warrant borrowing, management may postpone them for a year or two. This may be a sensible course if it anticipates that next year total investment opportunities, including the ones to be postponed, will not exceed the supply of internal funds. By waiting, these projects can be financed less expensively. Whether it pays to wait depends upon the difference between lending and borrowing rates and upon the net returns foregone in the meantime. Firms may thus build up a backlog of projects which help sustain aggregate investment after the birth of new opportunities flags.

A reduction in expected returns is moderated, in its effect on actual investment, in the same way for those firms in the borrowing ranges. In sum, credit rationing and inelasticity serve to make aggregate investment behavior more stable than it would otherwise be.

Change in the supply of funds The same force which shifts the investment-demand function of our representative firm may also shift its supply of funds curve in the same direction. This is particularly apt to be true of an increase in aggregate product demand. With larger sales, internal funds from profits are increased along with the desire to enlarge capacity. The shift in the supply function moderates, but does not remove the stabilizing effect of credit rationing.

The increase in current profit is seldom sufficient to finance the

whole increase in capacity called for by the increase in production requirements. A capital good does not ordinarily return its cost in depreciation, plus profit, until after several years of employment. Thus, financial limitations continue to serve as a modifying restraint on aggregate investment behavior.

Change in the rate of interest Next, let us consider the effects of a rise or fall in the general structure of interest rates — what we really have in mind when we speak of a change in "the" rate of interest. A fall in the rate of interest means a drop in both lending and borrowing rates. The supply of funds curve shifts downward. A firm with demand d_4d_4, in Figure 11-2, is not helped. Risks are so great that lenders are unwilling to lend to this firm.

Credit rationing also deters further investment by the firm in d_2d_2 position, unless the borrowing rate falls quite a bit. The firm with demand at d_3d_3 will increase its investment, but not by as much as the firm in the d_1d_1 position.

Similar reasoning applies to an increase in the rate of interest. Thus, credit rationing and inelasticity in the supply of funds work to reduce the sensitivity of investment to changes in the rate of interest.

Entry and expansion by large firms Although credit rationing and inelasticity restrain small and medium-sized firms, shouldn't we expect larger corporations in the industry to seize the opportunities which lesser firms pass up? Furthermore, shouldn't we expect entry of new firms or large corporations from other industries? Won't these events offset the effects of credit rationing?

The success of the large corporation is principally due to the ease with which it can obtain capital. We see traditional preserves of the small businessman, such as retailing, being invaded by corporate chains able to establish large stores that far exceed the financial resources of most unincorporated retailers.

Nevertheless, there are many frictions in the short run. Information concerning investment opportunities for an existing firm may not be available to outsiders. They must first suspect the opportunity and then verify it by statistical studies and by other means. Credit limits make it even more difficult to launch new firms than to expand old ones that have established lines of credit and debt ratings.

Established firms enjoy customer loyalties. It takes time and expense for entering firms to attract customers through advertising and

through other promotional means. Even large corporations hesitate to enter entirely new fields, where the present skills and knowledge of management are of little advantage. States regulate expansion in banking and some other industries; a large corporation may be deterred by fear of federal antitrust prosecution. These and other frictions preserve some of the stabilizing effects of credit rationing and inelasticity in the short run.

The Elasticity of Aggregate Investment Demand

In part, the responsiveness of aggregate investment to changes in the rate of interest depends upon the elasticities of industry investment-demand functions. Let us take a closer look at how elastic these appear to be in practice. Whether investment is sensitive to changes in the rate of interest seems to depend upon (1) the size of total interest charges relative to debt principal, (2) degrees of uncertainty attached to forecasts, and (3) the type of financing employed.

Residential construction About one dollar in four of gross private domestic investment finances residential construction. This type of expenditure has seemed to be fairly sensitive to changing interest rates. One reason is that the typical home buyer relies heavily on borrowing, and the aggregate cost of interest on a long-term mortgage is high relative to the principal of the loan. A change in mortgage rates by one percentage point substantially alters the cost of a home. For instance, interest on $20,000 borrowed for 20 years at 5 percent amounts to $11,680, whereas at 6 percent, it becomes $17,255. The typical borrower may pay more attention to his monthly bill; it rises from $132 to $143.

Plant and equipment expenditures More than 70 percent of gross private domestic investment is plant and equipment purchases by firms and nonprofit institutions. Interview, questionnaire, and statistical studies have almost invariably indicated that this type of investment is poorly responsive to changes in the rate of interest.[3]

[3]For example, see Robert Eisner, "Determinants of Capital Expenditures; An Interview Study," *University of Illinois Bulletin*, vol. 53, no. 43 (February 1956). Such studies are cited and critically reviewed in W. H. White, "Interest Inelasticity of Investment Demand — The Case from Business Attitude Surveys Re-examined," *American Economic Review*, vol. 46, no. 4 (September 1956), pp. 565–87.

One reason seems to be the uncertainty of expectations, which leads firms to accept only projects having marginal efficiencies of investment much higher than market rates of interest. Moderate changes in market rates are thus of secondary importance in their effects on profits and can be ignored.

Cut-off rates and payoff periods. One way firms do this is to set a high cut-off rate or lending rate, in our terms, for rejecting proposed projects. If a firm refuses to accept any proposals promising less than, say, a 15 percent rate of return, a change in the market rate of interest from 5 to 6 percent has little effect on investment.

Another practice with the same result is to set short payoff periods for equipment. Though a machine is expected to remain in service five years, management refuses to invest unless the machine is expected to yield its supply price in three years. This ordinarily means that the marginal efficiency of investment is considerably above market interest rates.

Credit rationing. Some executives, in answer to interviewers, reply that interest rates do not affect their outlays because investment is limited to the supply of internal funds. They may assign a lending rate, perhaps terming it a cut-off rate, to these funds and, over the long run, adjust it to trends in market interest rates. However, in the short run, it is impractical to make frequent adjustments, particularly since the lending rate is set high enough to allow a substantial premium for risk.

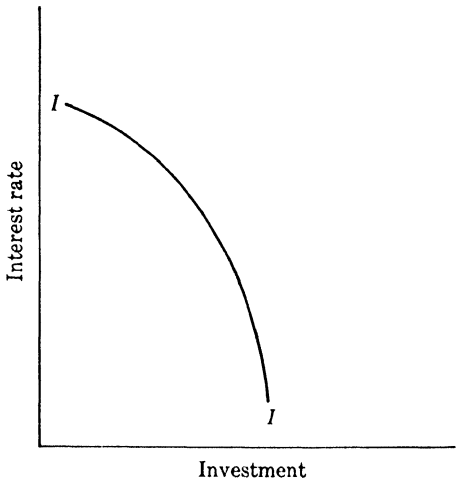
By limiting investment to internal funds, in most years, these firms are restricted by their own credit rationing. Other small firms find their credit rationed by lenders. We have seen how credit rationing and inelasticity limit the responsiveness of investment to changes in the market rate of interest.

Market power. Finally, firms, in imperfect competition and facing inelastic product demand conditions they have not fully exploited, may shift added interest costs to their customers and (or) secure more profits for internal financing by raising prices. Public utilities borrow heavily for long-term financing in almost assured markets. However, public-regulating authorities include interest charges in the cost base used to set utilities prices and are prone to allow firms to pass on these charges to their customers.

Inventory investment Investment in inventories is probably least sensitive to changes in the rate of interest. Firms add to materials and finished goods stocks when they expect rising sales, production requirements or prices. They reduce inventories when expectations turn the other way. The gains or losses from such changes are likely to outweigh the relatively small interest costs of carrying inventories.

Changes in credit rationing During periods when shortages of bank reserves cause interest rates to rise, banks are apt to ration loans more strictly in order to conserve reserves and to meet legal reserve requirements. This means the upper portions of *ss* in Figure 11-2 become less elastic and the vertical section, through which d_4d_4 passes, shifts to the left. Stricter credit rationing, rather than the rise in the market rate of interest, serves to reduce investment. There is evidence that mortgage borrowing has been particularly affected by this factor.[4]

11-3 The aggregate investment demand curve



[4]See the study by Warren L. Smith in: Joint Economic Committee, *Staff Report on Employment, Growth, and Price Levels*, 86th Cong., 1st sess. (Washington, D.C.: U.S. Government Printing Office, 1960), pp. 363–68. An empirical study of credit rationing is: G. L. Bach and C. J. Huizenga, "The Differential Effects of Tight Money," *American Economic Review*, vol. 51, no. 1 (March 1961), pp. 52–80.

Unusually high rates of interest If the market rate rises to unusually high levels, aggregate investment is apt to be more responsive to it. Total interest costs on debt are high relative to principal, and risk cushions may no longer provide the same profit assurances. Cut-off rates are likely to be raised and pay-off periods shortened. Consequently, we redraw the aggregate investment demand curve as *II* in Figure 11-3. It bends over and becomes more elastic as the rate of interest declines from high levels. The elasticity at any point also depends upon the value of the multiplier and upon the capacity of equipment producers. The latter also serves to make demand less elastic as the rate of interest falls.

The Acceleration Principle

Before leaving the theory of investment, we need to add one more tool to our box. This is the acceleration principle or, for short, the accelerator. The accelerator is concerned exclusively with the effect on investment demand of the relationship between production requirements and the stock of capital. It assumes that the state of technology, relative input prices, and numerous other things are constant or at least neutral in their effects on the desired capital-output ratio. Despite these and other assumptions, the accelerator has enough truth in it to give us an important clue to investment behavior.

Accelerator equations The acceleration principle postulates that net investment in a period is equal to the difference between desired capital, which is a constant multiple of current output, and the existing stock of capital. We shall want to consider it in terms of gross investment; so, we include the period's replacement requirement. The acceleration principle for gross investment is summarized in the following equation:

$$I_t = kY_t - K_t + D_t \tag{11-1}$$

Investment in period t is equal to the difference between desired capital (kY_t) and capital existing at the beginning of the period (K_t), plus the depreciation of capital in this period (D_t), which measures replacement requirements if capital is to be maintained.

Desired capital is a constant multiple (k) of the level of output in

period t (Y_t). We term the small k the accelerator coefficient. If firms in an industry, on the average, desire to maintain capital worth three times as much as output (we assume prices constant), the value of k is three. The accelerator coefficient is just another name for the desired capital-output ratio.

An alternative statement. The accelerator is often stated in another way. When output changes, investment is required in order to increase capacity. Thus, investment is determined by the change in output (plus replacement requirements in the case of gross investment). We can easily show that Equation 11-1 is equivalent to this way of stating the accelerator. Subtract investment of last period from investment in the current period and rearrange terms in the following way:

$$I_t - I_{t-1} = k(Y_t - Y_{t-1}) - (K_t - K_{t-1}) + (D_t - D_{t-1})$$

$$= k(Y_t - Y_{t-1}) - [(K_t - K_{t-1}) + D_{t-1}] + D_t$$

Now, the difference between capital at the beginning of this period and the stock at the beginning of last period ($K_t - K_{t-1}$) is, by definition, net investment last period. If we add to this last period's depreciation (D_{t-1}), we have gross investment last period (I_{t-1}). Thus, gross investment last period appears as a negative item on both sides of the equation and can be cancelled out. Doing this we have:

$$I_t = k(Y_t - Y_{t-1}) + D_t \tag{11-2}$$

The zero floor. Before using the accelerator in an example, we should be aware of one limitation on it. Gross investment cannot be less than zero. Firms can do no worse than buy no capital goods at all in a period. This puts a floor under the acceleration effect.

An accelerator example Now, suppose that an industry has a desired capital-output ratio of three. Let us see what happens to investment when demand and output go through a cycle of expansion, contraction, and recovery. The example is tabulated in Figure 11-4. In the long run, depreciation must increase with the stock of capital, but in the short run, we can assume it to be a constant $50 million each period.

In the first period, output is $100 million. Desired capital is thus

11-4 An industry accelerator model
(Millions of dollars)

Period	*Output*	*Capital desired*	*Capital existing*	*Depreciation*	*Gross investment*
1	100	300	300	50	50
2	110	330	300	50	80
3	130	390	330	50	110
4	150	450	390	50	110
5	160	480	450	50	80
6	160	480	480	50	50
7	110	330	480	50	0
8	80	240	430	50	0
9	80	240	380	50	0
10	80	240	330	50	0
11	80	240	280	50	10
12	80	240	240	50	50
13	100	300	240	50	110
14	100	300	300	50	50

$300 million and existing capital equals this figure. Income is in stationary equilibrium, and investment is confined to replacement.

Volatility of investment. In period two, output increases to $110 million and desired capital to $330 million. However, capital was not expanded in the first period; so, its value at the beginning of the second period is only $300 million. Thus, firms in our industry invest $30 million to expand capital and $50 million to offset depreciation; so, gross investment is $80 million. Note that an increase in output of only $10 million raised investment by $30 million. If the desired capital-output ratio in reality is on the order of two or three, as it seems to be for the full economy, we can see why construction and equipment production tend to be feast-or-famine industries.

In the third period, output has risen by $20 million and investment jumps by $60 million. Investment in the previous period raised capital to $330 million, but firms now desire $390 million. In the fourth period, output has again increased by $20 million, and investment is again $110 million. Note that if output increases by equal increments each period, investment remains constant from period to period; it does not increase.

Investment depends on the rate of growth. In the fifth period, output has increased to $160 million. The increase is the same as in period

two and gross investment is, therefore, the same. Note that, although output is still *increasing*, investment has *decreased* from the fourth period. When output grows by decreasing increments, investment falls.

By the sixth period, output has levelled off at $160 million. Thus, investment drops to the value needed for replacement. If output remained constant in subsequent periods, gross investment would remain constant at $50 million.

Effect of the zero floor. However, in the seventh period, demand drops rapidly, and production is curtailed to $110 million. Existing capital exceeds desired capital by more than depreciation. Even though gross investment collapses to nothing, the stock of capital is reduced only $50 million by depreciation. Consequently, in the eighth period, firms continue to disinvest. In fact, although output falls no further, firms fail to replace any of their capital in the ninth and tenth periods. Finally, in the eleventh period, replacement is resumed by $10 million and, in the twelfth period, firms replace all their depreciation.

The zero floor on gross investment and the durability of capital have created an assymmetrical effect. When output levelled off after expansion, investment immediately took the replacement value. But, when output levelled off after contraction, investment remained below complete replacement for five periods. During this time, producers held idle capital. It took five periods for normal wear and tear to reduce capital in operation to the point where replacement by idle equipment could no longer be made.

In the thirteenth period, output recovers to its level of the first period. This requires net investment, but, in the fourteenth period, investment returns to the level of depreciation.

A lagged accelerator One shortcoming of our accelerator can easily be rectified. We have assumed producers determine desired capital on the basis of current output. However, they don't know what current output will total until the period is over (although they should be able to get a fairly good prediction of it before this). Therefore, many economists prefer to put a lag in the accelerator:

$$I_t = kY_{t-1} - K_t + D_t \tag{11-3}$$

or

$$I_t = k(Y_{t-1} - Y_{t-2}) + D_t \tag{11-4}$$

That is, firms invest an amount in period t that will raise capital to the level desired on the basis of the previous period's production. The assumption is that demand in the current period will be the same as experienced last period.

If we apply this formula to our previous example, the figures for investment are the same, except that they occur one period later. The accelerator can be lagged three or more periods. It can contain distributed lags, being dependent upon current output and upon outputs several periods back. We shall leave these for more advanced books.

Multiplier-Accelerator Models

The acceleration principle can be applied to aggregate investment in the economy. This suggests linking it up with the multiplier in a feedback model. Many such multiplier-accelerator models have been formulated, and their properties investigated. Without a lag, such a model can be used to describe economic growth, and we shall later consider one worked out by Roy Harrod for this purpose. If a lag is placed in the accelerator (or multiplier), the feedback model can be made to generate cycles. John R. Hicks and others have employed such models in the study of business fluctuations. (See Reading and Research at the end of this chapter for citations.)

An inventory model The accelerator can be used for any type of capital, including inventories and housing. The latter can be made to depend upon change in population as well as upon income. Let us try our hand with a lagged inventory accelerator-multiplier model. We make three changes in the accelerator.

First, there is no depreciation of inventories. Second, inventory investment is net and can be either positive or negative (disinvestment). Thus, there is no zero floor (within practical limits).

Third, we shall include autonomous investment. It is conventional, in discussing the accelerator, to distinguish between induced and autonomous investment. Investment is induced, in this context, by a change of income. Thus, the pure accelerator is confined to induced investment. Autonomous investment covers capital outlays not induced by a change in income. They may be induced by other things, such as technological progress, but they are not termed induced in

this context. Since we are concentrating on inventories, we shall treat all fixed-capital investment as autonomous.

Algebra of the model. Our accelerator is:

$$I_t = kY_{t-1} - K_t + A_t \tag{11-5}$$

or

$$I_t = k(Y_{t-1} - Y_{t-2}) + A_t \tag{11-6}$$

Investment (I_t) is gross investment in inventories and fixed capital. The latter is indicated by A_t, for autonomous investment. The inventory portion of investment is determined by the difference between desired inventories (kY_{t-1}), and inventories existing at the beginning of the present period (K_t). Producers wish to maintain inventory stocks in a certain proportion (k) to expected sales, which they assume will be the same as in the last period.

The change in national income from one period to the next is, of course, the change in investment between the two periods *times* the multiplier. Thus,

$$Y_{t-1} - Y_{t-2} = m(I_{t-1} - I_{t-2}) \tag{11-7}$$

Substituting Equation 11-7 into 11-6, we have investment determined by both the accelerator and the multiplier:

$$I_t = km(I_{t-1} - I_{t-2}) + A_t \tag{11-8}$$

The level of income. We can determine the level of income each period by repeating an operation of Chapter 6:

$$C_t = a + cY_t \qquad \text{(the consumption function)}$$

$$Y_t = C_t + I_t \qquad \text{(equilibrium requirement)}$$

Thus,

$$\begin{aligned} Y_t &= a + cY_t + I_t \\ &= \frac{a}{1-c} + \frac{I_t}{1-c} \\ &= ma + mI_t \end{aligned} \tag{11-9}$$

Let us again assume that the marginal propensity to consume is six-tenths, giving a multiplier of 2.5, and that the intercept a is \$20 million. We shall suppose that firms wish to hold inventories in a

period equal to almost a third of expected sales. To be exact, let us give k the value .32. Our equations now have the values:

$$I_t = .8(I_{t-1} - I_{t-2}) + A_t \tag{11-8a}$$

$$Y_t = 50 + 2.5I_t \tag{11-9a}$$

Behavior of the model. In Figure 11-5, we use these equations to show what happens when a once-and-for-all change of autonomous investment alters the equilibrium level of national income. In period one, investment, which has remained constant for many periods, is at its initial autonomous level of $75 million. Income is in equilibrium at $237.5 million.

In period two, autonomous investment rises to $100 million and remains at this figure in subsequent periods. In this period, income is momentarily at its ultimate equilibrium value corresponding to this new level of autonomous investment. However, the increase of income from period one brings the accelerator into action. Firms decide to add more inventories. Thus, in the third period, they invest an amount equal to .32 of the increase of income, or eight-tenths of the

11-5 An inventory accelerator-multiplier model
(Billions of dollars)

$I_t = .8(I_{t-1} - I_{t-2}) + A_t$				$Y_t = 50 + 2.5I_t$
Period	*Income*	*Consumption*	*Investment*	*Remarks*
1	237.5	162.5	75.0	Initial equilibrium
2	300	200	100	Auton. invest. increases
3	350	230	120	$I = 100 + .8(I_2 - I_1)$
4	340	224	116	$I = 100 + .8(I_3 - I_2)$
5	292	195.2	96.8	
6	261.6	176.96	84.64	
7	275.68	185.41	90.27	
8	311.26	206.76	104.51	
9	328.47	217.08	111.39	
10	313.76	208.26	105.51	
11	288.24	192.94	95.29	
12	279.58	187.75	91.83	
13	293.07	195.84	97.23	
14	310.80	206.48	104.32	
15	314.18	208.51	105.67	
16	302.70	201.62	101.08	
inf.	300	200	100	

increase of investment from the first to the second period, plus the new amount of autonomous investment. Total investment is greater than before and expansion occurs.

Note that the expansion gives way to contraction after period three. Income swings down below its ultimate equilibrium level, then swings back above it. It is said to *hunt* its equilibrium. In this case, income hunts much as a pendulum, once set in motion, hunts its vertical equilibrium with gravity. The cycles damp down as time goes by. Note the peak in the ninth period is lower than that in the third period, and the one in the fifteenth period is still lower. The same trend toward $300 million can be seen in the troughs.

Generalizing the results Ultimately, the oscillations diminish to the point where we can regard income as being in its new $300 million equilibrium position — unless new disturbances, such as another change in autonomous investment or a rise in the propensity to consume, set new waves into motion. The rapidity with which income adjusts to its new equilibrium depends upon the size of the multiplier and of the accelerator. We deliberately chose a product of the two which is less than unity (i.e., $km = .8$). If it were unity, the cycles would continue indefinitely with constant amplitude and if it were greater than unity, they would be antidamped, increasing in amplitude until the system finally breaks down. In these cases, once equilibrium is disturbed, it is never restored.[5]

The Capital Adjustment Principle

It is easy to find fault with the accelerator. It assumes away most of the constraints on investment that businessmen actually experience It assumes, first, that firms start out with optimum capital stocks. Thus, the accelerator is apt to be weak as a recovery device in depression, when capacity is redundant. We indicated this by introducing the zero-floor constraint.

[5]It can be shown that $I_t = (km)^{t/2}U + A_t$, where U can be termed the *undulator*. The undulator is a trigonometric expression that creates waves much like the familiar sine curve. The first term, $(km)^{t/2}$, determines the *relative* amplitude of successive waves. It is apparent that if km is less than unity, this term diminishes in value over time and the waves are damped; if it is greater than unity, the waves are antidamped. The easiest way to master the algebra of multiplier-accelerator models is to read William Baumol, *Economic Dynamics, Second Edition* (New York: The Macmillan Company, 1959).

Assumptions of the accelerator Second, it assumes that producers will be able to acquire enough capital each period to maintain the desired ratio to output. This ignores the fact that some capital goods take more than one period to produce, that there are capacity limits on equipment producers, and that investible funds are limited. Third, the accelerator takes a strange view of producer expectations. Firms are not permitted to expect a further change in income but must predict that it will be the same for the next period as it is in the current one (unlagged accelerator) or as it was in the last period (lagged accelerator).

Fourth, the desired capital-output ratio is treated as a constant (k). For a single firm it varies, because of the lumpiness or indivisibility of machinery and because of increasing and decreasing returns to scale that arise for other reasons. In the aggregate, the desired ratio will change when the composition of output changes, since some industries use more capital per unit of output than do others. Moreover, the desired ratio is affected by changes in technology and relative input prices.

Validity of the accelerator Nevertheless, the accelerator does isolate some phenomena of investment behavior which appear realistic, particularly during relatively slow changes in national income and output. When output grows, more capital is needed for capacity, and the size of investment demand is likely to be greater when the rate of expansion in output is higher. If output grows at a diminishing rate, we should expect that before long investment demand will decline, unless there are compensating changes in relative input prices, technology, and the composition of aggregate demand. It is difficult to imagine that investment will remain above depreciation for long if output stabilizes at a constant level. We shall re-examine the accelerator when it relates to long-term growth in a later chapter.

The capital adjustment principle Some of the shortcomings of the accelerator are eliminated or reduced in importance in the more general concept of the capital adjustment principle:

$$I_t = A_t + bY_t - cK_t \tag{11-10}$$

This simply says that the part of investment that is not autonomous (A_t) is determined by the relationship between output (Y_t) and capital (K_t). These variables can be lagged if desired.

If output increases, while capital remains constant, investment rises to create more capacity. If capital increases, while output is constant, investment declines as desired capacity is achieved. Depreciation can be distributed among all three terms in the proportion with which it is (1) independent of output and capital, such as depreciation by obsolescence, (2) dependent on the rate of output, such as wear and tear, and (3) dependent on the size of capital.

It is apparent that the accelerator is a special case of the capital-adjustment principle. Confine autonomous investment to depreciation, make the income coefficient (b) equal to the desired capital-output ratio (k), and set the capital coefficient (c) equal to unity. We then have Equation 11-1, the accelerator. The advantage of the capital-adjustment principle is that it is not restricted in these ways, but can assume any coefficient values which appear to be realistic from statistical evidence or otherwise.

Summary

A firm may finance investment with internal funds from depreciation and profits and with external credit and equity funds. The cost of internal funds is the lending rate, which is at least as high as the going market rate on government bonds, and is generally set higher to offset the risks of internal investment. External funds are valued at the borrowing rate of interest, which reflects both market and subjective costs of obtaining credit and equity funds in their least-cost combinations.

The initial borrowing rate is apt to be above the lending rate both because of lenders' higher market rates and because of management's reluctance to obtain credit and equity funds. Creditors abridge management prerogatives, while stock issue runs the risk that outsiders will gain control. The borrowing rate rises when more funds are sought, because of increasing financial risk to creditors, increasing risk of control loss, and the limited market for a firm's shares. The increase in financial costs associated with an incremental increase in funds is termed the marginal cost of funds and is expressed as a rate of interest. Investment should be increased only as far as the MCF is less than the marginal efficiency of investment.

Credit rationing and inelasticity reduce investment by a firm and render it more stable in the face of changes in expected returns or in the market rate of interest. Financial constraints are greater on small

corporations and unincorporated firms. To some extent, their effect on aggregate investment is offset by the ease with which large corporations can finance investment, and by their willingness and ability to exploit opportunities unavailable to small enterprises.

Long-term investment that has a less uncertain return, such as residential construction, seems to be most sensitive to changes in the rate of interest. Business plant and equipment outlays are evaluated with large discounts for uncertainty and are often limited to internal financing. Consequently, low rates of interest play a minor role in determining such capital outlays. Inventory investment is probably least affected by the rate of interest. The aggregate-demand curve for investment is probably more elastic at higher rather than at lower rates of interest.

Investment induced by changes in the level of output is formalized in the acceleration principle or the accelerator. It shows that gross investment tends to (1) change by larger amounts than income, (2) remain constant when income grows by equal increments, (3) fall when income increases by decreasing increments, (4) be equal to depreciation when income levels off, and (5) remain nil for some time after income has taken a sharp downswing and then stabilized.

Accelerator-multiplier models generate either steady growth or damped, constant, or antidamped oscillations once equilibrium is disturbed. The type of movement depends on assumed lags, outside constraints (such as the zero floor on gross fixed investment), and values attributed to the accelerator and multiplier coefficients. The accelerator suffers from its extreme assumptions, but the more general capital adjustment principle has found fruitful application in empirical studies and dynamic model building.

Reading and Research

General bibliographic references are cited at the end of Chapter 1.

The supply of funds. James Duesenberry has systematically incorporated the supply of funds schedule in a theory of investment behavior. See his *Business Cycles and Economic Growth* (New York: McGraw-Hill Book Company, Inc., 1958), especially Chapters 5 and 6. An empirical study on the effects of financial constraints on investment is John Meyer and Edwin Kuh, *The Investment Decision* (Cam-

bridge, Mass.: Harvard University Press, 1957). Leading articles on the costs of funds are reprinted in Part III of the Solomon book cited at the end of Chapter 10.

Elasticity of investment demand. See the articles cited in footnotes and their bibliographies. For evidence that interest rates may significantly affect fixed investment in plant and equipment, but with a lag, see Franz Gehrels and Suzanne Wiggins, "Interest Rates and Fixed Investment," *American Economic Review*, vol. 47, no. 1 (March 1957), pp. 79–92.

The acceleration principle. The accelerator was named, discussed, and its limitations noted by the eminent American economist, John Maurice Clark, in a famous article, "Business Acceleration and the Law of Demand: A Technical Factor in Economic Cycles," reprinted in the American Economic Association, *Readings in Business Cycle Theory* (Philadelphia: The Blakiston Company, 1944). Albert Aftalion, a French economist, is known for his use of the accelerator to explain business fluctuations. See his article, "The Theory of Economic Cycles Based on the Capitalistic Technique of Production," reprinted in Alvin Hansen and Richard Clemence, *Readings in Business Cycles and National Income* (New York: W. W. Norton and Company, Inc., 1953).

Accelerator-multiplier models. Paul Samuelson has investigated the properties of such a model in his article, "Interactions Between the Multiplier Analysis and the Principle of Acceleration," reprinted in the AEA *Readings* volume above. A number of models are discussed in Baumol's book, cited in a footnote, and in E. F. Beach, *Economic Models; An Exposition* (New York: John Wiley and Sons, Inc., 1957). John R. Hicks' model is contained in *A Contribution to the Theory of the Trade Cycle* (Oxford, England: The Clarendon Press, 1950). An ingenious model, employing a lagged capital-adjustment equation and a lagged multiplier, is in Duesenberry's book cited above, Chapters 9 through 12. For a general discussion of the capital-adjustment principle, as well as a wealth of information on business cycle behavior, see R. C. O. Matthews, *The Business Cycle* (Chicago: The University of Chicago Press, 1959). This is one of the famous (and inexpensive) series of Cambridge Economic Handbooks.

12 Interest & General Equilibrium

At this point, our theory of aggregate demand consists of the consumption function and the aggregate investment-demand function. The first represents the propensity to consume, whereas the second relates the marginal efficiency of investment to the rate of interest. Given the propensity to consume, investment determines the equilibrium level of output. Investment, in turn, is determined by the rate of interest, given the marginal efficiency of investment. Thus, aggregate demand and equilibrium output are determined by the rate of interest.

General equilibrium The next step is to evolve a theory of what determines the rate of interest. This occupies the first half of our chapter. We shall find that the interest rate depends on the demand for money and the supply of money. The demand for money as a medium of exchange is determined by the levels of real output and prices.

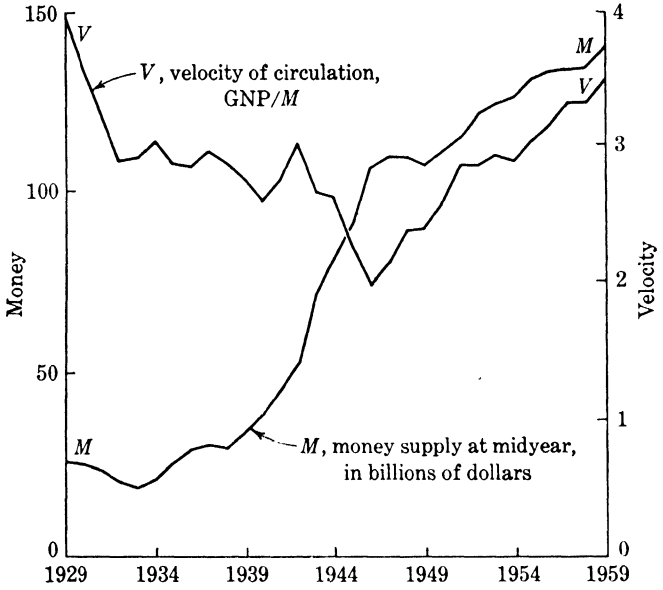
If we take the supply of money and the price level as given, we then find that interest depends upon real output. In the first paragraph, we pointed out that equilibrium output depends upon the rate of interest. Output and interest are connected by two functional relationships. This gives us the condition of general equilibrium, in which the rate of interest and real output are simultaneously determined, and there is equilibrium both between demand and supply of real output and between demand and supply of money. We shall use the model of general equilibrium to analyze depression and counter-depression policy in this chapter; in the next, we shall apply it to inflation and counter-inflation policy.

Interest and the demand for money Households and firms make two decisions concerning their wealth. First, they decide whether to increase it by saving. We have held that this decision is largely independent of the rate of interest in the short run. Second, they decide in what forms to hold their wealth. Besides homes and other durables in direct use, all wealth would be held in the safest and most liquid form, money, if people were not offered interest to compensate for the risk of lending.

Interest is the price we pay to borrow money; it is the reward we are promised for lending money. As the rate of interest rises, more people are willing to lend more of their wealth. This means that they are willing to hold less of their wealth in money. Consequently, the demand for money is inversely related to the rate of interest, just as the demand for potatoes is inversely related to the price of potatoes. In the same way that equality between demand and supply determines equilibrium price in the potato market, equality between the demand for money and its supply determines the rate of interest.

Changes in the Velocity of Circulation

In Chapter 5, we formulated a Fundamental Identity of macroeconomics to remind us that a change in national output at current



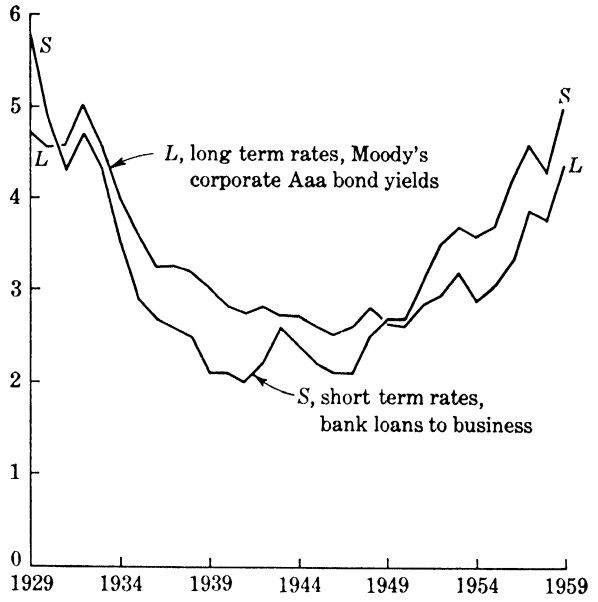
12-1 Money and its velocity of circulation

Source: *Historical Statistics of the United States* (series 267, p. 646), the *Federal Reserve Bulletin*, and (for GNP) *U.S. Income and Output*.

prices must be accompanied by a change in the quantity of money, its velocity of circulation, or both. In Figure 12-1 the behavior of these two variables is shown over the years 1929 through 1959. In this thirty-year span, the quantity of money rose $5\frac{1}{2}$ times, with the major expansion occurring in World War II. The velocity of circulation declined to a low point immediately after the war, then increased thereafter.

During the business downswing after 1929, both variables declined. Money went from a 1929 level of $21 billions to a low point of $19 billions in 1933, a decline of 10 percent. Velocity dropped from 4.0 to 2.9 in 1932, a fall of more than one-quarter, and remained below three until the war.

Velocity and the rate of interest A clue to the change in velocity is provided by the behavior of long- and short-term interest rates shown in Figure 12-2. The short-term rate is on loans to business



12-2 Long- and short-term interest rates (Percents)

Source: Historical Statistics of the United States (series 322 and 333, p. 655–56) and the *Survey of Current Business.*

by banks in 19 cities. The long-term rate is the effective yield on top-quality (Aaa) corporate bonds, compiled and reported by Moody's Investors Service.

Over the whole thirty years, interest rates declined to lows until shortly after the war, and then climbed back nearly to their 1929 levels by 1959. It is apparent, by comparing the charts, that velocity and rates of interest have tended to move together. This is the principal point we shall make in the first part of this chapter.

One exception calls for comment. In 1932, rates rose temporarily, while velocity continued to decline. This was a year of panic in bond and credit markets generally (yield rates on lower-quality bonds climbed much higher), when the desire to hold cash instead of bonds drove down velocity while it increased the rate of interest. We shall later consider this to have been due to a temporary and substantial increase in the public's liquidity preference.

Demands for Money

Keynes distinguished three motives for holding money. First, there is the *transactions motive.* Cash balances are held to facilitate the day-by-day and week-by-week purchases of things which a firm or household needs for current production or consumption. There would be no need to hold transactions balances if receipts of income were timed to coincide with expenditures of equal value. But this is not the case. The ebb and flow of sales receipts for a firm cannot be expected to match disbursements for materials, labor, interest and principal payments on debt, and so forth. A household receives income in weekly or monthly lumps but makes purchases in a fairly continuous way. Thus, in any period, each firm or household holds an average working cash balance as a medium of exchange for the period's transactions.

Second, because of the *precautionary motive,* households and firms hold money. Keynes identified this as the desire to hold liquidity in the event of some unforeseen contingency, such as a temporary lapse in sales receipts, or opportunity, such as a temporary drop in materials' prices. In recent years, this motive has been attached to wealth holding in general and has been given much more importance. Households and firms hold cash, because they *fear* that other assets will decline in value.

Third, Keynes stressed the *speculative motive* for holding cash. This arises when a household or firm *expects* declines in the values of other assets. Note the difference from the precautionary motive. The latter hinges on confidence; the speculative motive is a matter of expectations. In sum, households and firms hold cash balances as assets or stores of value, because of motives that are both precautionary and speculative.

Demand for transactions balances The demand for working balances, to cover the lapse between receipts and expenditures, is primarily dependent upon the value of transactions a firm or household expects to finance during a given period. A large firm needs a larger inventory of cash than a small firm, since it must undertake larger outlays in a month. In the short run, we can assume that the demand for transactions balances rises about in proportion to the

total value of transactions or gross national product at current prices.[1]

Other things may affect transactions demand. Slow change in institutions and habits of payment alter it over the long run. (We may recall the active money discussion of Chapter 5.) Increase in interest rates to high levels may lead firms to pare down working balances in order to lend more or borrow less.[2]

Demand for precautionary balances When it concerns unforeseen income contingencies and opportunities, the precautionary demand for cash probably rises about in proportion to total transactions, given the state of confidence. A large firm has larger emergencies and windfall opportunities than a small firm. High rates of interest may lead households and firms to cut down on these reserves, since losses or foregone opportunities are partly compensated by interest earnings. If the aggregate debt-equity ratio rises, we should expect firms to hold larger cash reserves to reduce the risk of default on interest and principal payments.

Households and firms also hold part of their total wealth in liquid form as a precaution against severe loss, in the event that other assets drop in value.[3] Of course, the size of this demand partly depends upon the volume of total wealth. It also depends upon who holds it. Some households and firms are more prone to accept risk than others.

The risk in bondholding. The major risk in holding a bond does not stem from the chance of default by the borrower, unless his earning position happens to be poor. The major risk is that the bond will fall in price and subject its holder to a capital loss. This danger is larger when the remaining time is longer before the bond matures

[1]William Baumol has shown that, under rather restrictive assumptions, transactions demand should rise as the square-root of transactions. See his article, "The Transactions Demand for Cash: An Inventory Theoretic Approach," *Quarterly Journal of Economics*, vol. 66, no. 4 (November 1952), pp. 545–56. Complicating our discussion by introducing this effect would not materially change our conclusions.

[2]This was suggested by Alvin Hansen and has been supported by theoretical treatment in James Tobin, "The Interest-Elasticity of Transactions Demand for Cash," *Review of Economics and Statistics*, vol. 38, no. 3 (August 1956), pp. 241–47.

[3]This section owes a great deal to a study by James Tobin, "Liquidity Preference as Behavior Towards Risk," *Review of Economic Studies*, vol. 25 (February 1958), pp. 65–86.

and will be redeemed by the borrower. There is least risk on a high-quality ninety-day or six-month bill, because the holder can simply wait until it falls due and collect full value.

It might be replied that there is no effective capital loss when bond prices fall, unless the bondholder sells the bond. This is true, but bondholders often expect to need cash before the bond matures, and they don't wish to be caught with a loss. Furthermore, we have already learned that when bond prices fall, the rate of interest automatically rises. Consequently, the contingency of a fall in bond prices is also the contingency of a rise in interest rates. If a person has cash when this occurs, he will then be in a position to lend at a higher rate.

Compensation for losses. As the rate of interest rises, the amount of money people wish to hold, because of the precautionary motive, should decrease. Those who are prone to take risks will be the first to lend by buying bonds. Moreover, it is rational to do so. The higher the rate of interest, the greater the capital loss in any one year which, in turn, is offset by the interest return.

Let us view the degree of confidence as a notion of probable change in bond prices. Jones figures that a 5 percent decline could easily occur, with the economic outlook as it is now, but that a 10 percent decline is much less likely and a 20 percent decline is quite improbable. If he buys a bond for $100 yielding 5 percent interest, it will pay him enough in a year to offset a 5 percent decline in price. The higher the rate of interest, the less the probability of a net loss in the light of his present state of confidence.

As the rate rises further, people less prone to accept risk are induced to lend. The same is true of those whose confidence is not as high as Jones's. That is, they view each percentage of decline as more probable than Jones does.

Diversification of holdings. A wealthy person, unless he is very risk-prone, or the portfolio manager of a lending institution does not put all his eggs in one basket. He reduces risk by diversification. This is partly a matter of holding the bonds of a number of corporations, instead of just one. More importantly, for our purposes, it means holding assets of varying degrees of risk, from cash through corporate shares. Thus, when the rate of interest rises, such a person buys more bonds and holds less cash, but this is a marginal adjustment rather than a wholesale shift from one to the other. More bonds are bought,

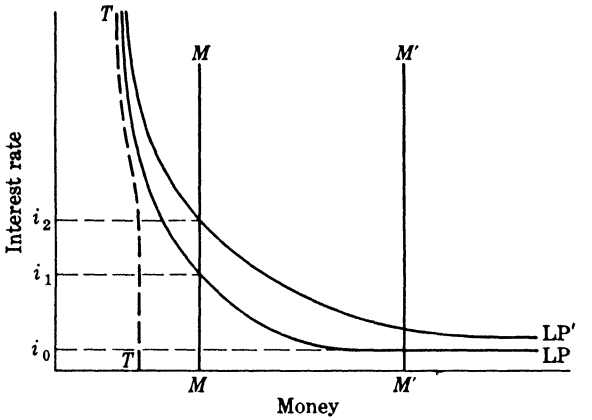
because greater interest offsets greater capital loss, but some cash is still held as a reserve against the possibility of a severe decline at the time when cash is needed.

Wealth effect of rising interest rates. There is another reason why precautionary demand calls for less cash at higher interest rates. As interest rates rise, bond prices fall; so, people have less nominal wealth than before. If their confidence is such that they wish to hold a given *proportion* of assets in cash, the value of this cash holding decreases as the value of their total wealth declines.

Speculative demand for money If we expect bond prices to fall, the thing to do is sell now and hold cash. This avoids a capital loss and puts us in position to buy bonds after their prices have fallen; that is, to lend at a higher rate of interest. Our expectation is likely to be framed on the current level of bond prices, compared with what we view as their normal level. If prices are above normal, we expect them to fall; if prices are below normal, we expect them to rise. It is this motive which Keynes emphasized in explaining why the demand for money is inversely related to the rate of interest.

The importance of disagreement. If everyone were agreed about the normal price of bonds, everyone would either hold entirely cash or entirely bonds, depending upon the current price level. At some low rate of interest (high price of bonds), they would all expect bond prices to fall, and they would hold no bonds. At some higher rate, they would all hold bonds and no cash. At some rate in between, there would be a wholesale shift. In fact, the rate of interest would be stabilized exactly at the shift rate, since the slightest rise above it would bring mass buying, driving down the interest rate, and the slightest fall below it would bring mass liquidation, raising the rate of interest.

Keynes stressed the disagreement among speculators. At a given rate of interest, some speculators are bulls, which means that they expect bond prices to rise whereas others are bears and they expect bond prices to fall. As the rate of interest rises, bond prices decline; more and more speculators come to view prices as below normal and buy bonds. When the rate of interest falls, more and more people decide that bond prices are as high as they will go and these people sell bonds. Consequently, disagreement causes marginal changes



12-3 The liquidity preference curve

between cash and bonds. This means that the speculative demand for money is inversely related to the rate of interest.

The Liquidity Preference Curve

Located in Figure 12-3 is the aggregate demand for money or, to use Keynes' name for it, the liquidity preference (LP) function. This indicates the quantity of money the public desires to hold for all three purposes — transactions, precautionary and speculative — at each rate of interest.

The dashed line labelled *TT* represents that portion of demand, measured between it and the vertical axis, which is for transactions balances and those precautionary balances primarily determined by the level of transactions, rather than by the rate of interest. Thus, this line is very inelastic at low interest rates but becomes less inelastic at high rates. The horizontal distance from *TT* to the LP curve represents money held for the speculative motive and as a precautionary portion of wealth. An increase in GNP at current prices shifts *TT* to the right and thus shifts the whole LP curve to the right. For the remainder of this section we shall assume GNP to be constant.

The supply of money The vertical line, *MM*, represents the existing stock of money. Strictly speaking, a perfectly inelastic supply function may not be appropriate. Banks may be induced to lend

more, given the size of their reserves, when interest rates rise. If so, the supply curve should slope upward to the right. However, as a rule banks stay almost *loaned up* — that is, they keep little excess reserve liquidity. If private borrowing declines, they lend to government by purchasing government securities. Consequently, the stock of money is maintained. Moreover, the Federal Reserve System can adjust bank reserves to the point where banks will lend the same amount whatever the rate of interest. Therefore, it will make our analysis easier and will not be too far from the truth to treat the supply of money as an autonomous or given variable, subject to change by government policy but independent of the rate of interest.

The equilibrium rate of interest Given the demand for money at LP and the supply of money at MM, the equilibrium rate of interest is i_1. This is the only rate at which the quantity of money that people wish to hold equals the quantity that they actually hold. (Money could hardly exist if it were not held by someone.)

This is a stable equilibrium. Why this is equilibrium and why it is stable can be understood if we imagine that interest were momentarily not i_1, but somewhat higher. People have more money than they wish to hold at this higher rate. Consequently, they purchase bonds. This demand for bonds raises their prices and thus reduces the rate of interest. When interest declines, people wish to hold more money because of the precautionary motive and some speculators, who were bulls before, now become bears. This process continues until the interest rate is brought down to the point where the public desires to hold exactly the amount of money in existence.

If the interest rate were momentarily below i_1, people would hold less money than they desire. They would sell bonds and the effect would be to reduce bond prices and raise the rate of interest until it reaches the level i.

Change in the quantity of money If the quantity of money is increased, line MM shifts to the right and the equilibrium rate of interest falls. It must fall, because the public is not willing to hold more money at rate i_1. As it receives added money, the public purchases more bonds, driving down the rate of interest until it is low enough that the desire to hold money equals the new supply. If the stock of money diminishes, the opposite events occur.

The liquidity trap Keynes argued that at some very low rate of interest, demand for money would become perfectly elastic (horizontal). The curve in Figure 12-3 is drawn to show this. Suppose that money were increased to the $M'M'$ position. The public willingly holds this much money only if the rate of interest is i_0. If money increases beyond $M'M'$, the rate of interest remains i_0. The public accepts the entire increase in money as an addition to speculative and precautionary holdings and refuses to lend by buying bonds.

There are three reasons for this perfect elasticity, which has been dubbed the "Keynesian trap." First, the low interest return does not adequately compensate for the incidental expenses and inconvenience of buying bonds. Second, at such a low rate, a minor decline in bond prices wipes out the interest return. Third, there is reason to expect that if bond prices change at all, they must decline. The public is aware that the money rate of interest cannot be negative. Thus, as it approaches zero, everyone becomes a bear and no one is willing to hold bonds. Since bonds are no longer purchased with added money, bond prices will not be raised and the interest rate is trapped at i_0.

Change in the outlook Suppose that some event, such as a business decline and spread of bankruptcies, causes people to lose confidence in their anticipations of bond prices. Perhaps speculative demand is also affected when some people who were bulls change their minds and become bears. The LP curve shifts to the right, to the LP′ position. Given the level of GNP, the left upper part of the curve represents mostly cash transactions and shifts very little. (The assumption of constant GNP in this situation is not very plausible, but we shall deal with the interaction on GNP shortly.) The shift is greater at lower interest rates. The level of the liquidity trap may also be raised somewhat by the reduction in confidence.

The increase in liquidity preference drives up the rate of interest. This is what happened in 1932. In the case shown in Figure 12-3, the rate is driven up to i_2. An improvement in the bond price outlook has the opposite effect.

The volatility of speculation. Speculation is always present in securities markets. Usually, it plays the desirable role of evening out price fluctuations. This is what Keynes was describing. Suppose that people attempt to buy more new bonds than corporations and

governments issue in a period. This will tend to raise prices, but, as prices start to rise, some speculators decide that they are now above normal and sell their bonds. This adds to the supply in the market and prevents bond prices from rising very high. There is a symmetrical effect when new issues tend to outrun demand.

However, speculation is a fair-weather pilot. Powerful forces acting on the market, such as a widespread loss in confidence, may cause bond prices to fall substantially despite speculators' initial resistance. At some point, speculators revise their anticipations and come to expect a further decline. Once this happens, a panic is apt to develop. Speculators stop buying and start selling. The more they sell, the more prices fall and the more their anticipations are justified and reinforced — and the more they sell.

Objection to Keynes' emphasis on the speculative motive. By arguing that bond prices are determined by speculators' notions of what they should be, Keynes left the bond market suspended by its own bootstraps — with the suspenders apt to break at any time. Speculators act to determine prices at the point they think is normal. Their decision is dependent upon previous prices set the same way, and so forth back in time. Thus, a trend, once developed, tends to gather its own momentum, and we should expect the prices of bonds frequently to be driven to one extreme or the other.

The bond market is much more stable than we could expect if interest rates were predominantly determined by speculation. Nevertheless, there does seem to be a systematically inverse relationship between the demand for money and the rate of interest, as our velocity figures show. This is the reason that economists have investigated the precautionary demand more fully than Keynes, and some have come to view it as the primary determinant of this relationship. This we have done. Speculative demand is reduced to a secondary role and, because the precautionary motive provides a strong stabilizing force in the market, speculative demand generally behaves itself in the way Keynes described. This does not remove his liquidity trap, however.

Other types of assets So far, we have generally implied that people have only the choice of holding bonds or cash. Of course, in reality there are many kinds of bonds and many assets which are not

bonds. People switch their holdings when relative yields on different assets change and when people come to revise their confidence and expectations about values of particular assets.

Interaction with stocks. Shortly before a business decline, when profits seem to be lagging, or once the decline sets in, it is usual for the public to view stock prices with less confidence or to expect them to decline. Many persons shift from stocks to bonds, causing stock prices to decline and bond prices to rise. Since this reduces the rate of interest, more money is retained in liquid balances as well. If the business decline is so severe that it brings a large wave of bankruptcies, concern about bond values may increase the public's liquidity preference and drive down bond prices temporarily.

Shortly before or coincident with recovery in business, the improved profit outlook leads some people to shift back from bonds into stock, bringing recovery of stock prices and a decline in bond prices. With a more favorable outlook for stocks and with rising interest rates, money holding diminishes.

Near-money claims. Fixed-value redeemable claims, such as savings accounts and U.S. savings bonds, are almost as liquid as money. A person is apt to feel he has money in the bank, whether he has a checking account or a savings account. The practical difference is that these near-monies are not media of exchange but must be converted into currency or demand deposits before they can be spent. On the other hand, they have the advantage of paying interest.

Existence of these claims satisfies a large part of the public's liquidity preference and means that the LP curve is less elastic and lies further to the left than it would otherwise. Nevertheless, there is expense and inconvenience in converting near-money to money. When the rate of interest is lower, then this cost is less compensated. Consequently, demand for money remains an inverse function of the rate of interest.

Changes in wealth Over the long run, demand for money increases both because growth in GNP calls for more transactions balances and because expansion of wealth increases the demand for precautionary and speculative balances. Suppose that the public wants to keep a certain proportion of its assets in cash at a given rate of interest. When its total assets grow, the amount of cash it wishes

to hold will also grow. If money were to remain in fixed supply, the result would be to drive up the rate of interest until the public wished to hold no larger a portion of its wealth in cash than the stock of money available after providing for transactions balances.

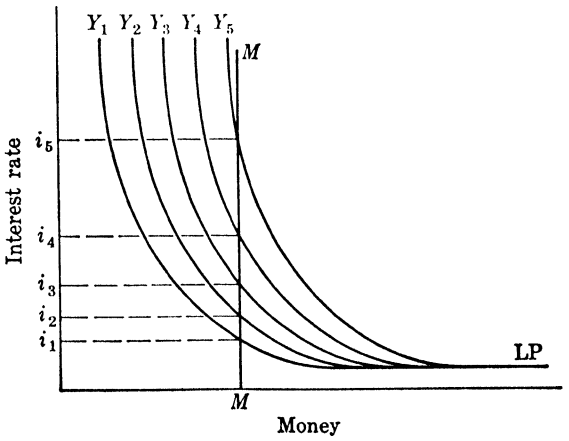
General Equilibrium

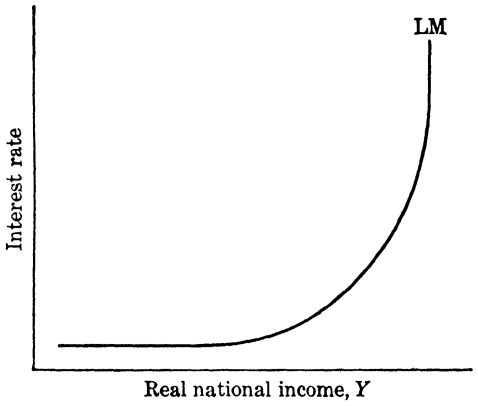
Our LP curve in Figure 12-3 reflects a given level of demand for transactions balances. Now, let us see what happens when GNP in current prices increases. Figure 12-4 shows LP curves at five successively greater levels of GNP, indicated by subscripts. As GNP increases, the *TT* line of Figure 12-3 shifts to the right, shifting the whole liquidity preference function with it.

Suppose that the quantity of money were to remain constant at *MM*. As the public needs more money for exchange, less is left over to satisfy its desire for an idle store of value in precautionary and speculative balances. Consequently, the rate of interest rises. The difference between two LP curves represents an equal increment in GNP, but note that interest does not rise by equal increments. It rises by increasing amounts. This is because the LP curve is steeper at higher interest rates.

The LM Curve There are actually an indefinitely large number of LP curves corresponding to an indefinitely large number of values

12-4 Interest and real income





12-5 The LM curve

GNP might assume. Let us suppose that the price level is constant and increase the level of real output, Y. The LP curve will shift to the right continuously and interest will rise at an accelerating pace. Each successive increment in Y will be accompanied by a larger increment in i, given the quantity of money constant.

Now, turn to Figure 12-5. The LM curve shows just what we have been describing. At some very low rate of interest, it is perfectly elastic, meaning that an increment in Y does not affect the rate of interest at all. This is Keynes' liquidity trap, again. As income continues to increase, interest begins to rise, and it rises at a more and more rapid rate. Finally, the LM curve approaches perfect inelasticity when the rate of interest rises to the point where no one holds precautionary or speculative balances. All money is used for transactions and, given the stock of money and the price level, a further increase in Y cannot occur.

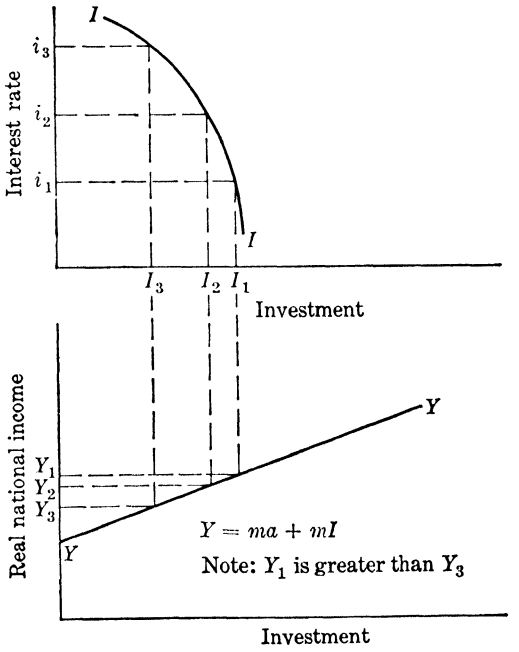
Shifts in the LM curve. The LM curve shifts to the right if there is an increase in the quantity of money or a reduction in demands for precautionary and speculative balances. The LM curve also shifts to the right in deflation. A fall in prices reduces demand for money in transactions, because it reduces the value of transactions. Since we measure only real income on the horizontal axis, the effect of deflation is not to move along LM, but to shift it to the right. Interest is less at each level of output (except in the liquidity trap), because less money for transactions is needed for exchanging that

output, and more of the total money supply is available to satisfy precautionary and speculative motives. By similar reasoning, the LM curve shifts to the left with (1) a decrease in money, (2) an increase in precautionary and speculative demands (which may also raise the trap level), and (3) inflation of prices.

The IS curve The LM curve shows us what the rate of interest is at each level of real output, but it doesn't tell us what the equilibrium level of output is. To discover this, we must formulate the IS curve, which shows how much real output is demanded at each rate of interest. We already have the building blocks, in the determinants of aggregate demand, and all we need to do is assemble them.

Figure 12-6 simply reproduces the familiar aggregate investment-demand function in the top chart. In the bottom chart income, Y, is expressed as a function (YY) of the level of investment (I). This line is the linear function, $Y = ma + mI$, which is now quite familiar (see Equations 6-9 and 6-11). Income is equal to the multiplier (m) *times*

12-6 Derivation of the IS curve



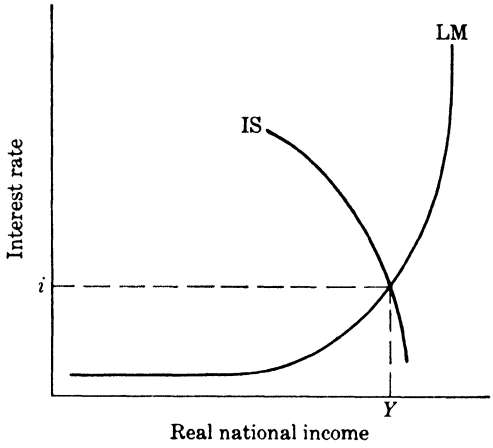
the consumption function intercept (a) *plus* the multiplier *times* the level of investment.

We obtain the IS curve, in Figure 12-7 below, by tracing changes of interest in the top chart of Figure 12-6 through their effect on investment and the latter's effect on income (bottom chart). As interest rises, income declines. At high levels of interest rates, income changes by more than at low levels, because the aggregate investment demand function is more elastic. (This curve is labelled IS, because each point on it represents a condition of equilibrium in aggregate output and the requirement for this, in a closed private economy, is that intended investment equal saving (S).)

Shifts in the IS curve. The IS curve shifts to the right if there is (1) an increase in aggregate investment demand, (2) an increase in the marginal propensity to consume, raising the multiplier, or (3) an increase in the average propensity to consume, raising the a intercept. These effects are apparent in Figure 12-6. It should also be apparent that the IS curve becomes more elastic at every point (less steep) if (1) aggregate investment demand becomes more elastic or (2) the multiplier increases, making the YY line steeper. Thus, an increase in the marginal propensity to consume increases the elasticity of the IS curve. The curve shifts leftward and becomes less elastic in the opposite instances.

By leaving out government and foreign transactions, the IS curve is concerned with a closed private economy. However, it is an easy matter to visualize the IS curve as it would behave in a more realistic economy. We learned in Chapter 9 that the marginal net tax rate has the same effect on the multiplier as the marginal propensity to save, whereas the average net tax rate is analogous to the average propensity to save. The marginal propensity to import affects the multiplier in the same way as the MPS. Consequently, an increase in taxes, greater progressiveness of tax rates, or an increase in the marginal propensity to import all serve to shift the IS curve to the left and reduce its elasticity. An increase in government purchases or gross exports, by increasing aggregate demand, has exactly the same effect as an increase of investment demand.

The condition of general equilibrium We now have the general equilibrium of the Keynesian system in Figure 12-7. The



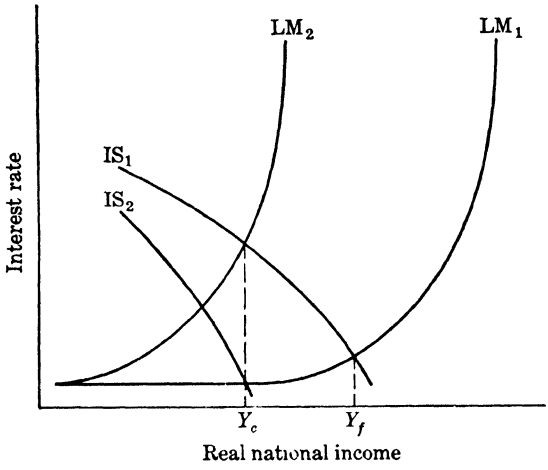
12-7 General equilibrium

equilibrium level of output is Y and the corresponding rate of interest is i. This is general equilibrium, because equilibrium prevails in both output and financial markets. Aggregate demand for output equals gross national product at every point on the IS curve. Aggregate demand for money equals the stock of money at every point on the LM curve. Only where the two intersect does demand equal supply simultaneously in both product and money markets.

What are the assumed givens for general equilibrium to prevail? The givens are, first, the three behavior functions: (1) the propensity to consume, (2) the marginal efficiency of investment or demand for investment, and (3) the public's liquidity preference. Second, the stock of money and the price level are assumed to be constant. The last assumption makes a strictly Keynesian model of it. This is the point of attack which both Keynes and his critics recognized to be most vulnerable. If we abandon the assumption of constant prices, the LM curve (and perhaps the IS curve) is liable to shift. We shall see the significance of this shortly.

Effectiveness of Counter-depression Policies

The IS and LM curves provide a powerful apparatus for analysing the effectiveness of monetary and fiscal policies designed to raise national output and to reduce unemployment. In the short run, we can neglect growth of the labor force and increases in its productivity



12-8 Underemployment equilibrium

at full employment, so that a particular level of aggregate output can be termed the full employment GNP. In Figure 12-8, this is Y_f. Let us suppose that the current level of income is Y_c. The economy is in depression and output is much less than the amount needed for full employment.

Underemployment equilibrium Output Y_c may be termed an underemployment equilibrium income, since it is less than full employment output and constitutes equilibrium as long as LM and IS remain where they are. We shall initially assume, with Keynes, that wages and prices are perfectly rigid downward, so that the price level does not fall. The underemployment equilibrium may have come about because LM shifted from position LM_1 to LM_2, or because IS shifted from IS_1 to IS_2, or because both curves shifted (not shown).

At the onset of depression, both may occur together. If the downturn is marked by a stock market collapse and widespread bankruptcies, liquidity preference jumps. The public rushes to get out of securities and into cash. Banks may reduce the stock of money by refusing to relend when old debts are paid off. However, the liquidity crisis runs its course in a few months. Securities prices stop falling and there is a reverse movement from cash to bonds, which now

appear to be good buys at their low and rising prices. The LM curve moves back to the right.

The depression continues if investment demand remains depressed, and IS remains well to the left of the position needed for full employment. The investment function may remain down because of the presence of a great deal of idle capacity. Furthermore, during the preceding boom, investment opportunities may have been largely saturated. Diminishing returns set in that were not counteracted by innovation or offset by changes in relative input prices. Confidence and expectations concerning returns to investment are apt to be poor.

Note that the IS curve in depression is depicted as being less elastic than at full employment. First, the things just mentioned may make business firms less responsive to changes in interest. In particular, lower interest rates do little to induce expansion of capacity when much capital is already redundant. Second, the built-in stabilizers, though they keep the IS curve from shifting as far as it would in their absence, have the effect of reducing its elasticity. This is because they reduce the marginal propensity to consume and the multiplier. Note, also, that the LM curve now intersects IS in its less elastic range, at lower rates of interest.

Effectiveness of monetary policy Suppose that income is Y_c because IS is at IS_2 and LM is at LM_1. In this case, monetary policy will have little effect on the rate of interest or on income, and it will be incapable of restoring full employment. An increase in money will shift LM to the right, but interest will fall very little, because it is already so low that most people are unwilling to buy bonds and thus drive the rate lower. With the IS curve in this position, indeed, the rate would have to be negative to achieve full employment. No monetary expansion could bring this about. If IS intercepts the horizontal axis at less than full-employment output, no positive rate of interest will provide full employment.

We have drawn an extreme case. At this underemployment equilibrium, the IS curve might be higher and the LM curve might be less elastic. Then, monetary policy would materially affect interest and might be capable of restoring full employment. However, the condition shown here apparently reflects pretty well the circumstances of the late Thirties. Interest rates were low, liquidity was high, and increases in the quantity of money proved incapable of restoring full employment.

Effectiveness of fiscal policy The condition which makes monetary policy least effective also makes fiscal policy most effective. An increase in government purchases raises aggregate demand and shifts the IS curve to the right. A cut in taxes has the same effect.

A rightward shift of the IS_2 curve will increase income almost by the full value of the multiplier *times* the increase in government purchases. The reason is that more money can be drawn into circulation without materially raising the rate of interest and thus discouraging investment. As we move to the right, however, LM_1 becomes less and less elastic. Thus, as IS increases fiscal policy becomes less potent and monetary policy more so. In order to induce the public to lend more of its reduced idle balances, held for precautionary and speculative reasons, government and business must offer higher interest rates. The rise of interest discourages investment, partly offsetting the effect of increased government expenditures (this is what moving up the IS function indicates).

Indeed, if IS should move into the vertical stretch of LM, expansion of government purchases will have no effect on income! No idle balances are held when LM is vertical. The entire stock of money is in transactions balances — and those have been trimmed to the point where households and firms are unwilling to cut them further even if interest rises a great deal. An increase in one type of expenditure (e.g., government purchases) takes money away from another kind (e.g., investment), and there is no increase in total spending or national income.

This may be termed the classical case, since the pre-Keynesian economists generally assumed that all money was used in transactions. It was also assumed that the demand for money was determined entirely by the level of money income and not at all by the rate of interest.

Financing fiscal policy We have implicitly assumed that fiscal policy is financed without increasing the stock of money. This is true if a government deficit is covered by borrowing from households or firms, instead of from banks. However, the deficit may be financed by borrowing new money from the banking system. In this case, the LM curve shifts to the right along with the IS curve. Government simultaneously carries out both expansionary fiscal and monetary policy. If relative elasticities make one less effective, they make the

other more effective. The moral of the story is that coupling monetary and fiscal policy is the surest way of changing aggregate demand, production, and employment.

Deflation and Unemployment

We have assumed that prices are constant. What happens when we drop this assumption? Suppose that unemployed labor and capital actively compete for employment and markets. At Y_c, the price level will fall, since there is substantial unemployment. Will this automatically restore full employment without overt government action?

A fall in prices shifts LM to the right, since money is released from transactions needs in order to satisfy precautionary and speculative demands. The effect is the same as that of an increase in the supply of money. It will restore full employment if monetary policy would. If interest is caught in the liquidity trap or if the IS curve crosses the horizontal axis to the left of full employment output, then, neither monetary policy nor deflation can cure unemployment, if their only effect is to shift the LM curve to the right.

Effects of deflation on the IS curve This is where the Pigou effect and the other "effects" discussed in Chapter 9 become crucially important. Deflation raises the real value of liquid government debt, and creditors of the government feel wealthier than they expected to feel at this time in their lives. This may induce them to consume more, raising the YY line in Figure 12-6 and shifting the IS curve to the right. Provided that adverse expectations do not offset the Pigou effect, eventually prices must fall until IS is restored to the point where it intersects LM at full employment.

The Pigou effect is aided by the other effects of deflation. The proportion of net taxes in GNY is reduced, by progressiveness of the tax structure and by increasing transfer payments, so that the average propensity to consume is raised. American export prices may fall relative to foreign prices, serving to increase exports and reduce imports. Deflation tends to reduce the business-saving share of GNY, if prices fall more than wages, but this is apt to have offsetting effects on investment. Unless these effects are offset by adverse price expectations, they also serve to shift the IS curve to the right.

Deflation is ordinarily a slow and painful process. It is apt to lead

to anticipations of further deflation, which cause households and firms to postpone consumption and investment purchases. These problems may be overcome by a government-administered once-and-for-all cut in wages and prices.

Government policies with the same effects However, there are other ways to accomplish the same effects quicker. A cut in taxes directly reduces the net tax share of GNY and raises consumption. If taxes are cut while government purchases are maintained or increased, the deficit is covered by borrowing. This creates more public debt to serve the Pigou effect. Part of government debt can be monetized by the Federal Reserve System through open-market purchases of government bonds. This creates more bank reserves and causes the quantity of money to be increased, shifting LM to the right.

Summary

The velocity of circulation is inversely related to the rate of interest, because the public wishes to hold larger cash balances at lower rates of interest. There are three motives for holding money. The transactions motive governs working balances that serve as active media of exchange. In the short run, transactions demand varies about in proportion to GNP in current prices, although it is probably somewhat sensitive to high rates of interest.

The precautionary motive governs holding of cash reserves against unforeseen contingencies and opportunities in business and household transactions and wealth holdings. This demand is inversely related to the rate of interest, because the higher the rate, the larger the capital loss which earnings offset. Finally, the speculative motive is based on the belief that securities prices are higher or lower than normal, and thus are expected to decline or rise. The lack of concensus on normal price means that speculative demand is inversely related to the rate of interest, under normal circumstances, and tends to stabilize the rate of interest.

The rate of interest is in equilibrium at that point where demand for money equals the existing stock. Given the latter, interest rates rise at an increasing rate as transactions demand increases, because of a rise in real output, the price level, or both. The relationship between real output and the rate of interest is formulated in the LM curve.

Aggregate demand for output is inversely related to the rate of interest, because investment declines as interest rises. This relationship is expressed by the IS curve. The output and interest rate at which LM equals IS is general equilibrium in the Keynesian system, with both product and money demands and supplies equal. Except in the liquidity trap, an increase in money, reduction of prices, or decrease in precautionary and speculative demands serve to shift LM to the right and increase equilibrium output by reducing the rate of interest. Increases in the marginal efficiency of investment and the propensity to consume shift IS to the right.

Monetary policy is least effective when IS intersects LM in the liquidity trap, but fiscal policy is most effective in this case. At the opposite extreme, where LM is perfectly inelastic, the reverse is true. Fiscal policy cannot increase aggregate demand and output, because each dollar borrowed or taxed by government reduces private spending in the same measure. (This is the one case where the balanced budget multiplier effect does not work.) A combination of fiscal and monetary policy is always effective, since it shifts both curves simultaneously.

The Keynesian underemployment equilibrium is a special case, dependent upon constant wages and prices. Deflation can ultimately be expected to restore full employment by its effects on the real value of liquid government debt, the net tax share of GNY, and foreign trade. However, tools of discretionary fiscal and monetary policy can do the job quicker and less painfully.

Reading and Research

General bibliographic sources are cited at the end of Chapter 1. For Keynesian theory see citations at the end of Chapter 5 as well as those below.

Money and interest. John R. Hicks made suggestions that underlie some of the modern revisions of Keynes' liquidity preference curve in an early article, "A Suggestion for Simplifying the Theory of Money," *Economica*, new series, vol. 2, no. 1 (February 1935), pp. 1–19; this has been reprinted in the American Economic Association, *Readings in Monetary Theory* (Philadelphia: The Blakiston Company, 1951). For a survey and extensive bibliography on the demand for money see Harry G. Johnson, "Monetary Theory and

Policy," *American Economic Review*, vol. 52, no. 3 (June 1962), pp. 335–84. Modern theories of the rate of interest are reviewed by G. L. S. Shackle, "Recent Theories Concerning the Nature and Role of Interest," *Economic Journal*, vol. 71 (June 1961), pp. 209–54.

General equilibrium. Hicks formulated the LM and IS curves in his review of the *General Theory*, "Mr. Keynes and the 'Classics'; A Suggested Interpretation," *Econometrica*, vol. 5 (April 1937), pp. 147–59. Alvin Hansen employs the general equilibrium model in his book, *Monetary Theory and Fiscal Policy* (New York: McGraw-Hill Book Company, Inc., 1959); see Chapter 5 in particular.

Loan funds analysis. There is an alternative to the liquidity preference analysis of interest rate determination. This is loanable funds analysis, which views the rate of interest as the price equating investment demand with the flow of saving, new money, and dishoarding in a period of time. In general equilibrium, the relations between interest and output in the liquidity preference and loanable funds analyses are identical. We have used liquidity preference, because it is easier to understand in the context of general equilibrium. The loanable funds approach may be preferred for dynamic analysis, because it stresses the direct effects on interest of changes in the marginal efficiency of investment, the propensity to save, liquidity preference, and the quantity of money.

Equivalence of the two theories is shown in: S. C. Tsiang, "Liquidity Preference and Loanable Funds Theories, Multiplier and Velocity Analyses: A Synthesis," *American Economic Review*, vol. 46, no. 4 (September 1956), pp. 539–64. For criticism of loanable funds theory see comments on this article by Gardner Ackley and Tsiang's reply, *American Economic Review*, vol. 47, no. 4 (September 1957), pp. 662–78.

13 Inflation

After World War II, fears of depression changed to concern about inflation. Except for brief recessions, employment remained at high levels. When wartime controls were abandoned, prices rose rapidly from mid-1946 until the fall of 1948. Consumer prices increased 33 percent; wholesale prices increased 50 percent. With the outbreak of war in Korea, inflation again set in. From the spring of 1950 until the early months of 1951, wholesale prices rose 16 percent. Consumer prices advanced more slowly but were 12 percent higher at the close of 1951.

These two inflations could easily be explained as "too much money chasing too few goods." It was harder to account for the third post-war inflation. In the fall of 1955, wholesale prices began to rise slowly and were joined by consumer prices early in the spring of 1956. Prices rose 2 or 3 percent a year. Consumer prices continued to rise through

the first half of the 1958 recession and failed to decline in the milder 1961 downturn. Whereas unemployment had been about 3 percent during the Korean War, it was above 4 percent between the 1953–54 and 1958 recessions, and over 5 percent between the 1958 and 1961 recessions. After 1955, real GNP grew substantially slower than its historical trend. It was difficult to argue that this inflation was caused by too much spending. Many people became convinced that organized labor and monopolistic business were pushing up wages and prices with little regard for the possible effects on output and employment.

Types of inflation Inflation is a sustained rise in the general price level. This definition guards against two misunderstandings. It is not considered inflation when consumer or wholesale prices fluctuate over the course of a few months. This is to be expected because of seasonal and other factors. Nor is it inflation when a long-term rise in prices of some products is offset by a long-term fall in others. Changes in relative prices, in response to shifts in demand and supply conditions, are not inflation. However, the rise of some prices may not be offset by the fall of others. Then, indexes of consumer and (or) wholesale prices rise. We shall consider this to be inflation, since over-all costs of living and producing increase.

An apparent exception is *repressed* inflation. At times, particularly during war, government curbs inflationary pressures by rationing and by price controls. By preventing people from spending as much as they would like, the price rise is kept wholly or partially repressed. Presumably, true inflation would occur if these controls were removed.

Inflations vary in degree — creeping, trotting, galloping, or rocketing into space. The last is hyperinflation. It has always occurred in connection with wars, either during hostilities or shortly afterwards. In order to purchase resources for military production or to meet postwar needs in a ravaged economy, governments have turned on the printing presses. As the added money is spent in competition with private demand, costs to government rise further, and more money is printed to meet them. When inflation becomes acute, people rush to buy before their money depreciates further. Workers paid in the morning spend their wages by noon. Debtors rush to pay their creditors. Instead of holding money, people hoard goods, reducing supply in the face of rapidly rising money demands. Finally, people refuse to accept money any longer and resort to barter.

Hyperinflation visited America during the Revolution. From 1776 through 1780, an index of wholesale prices in Philadelphia soared from 105 to 10,222.[1] This was when the Continental currency became "not worth a Continental."

The Quantity Theory of Money

Such experiences have taught men to beware of the printing press and to believe that whenever government undertakes or permits an increase in money, there will be inflation. In economics, this is known as the quantity theory of money. In extreme form, it says that the price level rises proportionately to the quantity of money in the short run. If money doubles, prices double. Hardly any economist holds to this strict version, but it serves as a point of departure for our discussion.

Constant velocity assumed This version of the quantity theory assumes that velocity and real output are constant in the short run; so, the equation of exchange is:

$$M\bar{V} = P\bar{Y} \tag{13-1}$$

The bars indicate that values of V and Y are constant. Obviously, prices must increase in proportion to the stock of money.

The classical monetary theorist assumed that velocity was constant, as a rule, in the short run, because he believed that all money is used for transactions purposes. Its role as a store of value was recognized but neglected. Transactions velocity normally changes only slowly as institutions and habits of payment evolve over the long run.

Changing velocity. Exceptions were recognized. In periods of financial crisis, fear of bankruptcy causes businessmen to hoard money temporarily. They may also hoard in anticipation of substantial price reductions for materials. On the other hand, during hyperinflation, velocity increases as people rush to get rid of their depreciating money. However, these things rarely occur, and the classical economist assumed that velocity would ordinarily be constant in the short run.

[1]Joint Economic Committee, *Study of Employment, Growth and Price Levels, Hearings, Part II*, 86th Cong., 1st sess. (Washington, D.C.: Government Printing Office, 1959), p. 394.

The importance of Keynes' liquidity preference theory is that it makes changes of velocity the rule rather than the exception. We have seen that the demand for money to be held as an idle asset is inversely related to the rate of interest. This means that velocity is directly related to the rate of interest.

The importance of liquidity preference as a damper on inflation can be seen in the postwar record of 1946–48 and 1950–51. We saw in Figure 12-1 that money greatly expanded during the war, and the postwar inflations appear to support the quantity theory. Nevertheless, the fact that velocity remained much lower than in the previous period of prosperity, 1929, considerably reduced the degree of inflation.

Suppose that the velocity of circulation had soon returned to its 1929 level after release of wartime controls. To illustrate, let V rise from its actual level of two in 1946 to four in 1948. Total spending in 1948 would have been $433 billions instead of its actual $259 billions. Given the rise in real GNP that occurred between these two years, prices would have nearly doubled! Despite the 33 percent inflation in consumer prices which did occur, the public desired to hold substantial amounts of money idle at the prevailing low interest rates.

We cannot assume that actual velocity can be expected to return to stable velocity or to "normal" velocity when extraordinary conditions are removed. When the quantity of money is increased in the short run, interest rates are reduced; so, velocity declines and spending does not increase in proportion to money. In the extreme case, where interest is in the liquidity trap, we saw in the last chapter that added money is hoarded, and there is no increase in spending at all.

Expansion of output Increased spending (MV) does not raise prices if real output expands in the same proportion. If the increase in spending occurs during a depression, when there is mass unemployment of labor and capital, output is apt to expand substantially without much, if any, increase in prices. Machinery can be reactivated and labor re-employed in the relative proportions that keep operating costs at a minimum. Unemployed labor is eager to be hired at the prevailing wage rate, and employers need not offer increased wages or fringe benefits to fill openings.

As recovery approaches full employment, bottlenecks appear, which drive up costs in some industries. These may be specific shortages of capital equipment, skilled labor, or materials. In time,

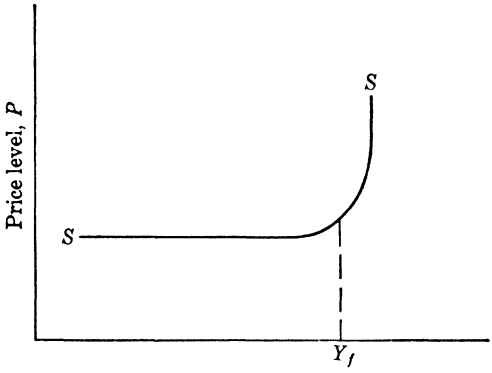
they can be eliminated by investment, training additional labor, importing scarce materials, or expanding domestic supplies. However, if demand rises so quickly that these adjustments cannot be made, then, rising costs are likely to be reflected in rising prices.

As demand continues to increase, more and more industries find output requirements pressing against capacity, and the result is that costs rise. When unemployment diminishes, it becomes difficult to hire labor and wage offers rise. Furthermore, unions enjoy greater bargaining power when most of their members are re-employed. On the product side, firms face sellers' markets in which they can raise prices without severe loss in the sales volume. At some point, output expands relatively little, while prices rise almost in proportion to demand.

Aggregate supply These notions are expressed in the short-run aggregate supply curve SS in Figure 13-1. When output is greatly below the amount that can be produced at full employment (Y_f), it can be increased substantially without a rise in the price level. When output approaches Y_f, prices begin to rise and rise steeply beyond Y_f, with little further increase in output. The great elasticity of output below full employment enjoys empirical support. Over the recovery years, 1934 through 1940, production (GNP in 1929 prices) increased 50 percent, while consumer and wholesale prices increased less than 5 percent.

It is important to note that this supply curve is short run. That is,

13-1 Short run aggregate supply

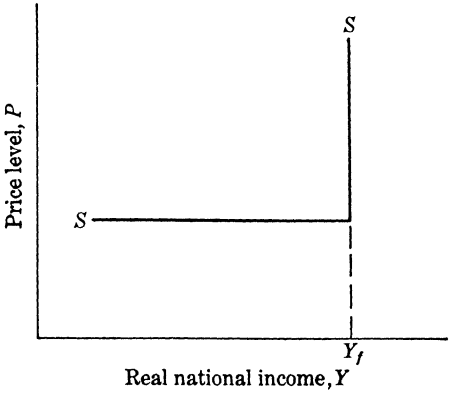


it shows the response of Y and P to changes in demand taking place over a short period of time. Strictly speaking, the period for one curve should be so short that the labor force, capital, and technology can be assumed constant. Over the long run, this curve shifts to the right, and the level of full employment output shifts with it, as all three factors change. Of course, part of the 1934–40 expansion was permitted by such shifts, but a substantial part was due to movement along the curve as unemployment decreased.

Inadequacy of the quantity theory Once we recognize that V and Y are not constant, even in the short run, the quantity theory of money is severely qualified. Spending (MV) may not rise in proportion to M, because V falls. Prices may not rise in proportion to spending, because Y rises. Furthermore, inflation may come from an increase in velocity due to decline in demand for idle money. It may arise without an increase in MV due to monopolistic wage-price hikes, though only at the expense of a fall in output and employment.

To build better theories of inflation, we should get to the heart of the matter by answering two questions. Under what circumstances will spending raise prices instead of output? What circumstances bring a rise in prices independent of spending? Answering the first question, we shall consider demand-pull inflation; answering the second will introduce cost-push inflation. We shall deal also with a hybrid type, termed *structural inflation*, which is a combination of both.

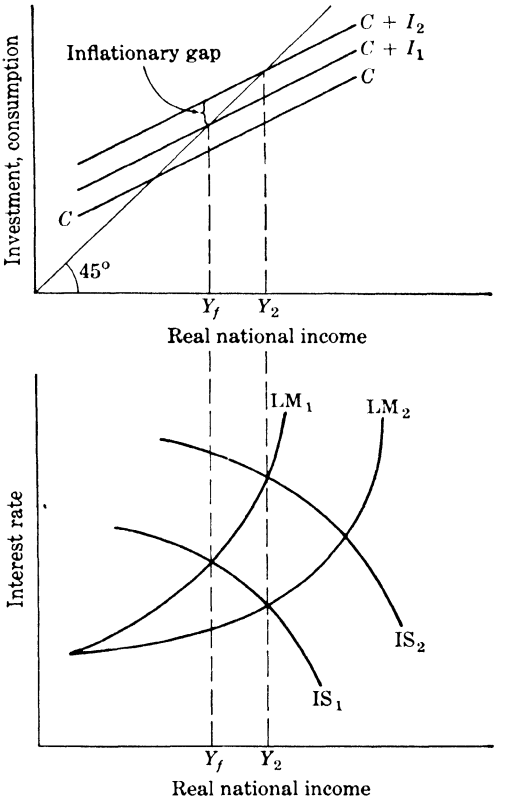
13-2 Assumed aggregate supply function



Money will not be neglected. In treating each type of inflation, we shall ask (1) whether it might be caused by an increase in money and (2) whether it might be prevented by refusal to increase money. Changes in the stock of money may either cause or permit inflation. The quantity theory, even qualified for changes in V and Y, covers only the former case.

For convenience in the analysis, we shall postulate the unrealistically simplified supply curve of Figure 13-2. Up to the point where labor is fully employed, output expands without any change in the price level; if demand increases beyond full employment, output can-

13-3 Demand-pull inflation



not increase, and prices must rise in the same proportion as money spending.

Demand-Pull Inflation

Demand-pull inflation occurs when aggregate demand exceeds the level of full employment output. Consumers and investors seek to buy more than can be produced. This condition is shown in the two charts of Figure 13-3. In the upper chart, the line $C + I_1$ is aggregate demand that just clears the market of full employment output (Y_f). If demand is, in fact, higher, such as $C + I_2$, the difference between it and $C + I_1$ may be termed the inflationary gap. If output were free to expand, Y_2 would be bought, but, since output is limited to Y_f, the consequence is a rise in prices.

Possible causes of demand-pull inflation may be seen in the lower chart. First, an increase in the quantity of money (or decrease in demand for money) might have shifted the LM curve from LM_1 to LM_2, given IS_1. As money increases, the rate of interest falls, since more is available for idle balances. This increases investment directly and consumption through the multiplier (moving down IS_1). Although it is consistent with the quantity theory, this analysis is better, since it indicates how increasing money finds its way into increased spending. The more elastic the LM curve in its range of intersection with IS, the less the decrease of interest and increase of inflationary demand for a given expansion in money.

On the other hand, demand-pull inflation can occur without an increase in money. Suppose that LM remains at LM_1, but IS shifts from IS_1 to IS_2 due to an increase in the expected profitability of investment (or in the propensity to consume). (A rise in government purchases or net exports would have the same effect.) Again, demand exceeds output, and the inflationary gap occurs. This case is not covered by the quantity theory.

Closing the gap It is important to realize that when an inflationary gap exists, prices do not simply rise to a higher level and then stay there. They continue to rise, period after period, as long as people try to buy more than can be produced.

If inflation is to be halted, the gap must be closed. Will this happen automatically? Two things provide affirmative answers. First, advance of labor, capital, and technology increase the level of

full employment output. If aggregate demand does not increase further, or at least not as fast as output increases, the inflationary pressure is removed. Second, the rise in prices increases transactions demand for money, which has the effect of shifting LM to the left. If money is held constant, once inflation begins, this shift raises interest rates, reduces investment, and brings aggregate demand down toward $C + I_1$, closing the inflationary gap.

What about the Pigou effect? If deflation raises the propensity to consume because liquid assets rise in value, shouldn't inflation lower the propensity to consume as these assets fall in value? If this happens, the IS curve shifts to the left. This serves to reduce the inflationary gap. To the extent that the Pigou effect has an inflationary counterpart, it also serves to remove or reduce inflationary pressures. Anticipations about future prices can work either to cancel or reinforce the Pigou effect, just as in deflation.

Cost-Push Inflation

Nearly everyone wants a larger slice of the national pie (GNP), and some are powerful enough to get it at the expense of others. Strong unions restrict membership and working hours, hike wages, and demand more costly fringe benefits. If they succeed in raising costs per labor hour by more than increases in productivity, costs per unit of output rise. Large firms reach agreements or understandings with their competitors to control expansion, divide markets, restrict output, and set prices. Furthermore, firms differentiate their products by styling and by real or bogus improvements, coupled with national advertising, to create consumer preferences. In these ways, they obtain greater power to administer prices.

Physicians, lawyers, barbers, and other professional and semiprofessional people restrict entry by limiting training opportunities, allowing only a certain number of applicants to pass strict qualifying examinations, or restricting the licenses to practice. Farmers, who are in potentially the most competitive industry, turn to the state for crop restrictions and price supports. In one way or another, persons in many occupations and owners of property seek a larger slice by raising price and restricting supply.

A price to the seller is a cost to the buyer. When unions raise labor costs, firms raise prices. Often, monopolistic industries await a wage

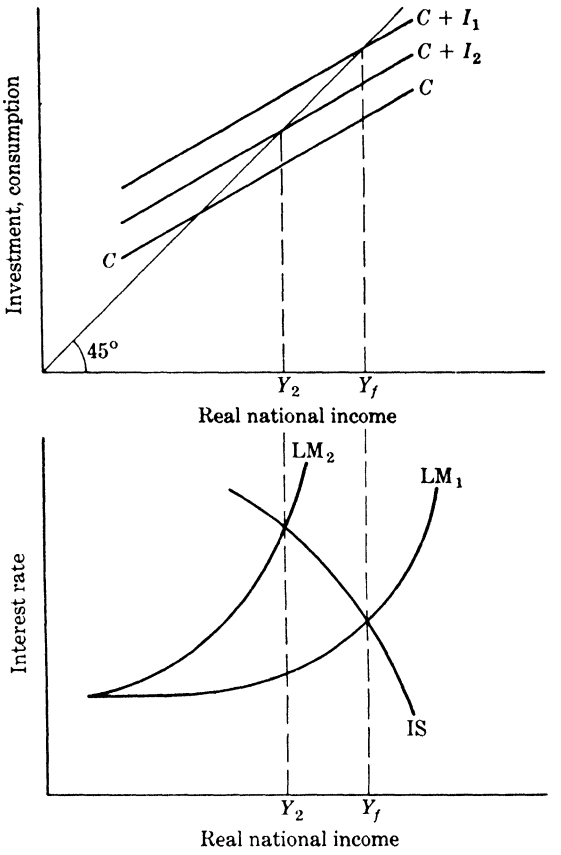
rise before increasing prices by substantially more than the true rise in labor costs. The public has little knowledge of how much labor costs per unit have increased, and the price hike is blamed on the union. Rise in steel prices increases costs and prices of automobiles and farm machinery. Increase in farm equipment prices raises agricultural support prices in order to maintain parity of prices received relative to costs incurred in farming. Increasing food and transportation prices raise the cost of living and the consumer price index. In many industries, wages then automatically rise because rates are tied to the consumer price index by *escalator clauses*, whereas in other industries, labor is provoked into higher demands in order to maintain purchasing power.

Effects of cost-push Cost-push inflation is an increase in prices which is independent of aggregate demand and occurs because some or all groups attempt to secure a larger share of national product by raising the prices of what they have to sell. It shifts the aggregate supply curve vertically upwards.

The attempt, not the result, creates the inflationary pressure. Even if all groups had the same market power and none succeeded in advancing its share, their attempt to do so, by raising prices or restricting output, would still be inflationary. In reality, market power is not equal, and some groups gain at the expense of others. The losers are competitive industries without government support; creditor classes, which include not only rich coupon clippers but also persons living on pensions and life insurance benefits; and salaried workers in government or private employment who cannot or will not bargain collectively. Cost-push does benefit the pushers, but the redistribution is likely to be inequitable.

If the quantity of money is constant or increases less than in proportion to prices, cost-push will probably result in lower output and employment. The case is shown in Figure 13-4. Before inflation sets in, aggregate demand (upper chart) is $C + I_1$, and output is at its full employment level. When prices begin to rise, transactions demand increases and LM rises from LM_1 to LM_2. This increases the rate of interest and reduces investment; consequently, aggregate demand drops to $C + I_2$. Output Y_2 is substantially less than the amount (Y_f) required for full employment.

Can we postulate a given IS curve? The redistribution may



13-4 Cost-push inflation

change the aggregate propensity to consume, but it is difficult to anticipate the direction of change, and, at any rate, it is likely to be minor. The Pigou effect, if it is present, will shift IS to the left and reduce output and employment further.

Demand-pull inflation was found to be self-limiting if money is not increased. Is this true also of cost-push inflation? The case is not so clear. Reduced output means less real income per capita and greater unemployment. Growth of the labor force and its productivity (shifting the supply curve to the right) raises the margin of unemployment over time. Unions may be deterred from raising wages

if management can readily break strikes by hiring from the pool of unemployed or if many unionists are unemployed. When excess capacity grows, firms may be unwilling to discourage sales by raising prices still further. Price agreements may collapse as "cheaters" attempt to spread overhead costs by gaining sales at the expense of rivals. The appearance or prospect of excess capacity will also reduce investment, cutting back aggregate demand. At some point, these things should call a halt to inflation, but the point is not clearly defined.

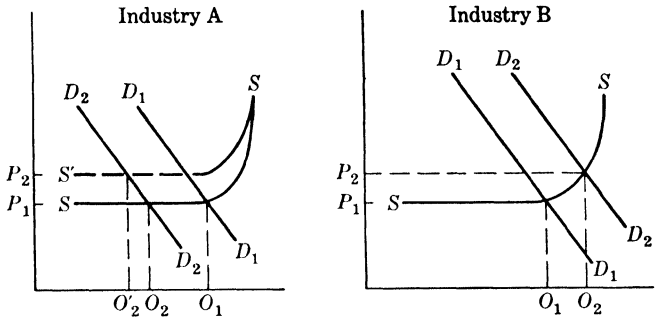
Structural Inflation

In a statistical analysis of creeping inflation between 1955 and 1957, Charles Schultze argued that neither aggregate demand-pull nor cost-push forces could explain the data.[2] He advanced the plausible hypothesis of structural inflation, which quickly won wide attention by economists. Structural inflation exists when three conditions are met: (1) there is a substantial shift in demand from one group of industries to another over a short period of time, (2) resources do not move rapidly from the losing to the gaining industries, and (3) wages and prices are rigid downwards but flexible upwards. An added element of inflation occurs if wages and prices in the losing industries are cost-pushed upwards by rising wages and prices in the gaining industries. Schultze argued that these conditions did exist in the 1955 to 1957 period.

An example is shown in Figure 13-5, where supply and demand functions for two industries are shown side-by-side. Initially, the demand for each is shown by the D_1D_1 curves. Then, demand shifts away from industry A (left chart) to industry B (right chart). Pressing against capacity in the latter industry, demand creates a demand-pull inflation in that sector. We are postulating a complete immobility of resources, so that the supply curves remain fixed in position. The increase in B's prices is sufficient to raise the consumer (or wholesale) price index because A's prices have not fallen. This rise in the index is sufficient to indicate creeping inflation to observers. Note also that there is less output and employment for industry A.

The increase in B's wages and prices may cause a cost-push infla-

[2]Joint Economic Committee, *Study of Employment, Growth and Price Levels, Study Paper No. 1 — Recent Inflation in the United States*, 86th Cong., 1st sess. (Washington, D.C.: Government Printing Office, 1959).



13-5 Structural inflation

tion in industry A, shifting its supply curve to the dashed-line position. Firms may believe that the slack demand is temporary and may raise wages and salaries toward B's levels in order to hold experienced workers. Unions may gain wage hikes because of the higher cost of living. If A uses some of B's output as an input, A's costs and prices rise. The consequence is a still larger decline in sales and employment for A.

Structural inflation has the same symptoms at the aggregate level — that is, rising prices and increasing unemployment — as over-all cost-push inflation. However, it is actually a combination of demand-pull in gaining sectors and (perhaps) cost-push in losing sectors. Attempts to control it by general monetary or fiscal policy rather than by specific controls designed to moderate the shift in demand are likely to result in more unemployment and less price stabilization. Nevertheless, general policy *could* control even structural inflation by reducing aggregate demand and employment a great deal. First, resistance to wage-price reduction in the losing sectors could be destroyed. Second, the pool of unemployed would permit more easy hiring and output expansion by the gaining industries (their supply curves would shift to the right). However, we might well be unwilling to suffer the penalty of mass unemployment and reduced growth that this policy would entail.

Distinguishing Causes of Inflation

In practice, it is difficult, if not impossible, to determine from statistics whether a particular inflation has been generated by cost-

push or demand-pull forces. Indeed, both may be present, as in the case of structual inflation. Suppose, however, that there has been no substantial shift in the composition of aggregate demand. We are called on to decide whether a rise in prices has been predominantly caused by cost-push or demand-pull.

We might credit cost-push from evidence that (1) wages rose before prices or that (2) wages rose faster than labor's productivity. Unfortunately, neither conclusively shows cost-push. Wages historically have risen as labor's productivity has increased. If this were not the case, labor's proportional share in the national product would decline. Since wages are always rising, it is evident that they must have risen before any particular price rise, whether or not they caused the price rise. Even if wages rose faster than productivity, we have no proof. This also occurs in demand-pull inflation. The pull on prices permits management to offer higher wages, relative to productivity, without reducing profits. It will have the incentive to do so in order to hire more labor in the face of overcapacity demand.

If wages and prices rise in spite of a reduction in aggregate output and employment, we have a clearer indication of cost-push. On the other hand, absence of unemployment does not indicate demand-pull in every case. Demand may just keep pace with growth in full employment output, without pressing strongly against capacity. Yet, prices rise because labor and management exert market power. Indeed, since demand is not restricted, there is no growth in unemployment to limit market power, and such inflation could go on indefinitely. Demand is accommodating, not causative in this plausible case.

Inflationary Bias and the Wage-Price Spiral

The modern economy may have an inflationary bias; so, the number of years of rising prices outnumbers those of stationary or falling prices. The built-in counter-recessionary stabilizers do not seem to work so well against inflation. Moreover, some economic practices and laws apparently provide a built-in destabilizing effect. Whereas government has the power to stop inflation, concern for full employment may prevent effective use of this power. Let us consider these things in more detail.

Built-in stabilizers We have learned that certain laws, habits, and institutions provide buffers to lessen the severity of business

recessions. These are (1) willingness of households to sacrifice saving in order to maintain living standards in the short run, (2) reduction in proprietors' and corporate business saving when profits fall more rapidly than total income, (3) reduced proportion of income collected by the progressive personal income tax, and (4) the increase in transfer payments to the unemployed, farmers, and general relief. Let us add the rise in net exports to these when the decline of domestic income and some prices reduce imports and expand exports.

Do these work in reverse to restrict inflationary pressures? Rise in domestic relative to foreign prices should curtail exports and expand imports, reducing net exports and thus, aggregate demand. Personal income tax collections will rise more than in proportion to total money income, reducing the proportion of disposable income. However, we cannot always expect transfers to fall and business saving to rise during inflation. In cost-push or structural inflation, unemployment may increase transfer payments, whereas profits and business saving may be curtailed by rising costs.

The important first stabilizer — consumer inertia — either has no counterpart during inflation or else acts in a perverse way. Real national income does not rise appreciably faster in inflation than in the absence of inflation, being held in check by full employment of labor and capital. If households receive the same proportion of total money income in either case, their real incomes or purchasing power are the same. We should not expect their propensity to consume to be altered in this case, barring anticipation effects. However, to the extent that progressive income taxes and rising business savings may reduce the proportion of disposable income to gross national income, the real income of households declines. That is, prices rise more than money income of households and to protect living standards they must increase the proportion of income spent for consumption. This partially offsets the stabilizing effect of taxes and business saving.

Built-in destabilizers Whereas the built-in stabilizers are apt to be less potent during inflation, attempts by people to protect themselves against price rises create certain built-in destabilizers. First, escalator clauses in contracts tie wages, construction charges, materials, and other prices to price indexes. When the indexes rise, so do these prices; and when these prices rise, so do the indexes. Second, many firms in imperfect competition employ standard markups over

operating costs when setting prices. When wage and materials' costs rise, prices are increased in proportion. Third, we have the escalator of parity price supports for agriculture, which raise food and fiber prices as farmers' costs increase. If monetary and fiscal policies permit, it is possible for these mechanisms to interact to provide an endless round-by-round wage-price spiral.[3]

Inflation can be eliminated by refusal to increase money as transactions demand rises or by raising taxes and lowering government purchases. Unless the inflationary force is purely demand-pull, however, price stability is bought at the expense of substantial unemployment. Believing strong cost-push or structural forces are present at all times in the modern economy, many observers argue that public policy designed to maintain full employment necessarily underwrites continued inflation. Big labor and big management can raise wages and prices with impunity, because the monetary and fiscal authorities yield to the popular demand that spending be maintained at full employment levels.

It seems to be true that wages and prices are more flexible upwards than downwards and that many groups are able and willing to exert market power to enhance their income shares during periods of full employment. Thus, full employment and price stability are apparently incompatible in today's economy. Recognizing this, some people would settle for less employment; others are willing to have some inflation in order to maintain full employment and a high rate of economic growth. A third way out is to enact and enforce laws designed to reduce economic power of labor and management, such as antitrust laws. We shall return to the question of whether it is possible by these means to have both full employment and price stability when we consider general policy questions in the concluding chapter.

From trot to gallup There is danger that creeping inflation may break into a trot, then a gallop. As inflation continues, more and more people come to expect further inflation and take action to guard themselves against loss in purchasing power. The destabilizers become more numerous and more powerful. Furthermore, convinced that the rate of return in purchasing power on bonds will continue to

[3]Cf. F. D. Holzman, "Income Determination in Open Inflation," *Review of Economics and Statistics*, vol. 32 (May 1950), pp. 150–58.

decline, people place more of their past and current savings in the stock market. The shift from bonds to stocks raises the rate of interest on the former but reduces the cost of funds from stock issue. Rising stock prices may create a speculative stock market; consequently, share prices are driven up rapidly in anticipation of short-run capital gains.

Investment is stimulated for several reasons. First, until interest rates rise, the real cost of investment is reduced; the loss of the creditor is a gain for the debtor. Even if interest rates rise to offset this, a speculative stock market provides inexpensive finance to firms willing to issue new shares. Indeed, promoters launch many new enterprises that have little chance of success simply because the stock can be unloaded on a gullible public before the venture fails.

Second, if money loses value while goods rise in price, firms are prompted to reduce liquidity by purchasing more materials for inventory. Finally, rising prices and a buoyant stock market are widely viewed as harbingers of prosperity. Firms may become overly optimistic and may undertake investments that were previously (perhaps correctly) considered too risky.

What begins as cost-push inflation may turn into demand-pull when investment expands. Whereas the propensity to consume is likely to be little affected by moderate inflation, a rapid rise in prices may lead households to accelerate their purchases of durable goods and perhaps even of non-durables.

We should not expect even a galloping inflation (say 15 to 20 percent rise in the price level each year) to turn into hyperinflation during peacetime. This will only occur if government chooses to greatly expand the money supply — and no government in a modern capitalist economy is likely to be that irresponsible or foolish. Nevertheless, once speculative forces have been let loose and once investments are predicated on rising prices, government policy to check inflation is apt to plunge the economy into depression. When speculators become convinced that prices will no longer rise, they sell and the bubble breaks. Firms stop buying materials before prices fall and halt purchases until they can work off what they already have. Investments previously made on expectation of price rises now fail to return profits and firms are discouraged from further risky ventures. The contraction of investment brings a decline in aggregate demand and causes a downturn of production and employment.

Summary

The most notable instances of inflation have occurred during or in the wake of wars when governments have literally turned on the printing presses to finance their expenditure needs. Such inflation is so clearly linked to an increase in money that many people, including some economists, have accepted the notion that price inflation is always caused by changes in the quantity of money. In this chapter, we have added to the quantity theory by considering (1) cases in which an increase of money does not result in a rise in the price level and (2) cases where price inflation occurs without an increase in the quantity of money. To be sure, in the latter cases, the quantity of money must generally be increased if inflation is to continue for very many years. The point is that money plays a passive or adaptive role rather than an active or causal one in these cases of inflation.

An increase in the quantity of money will not raise prices if either the velocity of circulation falls or real output rises proportionately. By acting to lower the rate of interest and thus lead people to hold more idle balances, an increase in money does reduce velocity. Except in the unlikely case that interest is in the liquidity trap, however, velocity will not fall in proportion to the increase in money, and total money expenditures (MV) must increase.

An increase in money expenditures is not inflationary if real national income (Y) increases proportionately. Even in the short run, with the supplies of resources virtually constant, output can expand by return from depression toward full employment of labor and capital. Indeed, experience with virtually stable prices during recovery from the Great Depression suggests that it is plausible to posit almost perfect elasticity of aggregate supply up to the point where labor is fully employed. This means that money can be increased during depression without inflationary results.

Three types of inflation are (1) demand-pull, (2) cost-push, and (3) structural inflation. Demand-pull arises when aggregate demand increases relative to output capacity at full employment. It may be caused by an increase in money, but it may also arise from an increase of investment, consumer, government, or foreign demand. Cost-push inflation occurs when monopolistic organizations of labor and capital try to obtain larger returns by raising wages and prices independent of demand conditions. If money expenditures remain the same, the consequence must be a reduction in output and employment. Struc-

tural inflation is caused by a shift in the composition of demand not matched by reallocation of resources; so, prices are pulled up in the gaining industries. Prices fail to fall in the losing industries and may even be pushed upwards by labor and capital, who are eager to enjoy some of the apparent gains of the advancing industries.

In practice, it is difficult and perhaps impossible to distinguish one kind of inflation from another. Neither an increase in wages before prices or an increase in wages greater than productivity distinguishes cost-push. If prices rise while unemployment is high and rising, we can be confident that cost-push or structural inflation is present. However, the absence of these indicators is no proof that the principal stimulus to inflation is aggregate demand. The latter may simply rise sufficiently to accommodate monopolists without forcing them to accept the penalty of their avarice.

Our modern economy may have a bias toward inflation. The built-in stabilizers are not as effective against inflation as against recession. To protect themselves, groups in the economy may create destabilizers such as escalator contracts. If a wage-price spiral is permitted to gather speed over an extended period of time, it may create speculative anticipations and behavior that make it difficult to regain control of prices without bringing down aggregate demand and employment into a depression.

Reading and Research

General bibliographic citations are given at the end of Chapter 1.

Inflation. In the June 1962 number of the *American Economic Review*, mention was made of a forthcoming survey of inflation theory by Martin Bronfenbrenner and Franklyn Holzman, to be published in the same *Review*. Look for this, since it will contain extensive bibliography as well as review of the issues. Thomas Wilson has authored a book reviewing inflation theory, *Inflation* (Cambridge, Mass.: Harvard University Press, 1961).

Besides Schultze's work cited in a footnote of this chapter, see other *Studies* in the same series that measure the causes and results of postwar inflation. Schultze has authored a Committee for Economic Development (CED) Supplementary Paper, *Prices, Costs, and Output for the Post War Decade: 1947–1957* (New York: CED, 1957). Some articles on the postwar inflation, by order of publication, are:

W. J. Yordon, "Industrial Concentration and Price Flexibility in Inflation: Price Response Rates in Fourteen Industries, 1947–1958," *Review of Economics and Statistics*, vol. 43, no. 3 (August 1961), pp. 287–94.

Joseph Yance, "A Model of Price Flexibility," *American Economic Review*, vol. 50, no. 3 (June 1960), pp. 401–18.

Fritz Machlup, "Another View of Cost-Push and Demand-Pull Inflation," *Review of Economics and Statistics*, vol. 42, no. 2 (May 1960), pp. 125–39.

Richard E. Selden, "Cost-Push versus Demand-Pull Inflation, 1955–57," *Journal of Political Economy*, vol. 47, no. 1 (February 1959), pp. 1–20.

Gardner Ackley, "Administered Prices and the Inflationary Process," *American Economic Review*, vol. 49, no. 2 (May 1959), pp. 419–30.

L. E. Gallaway, "The Wage-Push Inflation Thesis, 1950–57," *American Economic Review*, vol. 48, no. 5 (December 1958), pp. 967–72.

14 Economic Growth

Up to this point, we have considered what determines the equilibrium of the national income under constant conditions summed up in the LM and IS curves. These determine a certain stationary level of output at which aggregate demand absorbs aggregate output. The real world is not stationary. Productive resources expand more or less continuously from year to year and, except in depression, national income grows with the increase in labor, natural resources, and capital. Stationary equilibrium is a useful abstraction for short-run analysis; when the time interval is brief, we can assume constant resource supplies without serious error. However, in the long run, we shall see that aggregate demand and output must expand or contract — they cannot stand still if part of income is saved and capital accumulates.

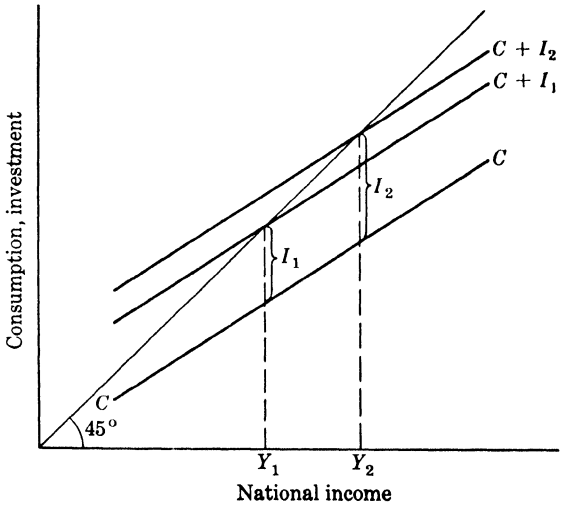
In this chapter, we shall shift from the notion of stationary equilibrium to growth equilibrium. The latter exists when aggregate demand grows and remains equal to expanding productive capacity from one period to the next. In every period, spending remains sufficient to fully employ capital; so, there is no disparity between sales, output, and capital capacity. We shall see that this is ordinarily a condition in which labor is also fully employed.

The Domar Model

Figure 14-1 is a familiar one, depicting equilibrium with a given condition of aggregate demand in a closed private economy. Consumption plus investment in the current year ($C + I_1$) equals current real output (Y_1). Aggregate spending clears the market of aggregate output. We use the long-run consumption function, with constant and equal average and marginal propensities to consume, because we are now interested in developing the conditions for long-run equilibrium growth.

How long can this stationary equilibrium continue? If we assume that gross investment does not exceed replacement requirements, then it can continue indefinitely. But in periods of prosperity, gross investment includes a great deal of net investment. Thus, we should

14-1 Investment requirments for growth



assume that I_1 increases the stock of capital. In our first models, we shall limit I_1 to net investment.

The paradox of stationary equilibrium Demand is stationary, but capital is growing. It is hard to imagine that firms continually add more plant, equipment, and inventories if sales are constant in the aggregate. One possibility is that technology, relative input prices, and the composition of aggregate demand might change continuously in such a way as to make it profitable to use more and more capital per unit of output. We shall return to this case shortly. For the time being, let us assume that the desired aggregate capital-output ratio is constant.

Investment I_1 occurs in the current period because firms do not possess as much capital as they desire, given their expectations and confidence. Investment brings them much closer to desired capital. Unless they come to desire still more capital, we should expect investment in the next period to be less than I_1. Given the desired capital-output ratio, the only thing which will increase desired capital is an increase in output requirements. Given the propensity to consume, the only thing which will increase output requirements is an *increase* in the level of investment. Thus, investment must increase to keep from falling!

Required growth of investment Evsey Domar formulated the required rate of increase in investment which, if maintained, keeps aggregate demand in each period equal to capital capacity.[1] Suppose that in the current year firms already have the capital they desire for current output, Y_1. Net investment I_1 occurs because they expect output to increase to Y_2 next year. In order to justify their expectations, aggregate demand must increase enough next year to purchase output Y_2. That is, demand must increase to $C + I_2$, where I_2 investment is greater than I_1.

How much increase of investment is required? This is a matter of simple algebra. First, the increase in output required to utilize investment in the current year is:

$$Y_2 - Y_1 = oI_1 \tag{14-1}$$

[1] "Expansion and Employment," *American Economic Review*, vol. 37, no. 1 (March 1947), pp. 34–55, reprinted in Domar's *Essays in the Theory of Economic Growth* (New York: Oxford University Press, 1957).

The small o stands for the marginal (desired) output-capital ratio. It is marginal, because we are only concerned with an increment in capacity and output, from Y_1 to Y_2, not total output (Y_1 or Y_2). This coefficient is the number of dollars' worth of additional output needed to justify a dollar invested in new plant, equipment, and inventories. (Variables are measured in constant prices.)

The change of investment needed to raise aggregate demand to Y_2 is provided by our familiar multiplier formula:

$$Y_2 - Y_1 = m(I_2 - I_1) \tag{14-2}$$

Now, by substitution and rearrangement of terms we have:

$$m(I_2 - I_1) = oI_1$$

or

$$\frac{I_2 - I_1}{I_1} = \frac{\Delta I}{I} = \frac{o}{m} \tag{14-3}$$

That is, the proportional increase of investment required to raise demand as much as capacity is o/m. If equilibrium is to be maintained each year, the required rate of growth of investment is directly proportional to the marginal output-capital ratio and inversely proportional to the multiplier.

We can see this on the chart of Figure 14-1. The greater the marginal output-capital ratio, the further along the horizontal axis must be the Y_2 corresponding to I_1, and the greater must be I_2 to absorb this output. On the other hand, imagine that the consumption function were rotated toward the horizontal axis around a point directly above Y_1. This would reduce the marginal propensity to consume and the multiplier. The saving gap at Y_2 would become larger, and it is apparent that I_2 would have to be greater in order to fill it. Thus, the required rate of investment growth is greater when the marginal output-capital ratio is greater and when the marginal propensity to consume is less.

An unstable equilibrium If investment increases at the required rate, demand equals full capacity output each year. Suppose, however, that investment fails to increase at this rate. Consider Figure 14-1 again. Suppose that investment is less than I_2 next year. If producers employ their new capacity and increase output to Y_2, they will be left with unintended inventory investment at the end of

the year. If they increase output only as much as the increase in aggregate demand, they fail to fully utilize their new capital. In either event, they have excess capital capacity. Consequently, we should expect them to revise capital plans and to increase investment still less than before, or even decrease it.

If they continue to increase investment at a decreasing rate, excess capacity will mount year after year. Sooner or later, firms will try to call a halt to this by cutting back on investment absolutely. However, this only makes the problem worse. Aggregate demand falls, and even the capital that was used to produce Y_1 output becomes idle.

An excess of investment. Consider what happens if investment should rise above the required rate. Let us return to Y_1 as current output, in Figure 14-1. If investment is greater than I_2 next year, aggregate demand exceeds Y_2, and producers find they are short of capacity. Thus, they are apt to accelerate investment. If they do, demand will exceed capacity by more and more each year. In the attempt to catch up, firms worsen the capital shortage.

In this case, we soon have demand-pull inflation, as spending presses more heavily against capacity each period. Eventually, if this continues, it may set in motion a wage-price spiral and speculative anticipations of further inflation. When something finally calls a halt to the rise in prices, the collapse of speculation may bring depression.

Thus, the required rate of growth in investment provides an unstable equilibrium. As long as investment grows at the required rate, producers continue to be satisfied with the capacity they have achieved. But, if investment departs from the required rate in either direction, it creates forces which cause it to depart still further. If growth of investment is too slow, depression results. If growth is too fast, there is inflation. The latter may sow the seeds of a later depression.

Harrod's Model

Roy Harrod developed a famous model of economic growth which is similar to Domar's.[2] He uses an unlagged accelerator to account for the growth in investment.

[2]Roy Harrod, *Towards a Dynamic Economics* (London: Macmillan & Co., Ltd., 1951).

Domar asks, How much increase of investment is needed to justify capacity created by investment I_1? Harrod poses the problem differently. He asks, How much increase in output is needed to generate sufficient demand, by accelerator-induced investment, to absorb the increased output?

The accelerator and saving functions There are three building blocks to Harrod's model. The first one is the familiar equilibrium requirement: intended investment equals saving each year. The second one is the saving function: saving is the average propensity to save (s) *times* income:

$$S_t = sY_t \tag{14-4}$$

In the final one, we have the unlagged accelerator:

$$I_t = k(Y_t - Y_{t-1}) \tag{14-5}$$

We omit depreciation, because we are dealing with net investment in this model.

In equilibrium, saving equals investment, so Equation 14-4 equals Equation 14-5. By setting them equal and by rearranging terms, we have:

$$k(Y_t - Y_{t-1}) = sY_t$$

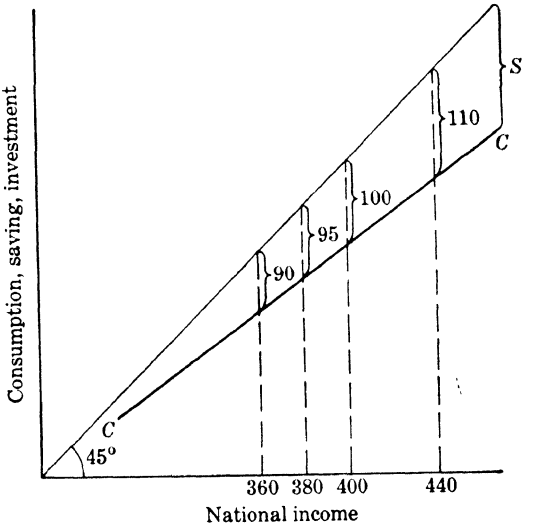
or

$$\frac{Y_t - Y_{t-1}}{Y_t}k = s \tag{14-6}$$

The warranted rate of growth Harrod terms the required proportional change of income, expressed by the fractional term in Equation 14-6, the *warranted rate of growth* and symbolizes it with G_w. The accelerator coefficient (k) is the required (marginal) capital-output ratio, which he symbolizes C_r. Thus, in his symbols, Equation 14-6 is:

$$G_w C_r = s \tag{14-6a}$$

Let us work out the logic of Harrod's model by trial and error. Suppose that output last period (Y_{t-1}) was \$360 billions in Figure 14-2, of which \$90 billions was investment last year (I_{t-1}). Suppose, also, that the required capital-output ratio is 2.5, and the average propensity to save is one-fourth.



14-2 Experiments with the Harrod model

Now, suppose that output in the current year increases to $380 billions. That is, it increases by $20 billions. Through the accelerator, this generates $50 billions of investment (i.e., 2.5 times $20 billions). However, saving is $95 billions (.25 times $380 billions). Saving exceeds intended investment and output is not in equilibrium.

Let us try again. Suppose that output increases to $440 billions, an increase of $80 billions. Investment of $200 billions is induced by this increase. Saving is $110 billions. This time, aggregate demand exceeds output, and again we have disequilibrium.

Suppose that output in the current year is $400 billions. It has increased by $40 billions; so, investment is $100 billions. Saving is also $100 billions. Consequently, output is in equilibrium and we have found the warranted increase in it.

Note that by substituting these values in Equation 14-6 we provide its solution:

$$\frac{400 - 360}{400} \times 2.5 = .25 = s$$

The warranted rate of growth is 10 percent per annum, which we can obtain directly from Equation 14-6a by substituting our values for C_r and s.

An unstable equilibrium Suppose that output does not grow at the warranted rate. Imagine that it increases only to $380 billions in the current year. We saw in our first trial that aggregate demand falls short of output in this case. We should expect producers to increase output still less next year, which only worsens the surplus.

On the other hand, if output increases by more than the warranted amount, demand exceeds production, as our second trial indicated. This should lead producers to accelerate output next year. Rather than remedy the problem, this would make it worse. Demand would increase beyond output in the next year by more than in the current year.

Thus, the Harrod equilibrium is unstable. As long as output grows at the warranted rate, it generates sufficient demand. (In a sense, we have Say's Law working — supply creates its own demand.) But once output falls short or exceeds the warranted rate, it generates forces which cause it to depart even further from equilibrium, either in the direction of depression or toward demand-pull inflation.

The natural rate of growth The actual rate of growth may be prevented from equalling the warranted rate once full employment is achieved. Harrod speaks of a "natural rate of growth," which is the maximum rate at which output can be advanced with full employment of labor. If the natural rate is chronically below the warranted rate, booms are few, depressions many, and the economy suffers from continual stagnation. We shall not go further in discussion of the natural rate, because our later analysis of the conditions of sustained growth will cover similar ground in another way.

Equivalence of the Harrod and Domar Models In the next section, we shall return to a Domar-type model, because it is simpler to understand and may seem more plausible. However, the Harrod model expresses the same things in other ways and is formally equivalent to the Domar model in the long run.

If the marginal and average propensities to save are constant and equal, as they appear to be over the long run, Domar's required rate of growth for investment is the same as Harrod's warranted rate of growth for income. We can first satisfy ourselves of this by intuition. For equilibrium to prevail, intended investment must equal saving.

In the long run, saving is a constant proportion of income. Consequently, if income doubles, saving doubles. To maintain equilibrium, investment must also double. Thus, the required rate of growth for investment equals the warranted rate of growth for income.

The algebra. We can also demonstrate this algebraically. In Equation 14-3, Domar's required rate is inversely proportional to the multiplier. Now, we know that the multiplier is the reciprocal of unity *minus* the marginal propensity to consume, or the reciprocal of the marginal propensity to save. Since the MPS is equal to the average propensity to save (s) in the long run, we can substitute the latter, and Equation 14-3 becomes:

$$\frac{\Delta I}{I} = os \tag{14-3a}$$

Harrod's required capital-output ratio, C_r, is just the reciprocal of the marginal (desired) output-capital ratio, o. Thus, we can rewrite Equation 14-6a:

$$G_w = os \tag{14-6b}$$

The required rate of growth for investment is equal to the warranted rate of growth for income if the marginal and average propensities to save are equal.[3]

There remains a difference in approach between the two authors. In the Domar model, investment creates capacity in excess of current needs, and an increase in aggregate demand is required to justify it. In the Harrod model, firms end up each period with the desired capital, and a subsequent increase in output is required to induce them to continue investing. In the Domar argument, capacity precedes demand; for Harrod, increase in demand calls for greater capacity. In reality, some firms are building ahead while others are catching up. In the aggregate, the process is probably best viewed as simultaneous. To try to say which comes first, demand or capacity, is like deciding whether the chicken came before the egg.

[3]In Equation 14-3, the proportional change for investment is measured with former investment in the denominator whereas Equation 14-6 has current income in the denominator. This leaves a slight, but constant, proportional difference between the two rates. This disappears when period analysis is replaced by continuous change and has no substantive importance.

Requirements for Sustained Growth

Our economy does not display the symptoms of continual stagnation. It shows a good deal of stability; most recessions are soon followed by recoveries, rather than collapse into depression. However, there have been notable instances when stabilizing forces have failed. Thus, we have three questions to deal with. First, what are the conditions for continual growth at full employment and how are these conditions maintained? Second, why doesn't the appearance of excess capacity turn every recession into a depression; and why doesn't a shortage of capacity turn every boom into an inflationary spiral? Third, what events are apt to be powerful enough to plunge the economy into depression? Using a Domar-type model, William Fellner has offered three conditions for sustained growth, and we shall draw heavily from his work.[4]

We shall return to our practice of treating investment as gross of replacement requirements. However, at first, we shall assume that a constant proportion of gross investment is net investment. We shall also begin by assuming that the economy has been growing for some time and that producers have the capital they desire for the output of each period. Aggregate demand equals full-capacity output in each year. What is required to maintain this equilibrium?

Growth and flexibility of money There are three requirements. First, the stock of money must grow as the demand for money increases. Otherwise, the rate of interest is driven upwards and restrains the growth of investment. Some business downturns, particularly that of 1907, seem to have been at least partly due to inelasticity in the money supply. Long-run growth increases transactions demand. It also increases the precautionary and speculative demands, since wealth grows along with income.

It is possible to have sustained growth in real output without an increase in the supply of money if the growth is accompanied by continual deflation. Although a high rate of growth was achieved in the latter nineteenth century in spite of continual deflation, it is doubtful that this could occur today. Oligopolies in business and organized labor are resistant to price and wage reductions. Consequently, supply and labor prices are inflexible downward. Reduction

[4]William Fellner, *Trends and Cycles in Economic Activity* (New York: Henry Holt and Company, 1956), especially Parts II and III.

in final-goods prices would mean reduced profits for their producers and would discourage investment both by reducing expected returns and by curtailing the flow of internal funds.

Over the long run, money should be increased in proportion to output and wealth, as a rule. However, this is not an automatic formula, as some have suggested.[5] We shall see that there are times when money should be deliberately increased at a faster or slower rate than output, in order to reduce or raise the rate of interest as a governor on investment. Furthermore, in the face of short-run disturbances to output and confidence in asset values, a flexibly managed monetary system is essential for stability.

Mobility of resources The second requirement for sustained growth is mobility of productive resources. The composition of aggregate demand changes over time. Part of the net investment in every year is generated by increasing demand for some outputs at the expense of others. The net investment of the gaining industries more than offsets net disinvestment by the losing industries, since it takes longer to reduce capital by failing to replace it.

However, the willingness of gaining industries to expand capital depends upon their ability and willingness to obtain resources from the declining industries. Thus, it is important that labor be as mobile as possible. Mobility is partly restricted by training requirements, age of the worker, reluctance to change communities and ignorance of job opportunities. It may also be restricted by unions forcing the losing industries to retain unneeded employees (*featherbedding*) and restrictions of hiring by the gaining industries (e.g., the closed shop). The gaining industry may be sufficiently monopolistic to raise prices and restrict output rather than expand capacity as much as demand would warrant at constant prices.

The other side of the coin is greater stability in the composition of aggregate demand. If changes in the composition of demand occur slowly resources have more time to move from declining to gaining industries. There is less likelihood that bottlenecks in labor and materials supplies will reduce investment opportunities in the gaining industries.

[5]Cf. Edward S. Shaw, "Money Supply and Stable Economic Growth," *United States Monetary Policy* (New York: The American Assembly, Columbia University Press, 1958), pp. 49–72.

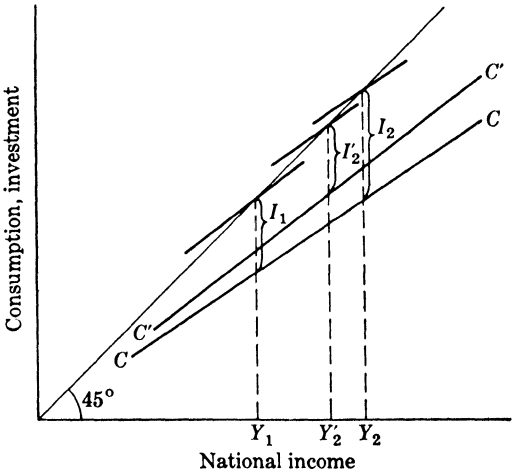
Compensating improvements in technology The third requirement involves more explanation and we will devote the next section to this requirement. Historically, capital has grown at a faster pace than labor and discovery of natural resources. In the absence of compensating innovation, this would diminish returns to capital. That is, the marginal efficiency of investment would decline. However, innovation can prevent diminishing returns, or lessen the rate at which returns diminish, if it is laborsaving and materials-saving. Our third requirement for sustained growth is that innovation be sufficiently laborsaving and materials-saving in character, in order to prevent a downturn of investment from diminishing returns.

Diminishing Returns and Equilibrium Growth

Figure 14-3 is almost identical with Figure 14-1. In the absence of diminishing returns, investment I_1 creates capacity equal to Y_2 *minus* Y_1. Investment must increase to I_2 the following year to absorb full-capacity production. If diminishing returns occur, the marginal output-capital ratio is reduced and capacity increases only to Y_2'. Given the consumption function CC, less investment is needed to provide equilibrium demand.

Moreover, diminishing returns to capital will probably reduce the

14-3 Adjustments to diminishing returns



aggregate propensity to save, shifting the consumption function upward to $C'C'$, for example. The reason is that profits and, therefore, business saving are reduced by diminishing returns. Thus, investment need increase only to I_2' in order to provide aggregate demand equal to full-capacity output.

Transition to the stationary state So far, diminishing returns do not appear to disturb the process of equilibrium growth even though they slow down the rate of growth. A model such as this might have been used by Classical economists (e.g., Ricardo and Mill) to illustrate transition to the stationary state.

Classical economists did not expect innovation to prevent diminishing returns. When labor and capital grew, land remained constant, and diminishing returns in cultivation and mining would occur. Eventually, this would lead to a state in which labor's wages would be permanently reduced to a bare subsistence level, and the marginal productivity of capital would be zero. When the returns to capital fell, saving also fell, and in the stationary state, both net saving and net investment would be absent.

Inadequate interest decline However, the smooth transition to the stationary state requires two questionable assumptions. First, it requires that the rate of interest fall continuously as profits on investment decline. Unless interest falls sufficiently, firms will fail to invest even as much as I_2' in Figure 14-3.

If interest falls, it induces firms to make investments that require more capital per unit of output at the margin. It also induces them to employ more capital-using methods for all their production. Not only is the marginal capital-output ratio raised, but also the average capital-output ratio. This is an important factor that helps to sustain investment. Capital is substituted for labor and materials in order to produce a given level of output. This could mean a positive level of net investment even if aggregate demand and output were stationary.

However, for such substitution to continue, interest must continue to fall. This requires that money be increased more than in proportion to output. Let us assume that this occurs. Nevertheless, we have learned that interest cannot fall below the liquidity trap. Moreover, the uncertainty of investment probably precludes firms from under-

taking projects that have promised returns that are well above the low rate of the safest securities. Thus, the rate of interest cannot fall low enough to sustain investment at the point where the marginal efficiency is zero — indeed, we should expect firms to halt investment well short of this point.

Inadequate decline in saving The second Classical assumption is that saving will adjust downward in the same way that investment does. To point up the problem, let us assume that the rate of interest can fall so far that firms willingly invest until the marginal efficiency of investment is zero. When this point is reached, net investment ceases, and net saving at full employment must be zero if aggregate demand is to equal full employment output.

Reduced profits do reduce business saving, as we have seen. But, can we expect net saving by households to decline to zero even when the rate of interest does? Not if an appreciable part of saving is for the purpose of evening out lifetime consumption, and the population is growing. We have already seen that saving of the young more than offsets saving of the old, in this case. Moreover, this type of saving is apt to increase as the rate of interest falls, rather than decrease. Consequently, we cannot assume that saving will fall sufficiently to prevent a gap from appearing between aggregate demand and output at full employment.

We are left with the conclusion that equilibrium can be maintained at a lower rate of growth in the face of moderately diminishing returns, provided that money increases enough to push down the interest rate. However, this mechanism is limited. The rate of interest cannot fall indefinitely, and the propensity to save is unlikely to fall to zero net saving. Consequently, at some point, diminishing returns must cause a failure of investment to equal saving at full employment. Growth then gives way to depression.

Compensating improvements, again Thus, we return to our third requirement for sustained equilibrium growth. Innovation must occur that is sufficiently laborsaving and materials-saving to prevent diminishing returns to capital — or to reduce the rate at which they diminish enough, so that interest-saving adjustments can preserve equilibrium.

Fellner suggests that the upward pressure on wages and on ma-

terials prices, which occurs as these inputs become relatively more scarce compared to capital, serves to bring forth compensating innovations. We have already reviewed his argument. There must, first of all, be enough inventive activity to provide many improvement options to producers. With rising wages and materials prices, firms can then be expected to adopt those improvements which economize on labor and materials. It is possible that the rate of improvements will be rapid enough and that the labor and materials savings they offer are great enough, so that diminishing returns will not call a halt to equilibrium growth.

Effects on replacement. We can abandon our assumption of a constant proportion of replacement in gross investment. Innovation and changes in production methods, brought by changes in relative input prices, both serve to make old capital goods obsolete. Thus, they raise replacement requirements and help increase investment along the equilibrium path. However, there is still a greater requirement that innovation or a falling interest rate increase profit per unit of output. This is necessary since the increased obsolescence rate reduces the service lives of capital goods. More must be returned to investing firms each year to offset the reduction in numbers of years.

The Stability of Unstable Equilibrium

We have answered the first question: What are the conditions for continual growth and how are they maintained? In sum, there must be (1) a continual growth in the supply of money, (2) mobility of resources, and (3) technological change which prevents diminishing returns to capital from reducing investment expansion below its equilibrium rate. Now, we turn to the question, Why is the economy more resilient to disturbances than the simple model of unstable equilibrium implies?

We can hardly expect investment to increase every period by just the amount needed to raise aggregate demand to full-capacity output. In fact, we know that the propensity to consume is not perfectly stable, investment is subject to autonomous changes and, in a complete economy, changes in fiscal policy and foreign transactions interrupt smooth growth. These may bring recessions or booms, but the recessions usually do not turn to depressions, and the booms usually do not set off inflationary spirals.

Types of unstable equilibrium. Walking a tightrope without a balancing pole is an unstable equilibrium fraught with danger. If we hold a balancing pole, we are still in an unstable equilibrium, but we are able to correct minor imbalances before we fall. If we walk a broad log with a balancing pole in hand, we may still fall into the creek, but it will take a strong force before we lose our balance. We shall review a number of reasons why the unstable equilibrium of economic growth is like walking a broad log (inertia of expectations) with a balancing pole (built-in stabilizers).

The inertia of long term expectations Businessmen hardly expect sales to grow continuously at a constant rate. In some years, they know that sales will not rise enough fully to employ new capital capacity, whereas in other years, they realize that sales will exceed capacity. Inventories provide buffers, and production schedules can be revised to meet changes in market conditions in a few months.

If the economy has been in prosperity for several years, businessmen tend to project the experienced rate of growth in long-term investment planning. Failure of sales to rise over the projected path for several months does not cause revision of fixed-capital investment plans. It is apt to cause firms to reduce orders for inventory and, if they expect reduction in interest rates and equipment prices, some firms may postpone some fixed-capital outlays for a few months. However, unless something happens to revise their long-term expectations, firms continue a high level of fixed investment.

Three other factors may be mentioned at this point. Construction projects begun before sales weaken are continued. Second, although new expansion projects may not be considered profitable, firms may draw upon their backlog of projects that were postponed until they could be financed internally. Finally, there may be a backlog of orders for equipment that producers of machinery continue to fill even though new orders decline.

The built-in stabilizers Reduction in sales and profits from sales can lead to reduced output, inventory investment, and some postponement of fixed investment. Thus, recession occurs. This is when the built-in stabilizers go to work. Defense of living standards, reduction in proprietors' and corporate shares of gross income, reduction in the gross tax share, and increase in transfer payments all serve to keep consumption from declining as fast as output.

By bolstering consumer demand, these stabilizers also serve to prevent investment from collapsing. The excess capacity in business is much less than it would otherwise be. Also, prices are not apt to decline greatly. Thus, firms are less prone to postpone buying supplies and machinery until prices have hit bottom.

Decline in the rate of interest Another built-in stabilizer is the fall in interest rates and the easing of credit terms which normally accompany recession. This is partly due to the shift of holdings from stocks to bonds that the public makes when recession begins. Also, recession reduces the transactions demand for cash, freeing more money to be held in idle balances. Finally, the Federal Reserve System is likely to augment bank reserves in order to alleviate the recession. The last is not a built-in stabilizer, but it is orthodox discretionary monetary policy. The reduction in interest rates and the easing of credit serve to stimulate investment both for expansion of capacity and for substitution of labor and materials by capital.

To sum up, inertia of long-term expectations keeps fixed investment from declining sharply, even though sales fall below full-capacity output in recession. Continuing projects already begun and drawing upon investment backlogs also help. The decline in aggregate demand is relatively mild because of the built-in stabilizers and the decline in the rate of interest. These provide the economy's balancing pole.

Stabilizers against inflation Now, let us turn to the stabilizing forces that act to prevent inflation when investment tends to expand above the equilibrium rate. The inertia of long-term expectations, constraints on internal and external financing by small firms, and rationing of output by equipment producers restrain the expansion of investment. Limited capacity in the equipment-producing industries and in construction also serves to drive up capital-goods prices, with the same effect. This is one place where immobility of productive resources is a help rather than a hindrance to stable growth. By the time capital-goods producers can expand capacity to meet extraordinary orders, the force behind these orders may have diminished or disappeared.

The full-employment constraint. At full employment, not only are capital-goods producers constrained from increasing capacity, but consumer-goods producers are also constrained. This is what Harrod

has in mind with his natural rate ceiling. Output in the aggregate cannot increase faster than growth in the labor force and its productivity. The difficulty in hiring sufficient labor to operate additional capital directly restrains producers' willingness to accelerate investment.

The rate of interest in inflation The built-in stabilizers on consumption may be of some help during inflation, though we have argued their effectiveness is likely to be considerably less than during recession. If money increases only in proportion to real output, a rise in prices drives up the rate of interest by increasing transactions demand more than in proportion to output. A tendency to shift from bonds to stocks, as profits rise, may help in this direction, though it reduces costs of equity financing.

Unless the rate of interest rises more than in proportion to wages and prices, it is unlikely to restrict investment expansion. An increase in wages relative to the money rate of interest has the same effect as a fall in the latter when wages are constant. Substitution of capital for labor becomes profitable and adds to demand for investment.

Moreover, if money interest rates rise less than prices, the real rate of interest falls. Firms can finance more investment by borrowing before they reach the same level of risk. However, it is necessary for them to view inflation as a trend of the future. Inertia of price expectations is also a stabilizing force.

The Federal Reserve System is able to control expansion of money to the degree that it can cause interest rates to rise faster than wages and prices. It is helped by the inflationary increase in transactions demand. But it can go further by refusing to increase bank reserves in proportion to the growth of real output or by reducing reserves absolutely. Again, this is not a built-in stabilizer but is an orthodox monetary policy.

Major Shocks

So far, we have painted a picture of self-sustained growth. As long as the money supply expands sufficiently, there is mobility of resources, and innovation solves the problem of diminishing returns, investment trends upward at the rate required for equilibrium. Minor departures from this path are corrected by inertia of long-term

expectations, the built-in stabilizers of consumption, compensating changes in the rate of interest, limitations on capital-goods production capacity, and the continuation of projects already begun. Nevertheless, equilibrium growth is not inevitable. There are forces strong enough to break through the mechanisms of growth and stability.

Failures in the requirements for equilibrium growth The requirements for sustained growth may not be fulfilled. If the supply of money does not increase as demand for it increases, interest rates rise and there is closer rationing of credit. This may bring depression. A marked short-run shift in consumer preferences could have the same effect. The shift might be so rapid or resources so immobile that curtailed investment in the losing industries is not offset by increased investment in the gaining industries. Structural inflation might result, but aggregate investment could be sufficiently dampened to bring depression instead.

Failure of invention to provide sufficient laborsaving and materials-saving innovations brings diminishing returns to investment. Reduction in the rate of interest and the propensity to save may not be sufficient or quick enough to prevent a decrease in aggregate investment. Once the decrease occurs, idle capital further dampens the incentive to invest.

These things slowly undermine the marginal efficiency of investment and do not appear as outside shocks to the economic system. Inflation or depression may be generated by powerful forces that we have not yet introduced in our model of economic growth. Three types of outside forces seem to have been most important: (1) Schumpeterian waves of innovation, (2) speculative booms and busts, which often accompany waves of innovation, and (3) major wars.

Waves of innovation In equilibrium growth, investment is induced by expansion of output and capacity requirements. Harrod made this explicit by building the accelerator into his model, but it is also implicit in Domar's model. Firms are willing to increase investment at the equilibrium rate because output expands enough in each period to justify this investment.

Investment can be autonomous of current changes in both output and capacity requirements. One example we have already covered is substitution investment caused by a decline in interest rates

relative to wages and profits. A major cause of autonomous changes in investment is innovation of the type Schumpeter emphasized.

Building ahead of demand. The birth of new industries is apt to create a boom as it drives investment above the equilibrium rate. The new industries may build capacity far in advance of expected markets; so, their investment is not held in check by current expansion in demand for their products. For instance, during the nineteenth century, railroads and utilities laid rails and strung wires in sparsely inhabited regions years before these facilities could be expected to be fully utilized.

Nevertheless, there are limits to the amount of investment that a wave of innovation can bring. In a few years, the new industries have expanded to the limits of their present and prospective markets. In the absence of new major innovational opportunities, aggregate investment is apt to fall below its equilibrium rate of growth and remain below it until firms reduce long-term expectations. Then, depression occurs.

Speculation Speculation may accompany an innovational boom. New industries promise high profit returns. Profit margins are also raised for old industries with capacity shortages when output expands faster than capital. Stocks are good buys; perhaps made more attractive by inflation, since the real value of bonds and other assets that are relatively constant in money value is reduced. After awhile, the rise in stock prices may provide sufficient promise of capital gains so that the public comes to pay less attention to earnings and more attention to short term gains. The stock market becomes a casino.

Rapidly rising stock prices sharply reduce the cost of equity financing, and firms may be induced to undertake projects that would otherwise be passed up. Thus, aggregate investment is further stimulated. Also, the euphoria of sudden riches may raise the aggregate propensity to consume.

As the stock price indexes rise at an accelerating rate, more and more bettors come to wonder how long their luck will hold. There is growing apprehension that this cannot go on forever and that one must cash in his chips just before wins turn to losses. Almost any-

thing can precipitate panic. Perhaps exhaustion of innovational opportunities reduces earnings and a recession occurs in business. This is one of many things that might tip the market.

When the crash comes, the propensity to consume is depressed, investment is curtailed by sharply increased costs of equity financing, and business expectations and confidence take a turn for the worse. Speculative shocks preceded the depressions starting in 1873, 1893, and 1929 — all long and severe. It is difficult to distinguish the degrees to which these depressions were caused by declining profit expectations and by the collapse of speculation. Since business failed to recover quickly, it would appear that impaired long-term profit prospects played a substantial role in causing these depressions. Furthermore, we must now recognize what we might term the Harrod-Domar effect; reduced aggregate demand left capital idle and thus, undermined the incentive to invest.

Major wars Innovation may be a less disturbing force in the twentieth century, but the two World Wars and perhaps the Korean War have imposed major shocks on the economy. The effects of war are both immediate and delayed. The immediate effect is to create strong inflationary pressures which must be at least partially controlled by fiscal policy, rationing and price controls, and patriotic appeals to save.

The delayed effects are less obvious. Many backlogs are inherited from the war, which serve to spur investment afterwards. The stock of money and liquid assets is greatly increased. This unaccustomed wealth raises the propensity to consume, on the one hand, and reduces the rate of interest, on the other. Consumers' durables replacement needs are high. Housing and business capital is in short supply, since investment in civilian capacity was sharply curtailed during the war. Finally, the extraordinary wartime research has many by-products for innovation in peacetime production. Examples are radar, for guidance of ships and planes, and nuclear fission, for many applications in production and research.

These backlogs create a postwar boom. High profits may set off speculation in stocks. In a few years, firms catch up on their capital needs, construction removes housing shortages, and the war-born innovational opportunities are largely used up. Declining profits,

or some other event, may collapse stock prices. Depression occurs as a long-delayed aftermath of war.

Summary

Stationary equilibrium cannot be maintained over the long run, because net investment provides a continual growth of capital, and this dampens the incentive for further investment. Output must expand to use this capacity, but expansion requires an increase of investment. Thus, investment must increase to keep from falling. Domar's model indicates that the required rate of growth for investment is directly proportional to the marginal output-capital ratio and inversely proportional to the multiplier.

Harrod's model employs the accelerator to indicate that the warranted or equilibrium rate of growth for output is inversely proportional to the marginal capital-output ratio and directly proportional to the average propensity to save. If the marginal and average propensities to save are equal, as they seem to be in the long run, equilibrium requires the same rate of growth for national income and investment. The Domar and Harrod models give the same results.

Constraints on investment may force it to leave the equilibrium path. We found that these constraints are removed if there is continued expansion in money, mobility of resources, and innovation that largely remedies the problem of diminishing returns. The remaining decline in the marginal efficiency of investment may be offset by reduction in the interest rate and the propensity to save, though these mean a reduced rate of equilibrium growth.

The Harrod-Domar models have unstable equilibria; so, an initial departure breeds forces causing a further departure from equilibrium. However, in reality, equilibrium, though unstable, is not as fragile as these models imply. Moderate disturbances cause only temporary recessions or booms, because of the inertia of long-term expectations, completion of projects already begun, backlogs due to financial constraints, limited capacity of equipment producers, built-in stabilizers, and compensating changes in the rate of interest.

Nevertheless, depressions do occur. They may come because the requirements for sustained growth are not met. Also, major outside shocks may be responsible. These are waves of innovation in new industries, speculative bubbles, and major wars.

Reading and Research

General bibliographic sources are cited at the end of Chapter 1.

Harrod-Domar models. For a systematic presentation of Harrod-Domar type models see D. Hamberg, *Economic Growth and Instability* (New York: W. W. Norton & Company, Inc., 1956). Kenneth Kurihara has written two books along the same lines: *National Income and Economic Growth* (Chicago: Rand McNally & Company, 1961) and *The Keynesian Theory of Economic Development* (New York: Columbia University Press, 1959).

Price adjustment to diminishing returns. Two interesting, but difficult, articles seek to show that the unstable equilibrium of Harrod-Domar models is unrealistic because of substitution investment induced by relative price changes of inputs. We have tried to include a similar effect in our discussion of the requirements of sustained growth. The articles are: James Tobin, "A Dynamic Aggregative Model," *Journal of Political Economy*, vol. 63, no. 1 (April 1955), pp. 103–15 and Robert Solow, "A Contribution to the Theory of Economic Growth," *Quarterly Journal of Economics*, vol. 70, no. 1 (February 1956), pp. 65–94.

The Tobin-Solow articles are sharply criticized by Robert Eisner in his article, "On Growth Models and the Neo-Classical Resurgence," *Economic Journal*, vol. 68, no. 4 (December 1958), pp. 707–21. Tobin and Solow reply to Eisner in the *Economic Journal*, vol. 69, no. 3 (September 1959), pp. 597–600.

Some other growth models. The following references contain other interesting models of economic growth:

D. G. Champernowne, "Capital Accumulation and the Maintenance of Full Employment," *Economic Journal*, vol. 68, no. 2 (June 1958), pp. 211–44.

James Duesenberry, *Business Cycles and Economic Growth* (New York: McGraw-Hill Book Company, Inc., 1958).

Nicholas Kaldor, "A Model of Economic Growth," *Economic Journal*, vol. 67, no. 4 (December 1957), pp. 591–624.

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15 Policies for Growth & Stability

In previous chapters, we have mentioned monetary and fiscal policy several times, in order to illustrate particular points. In this chapter, we shall draw upon these points and go much further in defining the problems of economic policy for growth and stability. We shall begin by suggesting generally accepted goals and possible conflicts between them.

Goals of policy Most Americans probably favor (1) a high rate of economic growth, (2) generally full employment of labor, and (3) general stability in the price level. However, there are other goals, as well. We wish for equity and fairness in dividing among our people the benefits and costs of production and growth. Freedom to choose

jobs, invest capital, buy what we want, and live our lives as we choose are a part of our American heritage, which few would willingly give up. The unpleasant need to provide for defense and to secure foreign allies must remain a goal of policy in the cold war.

Some goals conflict. Our rate of growth could probably be increased greatly by adopting the methods of totalitarian nations, but only at the expense of freedom. One conflict that we shall have to discuss is the apparent incompatibility of high growth and full employment with price stability.

Policies for Economic Growth

Economic growth, like so many other things in economics, is a matter of demand and supply. The economy will not grow unless aggregate demand increases. Moreover, we learned in the last chapter that demand must increase enough to utilize the growing stock of capital, which investment creates in the course of determining demand. However, demand can outrun supply; growth is curtailed, because the ability to produce increases too slowly.

The problem of aggregate demand There is a good deal of unresolved argument as to whether growth will be stimulated by an increase in the propensity to save or by an increase in the propensity to consume. Those who believe that saving should be increased point out that this increases the supply of funds for investment. This is particularly true if policy is designed to increase depreciation and retained earnings of firms, which, in turn, reduces the financial constraint on investment. Those who argue for more consumption point out that the ultimate end of production is consumption and that investment cannot prove to be profitable unless consumers spend more.

Actual and equilibrium rates. Each position makes an implicit assumption about the relationship between the actual rate of growth in investment and the rate required to maintain equality between aggregate demand and supply at full-capacity production, which we can term the *equilibrium rate*. If the equilibrium rate tends to exceed the actual rate, aggregate demand is insufficient to purchase full-capacity output. Firms are deterred by excess capacity from accelerating investment, and there are likely to be frequency recessions or even a depression.

In this case, an increase in the propensity to consume (reduction in

the propensity to save) reduces the equilibrium rate. By bringing it into line with the actual rate, recessions are avoided, and the actual growth over the long run is greater.

On the other hand, the actual rate may tend to exceed the equilibrium rate. Inflationary pressures develop and firms are chronically short of capacity. An increase in the equilibrium rate is called for, which can be achieved by increasing the propensity to save.

The danger of overshooting. However, either approach to raising the rate of growth is indirect and may overshoot to have the opposite effect. Policy to increase saving may raise the equilibrium rate too high, resulting in recessions or depression. Measures to reduce the propensity to save may bring the equilibrium rate below the actual rate, bringing inflation followed by collapse of speculation and depression.

Policy should be primarily directed toward increasing the actual rate of growth directly by raising the marginal efficiency of investment or lowering the rate of interest. Then, if the equilibrium rate should lag behind, supplementary policy to raise saving may be employed. If the equilibrium rate is altered to *accommodate* the actual rate of growth, the problem of aggregate demand is solved. We shall consider policies designed to increase saving when we come to the problem of demand-pull inflation.

Increasing the marginal efficiency of investment As capital grows relative to labor and natural resources, the marginal efficiency of investment is reduced by diminishing returns. Consequently, one part of growth policy is to increase the rates of expansion in the supply of labor services and in the discovery and development of natural resources. Improvements in the quality of the labor force are as important as increases in its quantity. A shortage of skills as well as a shortage of bodies results in diminishing returns to capital. Increasing the supply of labor is also a matter of mobility — men must be where they are needed when they are needed. Technological progress and improvements in knowledge of production techniques play an obvious role in raising the marginal efficiency of investment.

Increasing Aggregate Supply

From another viewpoint, the aforementioned factors serve to increase the ability to produce. Growth and improvement in the quality

of labor, natural resources, capital, and production techniques all raise aggregate supply. Let us consider some of these policy measures. Our discussion will be suggestive, rather than comprehensive.

The supply of labor The labor force can be increased by expanding the population and by encouraging a larger proportion of persons in the working ages to seek employment. The slow way to expand population is to encourage early marriages, discourage birth control, and expand public health facilities in order to cut down the death rate. The quick way is to lower legal barriers to immigration. Low birth rates prior to the end of World War II have resulted in postwar labor shortages, and at least one economist has suggested allowing more immigration.[1] Although the postwar baby boom will accelerate expansion of the labor force in the mid-Sixties, immigration would serve as a further stimulus to economic growth.

Raising the level of general education and the specific skills of labor have become more urgent problems as increasing mechanization of production has reduced employment of unskilled workers in recent years. A major step would be federal aid to education in states having inadequate tax bases to provide adequate facilities themselves. California and some other states have led the way by providing vocational training in junior colleges and college-extension courses for adults.

Increasing entry and mobility. Shorter working hours and longer vacations cut down on the supply of labor, but increasing leisure is, in itself, a benefit of economic growth. The labor force can be increased by encouraging housewives to seek employment; something they have notably done during postwar prosperity. Mobility of labor may be increased by laws against union restrictions, such as featherbedding, the closed shop, and unnecessarily long apprenticeship periods. Willingness and ability of workers to change jobs can be increased by better information about employment opportunities, retraining aids, and loans to enable movement to new communities.

Increasing the supply of labor is a question of increasing the demand for labor to a substantial degree. When employment is high, labor makes fewer demands for shorter hours in order to spread the

[1]Edward F. Denison, "How to Raise the High-Employment Growth Rate by One Percentage Point," *American Economic Review*, vol. 52, no. 2 (May 1962), pp. 67–75.

work. Restrictions on mobility lessen. Housewives are drawn into employment, and surplus labor in farming and marginal jobs migrates to more productive employments. The birth rate increases, and more workers are induced to immigrate. This is one of several ways in which growth in aggregate demand stimulates growth in aggregate supply.

Discovery and development of natural resources Discovery and development of natural resources is largely a private responsibility. However, one of the most pressing problems is the growing scarcity of fresh water. Control of pollution, collection and channelling of water from surplus to deficit areas, and recovery, purification, and recycling of water are traditional activities of government. Another relative scarcity is timber supplies. Access roads, controlled cutting, harvesting of timber on public lands are within the province of public policy.

Classical economists clearly underestimated the abundance of land and other natural resources, and the ability of man to adapt to specific scarcities. Each decade for the past half-century, the public has been alarmed to learn that petroleum supplies will last only 15 years or so. Present estimates of future fuel and mineral supplies are generally optimistic.[2]

Moreover, market forces and technology readily overcome specific shortages by (1) substituting foreign for domestic supplies, (2) developing cheaper ways to recover lower-grade and less accessible domestic deposits, (3) substituting materials in production of end products, and (4) substituting end products in serving particular needs. For example, we import more petroleum and learn to dig deeper for it at home. We can substitute shale oil, natural gas, or coal in production of gasoline, and ultimately, we can switch to electricity, other fuels, nuclear power, or solar energy to serve our transportation needs. Natural resource limitations are not likely to be an important constraint on economic growth in this century.

Technology and knowledge By a change in the tax laws in 1954, industrial research and development expenses were made

[2]Cf. Joseph L. Fisher and Edward Boorstein, *The Adequacy of Resources for Economic Growth in the United States*, Study Paper No. 13, Study of Employment, Growth, and Price Levels by the Joint Economic Committee, 86th Cong., 1st sess. (Washington, D.C.: Government Printing Office, 1959).

tax-exempt. This may have played a substantial part in the extraordinary expansion of these outlays. They increased 80 percent by 1959, and it has been estimated they will double again by 1969.[3] A by-product of the cold war has been an immense amount of government-sponsored fundamental and applied research, a major part of which has been adapted to civilian production.

The application of new techniques to production — innovation, as distinct from invention — can be stimulated in a number of ways. Permitting accelerated depreciation probably has this effect, since many firms are reluctant to replace existing equipment before it is substantially written off. Government can spread knowledge of new production techniques in industry, as it now does in agriculture. Patent laws can be reformed to preserve their protection of inventions put to use but deny it for those designed to impede product development by competing firms.

Accumulation of capital Accumulation of capital is stimulated by many policies with which we are now familiar. Increasing supplies of cooperating factors and encouraging technological progress raise the marginal efficiency of investment. Monetary policy to maintain low interest rates or to reduce them plays an obvious role. The supply of investible funds may be augmented by liberalizing depreciation allowances and by reducing profits taxes. Tax credits may be granted for profits if they are invested internally, in order to provide a direct incentive for expansion.

Social overhead capital. Government investment in social overhead capital complements private investment and provides greater opportunities for the latter. Construction of highways, multipurpose river valley projects, airports, harbor facilities, navigation channels, and recreational parks are obvious examples. Outlays for public education, slum clearance and urban renewal, water and sewage systems, and public hospitals not only contribute directly to human welfare but stimulate private investment by improving the quantity and quality of labor.

High and rising aggregate demand is both a result and a cause of capital formation, as our models of growth have shown. This brings

[3] Dexter Keezer, "The Outlook for Expenditures on Research and Development During the Next Decade," *American Economic Review*, vol. 50, no. 2 (May 1960), pp. 355–69.

us back to the problem of equilibrium growth. To a large degree, raising the marginal efficiency of investment serves also to raise the equilibrium rate of growth. First, activities increasing the MEI generally increase the marginal output-capital ratio as well. It might be better to put this the other way — increasing labor and materials supplies and improving technology raise the marginal output-capital ratio, and this usually means an increase in the marginal efficiency of investment. Second, higher profits mean greater business saving. Thus, the equilibrium rate of growth is raised by the same factors that increase the actual rate, and it may be raised enough to avoid inflationary pressures.

Policies for Full Employment

We shall consider four types of policy for fighting recessions and depressions. They are (1) monetary policy, carried out by the Federal Reserve System with help from the U.S. Treasury, (2) fiscal policy, both discretionary and nondiscretionary, which is dependent upon existing laws and regulations or changes in these by Congress and the President, (3) lending by the federal government, and (4) laws and regulations governing financial transactions which tend to stabilize the economy or lessen the severity of depression.

Monetary policy The Federal Reserve System is able to effect bank reserves and general credit conditions in three ways: (1) raising or lowering bank reserve requirements, (2) raising or lowering interest rates charged for lending reserves to commercial banks, and (3) sales and purchases of government securities in what are known as *open market operations*. In addition, the FRS has been given selective controls over specific types of credit.

During World War II, the FRS was empowered to set minimum downpayments and maximum repayment periods on consumer loans. This power was reinstated as a counter-inflation device in 1948 and again, during the Korean War, when the same type of selective control was also applied to loans for residential construction. These powers have lapsed, but the FRS retains permanent regulation of margin requirements for securities purchasers. Margin is the amount a stock buyer must contribute from his own savings in order to purchase stocks; so, if the requirement is 70 percent, only 30 percent of the value of the stock may be borrowed.

Open market operations The FRS rarely alters reserve requirements and tends to use changes in its lending rate as a backstop to open market operations. Purchase and sale of government securities is a sensitive and highly effective way to regulate credit conditions on a continuous basis. If the FRS purchases government securities, it automatically increases commercial bank reserves in the same measure, whereas it reduces them by selling securities. When bank reserves are increased, banks are able to lend more; when they are decreased, banks are under pressure to reduce loans.

As recession sets in, the FRS should buy government securities, reduce its lending rate of interest, and perhaps, reduce reserve requirements. Besides increasing bank reserves, open market purchases have other direct effects on credit conditions and incentives to spend. Purchase of government securities tends to raise their prices immediately and lower effective interest rates. This effect migrates to private securities, as the public sells government securities to buy private ones.

Changes in the rate of interest on long-term bonds and mortgages are apt to have the greatest impact on spending, since long-term borrowing is most sensitive to interest changes. Thus, the FRS has been urged to buy and sell long term government bonds as well as ninety-day government bills, to which it restricted operations for several years. The FRS has changed policy from "bills only" to "bills preferably" and may be willing to enter the long-term market if the need for reducing long-term rates becomes urgent.

Nevertheless, in a severe depression, monetary policy is apt to be a weak instrument. Although banks have more ability to lend, they find a shortage of credit-worthy borrowers. The elasticity of aggregate investment demand is low, because of idle capacity, impaired confidence, and reduced expectations. The multiplier is lower, because of built-in stabilizers. As the rate of interest declines, so does velocity of circulation. The public hoards a larger and larger part of the money supply in idle precautionary and speculative balances. In the extreme, interest may get caught in the liquidity trap. The Pigou effect may be swamped by adverse price expectations. These are the events we considered with IS and LM curves in Chapter 12.

Fiscal policy When recession sets in, a deficit automatically develops in the government budget, because of falling tax revenues

and increasing transfer payments. We have learned that this is a desirable built-in stabilizer and constitutes nondiscretionary fiscal policy. However, deficits add to the national debt. To attempt to balance the budget by raising taxes or reducing government expenditures would destroy the stabilizer and compound the decline in business. Today, most people are agreed that increasing the public debt is secondary to restoring prosperity. The loss in output, reduction in growth, and hardships of mass unemployment are more pressing burdens.

Nondiscretionary fiscal policy may not be enough. Congress may be called on to reduce tax rates or increase public works and transfer payments. In the Great Depression, emphasis was necessarily placed on increased payments, because federal taxes were so small a portion of national income that there was little margin to cut. Today, there are several major reasons to shift the emphasis.

Stabilizing public works. First, public works should be planned and carried out on a continuous basis, regardless of business conditions. If more social overhead capital is needed, the public should not have to wait for depression to get it. On the other hand, projects dreamed up just to employ idle men are apt to be of the leaf-raking variety — wasteful of productive resources.

Second, there is danger that public works not of the leaf-raking variety will compete for labor, materials, capital goods, and investible funds with private enterprise. Even the threat or fear of such competition may restrain private investment.

Third, it takes time to plan, appropriate funds, begin and complete public works projects. This can be shortened by planning in advance and holding a shelf of projects to be quickly implemented in recession. However, in recession there is the added danger that the time lag in getting projects under way and completing them may carry government purchases past the recovery period and may add to inflationary pressures. This danger is virtually absent in severe depression, however.

Changing taxes. The sheer size of the national tax bill makes tax cutting a powerful tool today. Tax changes can be initiated more readily, have an immediate effect on disposable income as withholdings are reduced, and can be terminated quickly. Of course, Congress may be out of session or delay too long before cutting taxes.

Political pressures may prevent Congress from raising tax rates once inflationary pressures build up. Moreover, during inflationary periods, when a surplus budget is called for, Congress may be both reluctant to raise tax rates and rein in expenditures.

Formula flexibility Such considerations have led economists to search for some automatic device to overcome Congressional indecision and political pressures. One proposal is "formula flexibility," which won support by the influential Commission on Money and Credit.[4] This would tie changes in tax rates to selected statistical indicators of recession and inflation.

For instance, the FRS index of industrial production might be chosen as the indicator for recession and the consumer price index as the indicator of inflation. Modest changes in either would not call for altering tax rates. However, if the production index fell (say) 5 percent in a quarter, this would call for a stated reduction in tax rates. If the CPI rose 2 percent in a quarter, this would call for a scheduled increase in rates. The Commission on Money and Credit suggested that the tax changes be limited to raising and lowering the first-bracket personal income tax rate, in order to have the simplest and most direct effect on spending.

Presidential discretion. Any automatic formula is bound to fail on occasion. For instance, a major strike could drop the industrial production index by the critical amount. To guard against this, responsibility and discretion in carrying out the formula could rest with the President. Congress might reserve power to veto his actions by joint resolution.

The chief obstacle to formula flexibility is reluctance of Congress to delegate tax powers to the President. In January 1962, President Kennedy asked for discretionary power to alter taxes within specified limits, but there was no sign that Congress would give it to him.

Coordinating fiscal and monetary policy A government deficit can be financed by borrowing from the nonbank public, from commercial banks, and from the Federal Reserve System. The effectiveness of fiscal policy in recession depends upon which group buys

[4]See its *Report* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1961), pp. 129–30. Several members of the Commission registered vigorous dissents to the proposal.

the bonds. If the nonbank public buys them, it transfers existing money to government. Some may come from idle hoards, but at least part is money that would otherwise have financed private investment (or possibly consumption).

If government borrows from banks, the immediate effect is to increase the supply of money, since any bank lending creates demand deposits. When government spends this money, it can then be used for private spending by the recipients. However, the net effect will not be to create money if banks have no excess reserves and must curtail private lending in order to buy government bonds.

If the Federal Reserve System buys bonds, bank reserves are increased. Commercial banks are enabled to buy government bonds themselves in a multiple of the increased reserves and without contracting private lending. Consequently, the money supply is expanded and government activities are financed without withdrawing money from private spending.

Purchases of government bonds by the FRS are nothing but expansionary open-market operations. Thus, to be most effective, deficit fiscal policy should be supported by expansionary monetary policy. We made this point earlier with IS and LM curves.

Government lending The federal government may stimulate lagging business by direct loans, such as those made to large businesses by the Reconstruction Finance Corporation during the Great Depression. The Small Business Administration regularly lends to business. About one-fifth of agricultural production and mortgage loans come from government, in addition to crop loans used in price support operations. Loans are made to local governments for urban renewal and other projects. Government is engaged in many other lending programs, as well, which could be expanded in recession.

Government agencies and semi-independent institutions support mortgage credit by lending directly, buying mortgages from primary lenders, or supplying reserves to savings institutions. These provide a direct lever for stimulating construction in recession and have been used for this purpose.

Regulations and laws governing financial transactions Many laws and regulations might be thought of as providing stabilizing effects in some way. We shall concentrate on those which serve

to moderate speculation and to quiet fears that might generate liquidity panics. Stock market speculation is far from tamed, but major crashes are made less likely by FRS controls on margin credit, tighter rules on selling short, and regulation of stock issues by the Securities and Exchange Commission.

A number of laws now guard banks and other lending institutions from bankruptcy and runs by depositors. The federal government insures and guarantees a large proportion of housing mortgages. Demand and savings deposits are guaranteed, so that fear of loss is less apt to set off bank runs. By increasing reserves, the Federal Reserve System has much greater power to increase bank liquidity than it had in the early Thirties. The large proportion of bank assets consisting of government debt provides a fairly liquid and safe secondary reserve.

The commitment to stabilization Probably the greatest stabilizing effect comes from the change in government's attitude toward depression, announced in the Employment Act of 1946 and publicly accepted by both parties. Prior to the Thirties, the attitude was that the depression stemmed from financial excesses in the preceding boom, and the best policy was to let business recover by itself, which it soon would do — financial excesses would be remedied by liquidations and consolidations. Today, this belief is gone and government is expected to act quickly and strongly to restore prosperity; confidence that government will and can do this underwrites the willingness of firms to continue long-term capital plans and of households to maintain consumption standards.

Is depression obsolete? Many of the stabilizing factors we have mentioned originated in the Thirties or have become much more powerful since the Great Depression. This is true of the commitment to fight depression, the stabilizing laws on financial transactions, much of government lending, the built-in stabilizers, and tools of monetary policy.

Furthermore, there is evidence that firms are less prone to speculate in inventories and that they plan further into the future for fixed-capital expansion.[5] Schumpeterian waves of innovation may

[5]For this and other discussions of the new stability see Arthur F. Burns, "Progress Towards Economic Stability," *American Economic Review*, vol. 50, no. 1 (March 1960), pp. 1–19.

be a thing of the past. Research and development activities are regularized and greatly expanded.

The public has a larger volume of liquid assets and credit resources relative to income, with which to defend living standards when income falls. Population is expanding at a substantially higher rate than in the late Twenties, though less than before World War I, and this will shortly bring acceleration of growth in the labor force. More workers are in white collar jobs, where they are relatively immune to layoffs. The cold war continues to generate high government spending and to provide civilian by-products of military research.

Cycles or sustained growth? These are the things that lead some people to argue that there will never again be a major depression. In our own analysis of the last chapter, emphasis was placed on the resiliency of the system, despite the unstable nature of growth equilibrium. The use of a model of growth to describe normal development was itself a matter of judgment. We could have taken another view, which is still popular. This is that business has an inherent tendency to go through recurrent cycles of expansion, boom, contraction, and depression. A wave-like motion, rather than steady growth, is to be expected. This view may have been correct in the nineteenth century, but it is questionable today.

Nevertheless, let us not be too confident about prosperity. Past generations have been able to muster convincing arguments to show the permanence of good times. Many people in the late Twenties were able to "prove," at least to themselves, that America had entered a New Era of permanent prosperity. We still have speculation, technological progress may still fail to do its job, and the impact of wars and preparation for war is hardly a thing of the past.

Policies Against Inflation

Policies to deal with demand-pull inflation are mainly the reverse of policies to counteract recession. The Federal Reserve System should tighten money by selling government securities, by raising its lending rate, and perhaps, by increasing reserve requirements. Fiscal policy calls for higher taxes, perhaps through formula flexibility and curtailed government spending. Government lending operations should be reduced, unless justified on other grounds, and support of

the mortgage market relaxed. In sum, these policies are directed toward reducing the pressure of demand on capacity.

Monetary policy is likely to be more effective against inflation. As interest rates rise, increase in the velocity of circulation partially counteracts monetary policy, but there is nothing like the liquidity trap with which to contend, and the demand for money is likely to be quite inelastic with respect to the rate of interest when the latter is at high levels. Interest rates can be lifted into the area where aggregate investment demand is more elastic and responsive to credit policy.

Raising the propensity to save Let us return to the question of achieving equilibrium growth. Demand-pull inflation is generated if the actual rate of expansion in investment tends to exceed the equilibrium rate. To raise the latter, the marginal propensity to save may be increased by fiscal policy. Such policy could be designed either to increase private saving or to supplement private saving with government saving.

To increase private saving, the structure of taxes could be changed to bear more heavily on consumption and less heavily on corporate earnings and private saving. One way would be to replace corporate tax revenues by sales tax revenues. To avoid causing hardships for lower-income groups, food, housing, essential clothing and some other items could be tax-exempt, as they often are under state sales taxes.[6]

It is possible to construct sales tax rates on nonessential items in a way which is even more progressive in incidence than the present personal income tax. The drawbacks are that such taxes abridge effective consumer choice and may impede incentives to earn income. Of course, the affected industries would fight such tax proposals. Congress may not be sufficiently omniscient to select only those articles least essential to human needs, and what is essential for one family is a luxury to another in the same income bracket. Nevertheless, this is one way that resources could be directed from production of consumer goods to production of capital goods.

Government saving. Another approach is to have government do the saving by operating with a budget surplus. This occurs auto-

[6]Similar use of sales taxes is suggested by William Fellner in his article, "Rapid Growth as an Objective of Economic Policy," *American Economic Review* vol. 50, no. 2 (May 1960), pp. 93–105.

matically as inflation raises personal income tax revenues, provided that public outlays are not increased in the same measure. Government then uses the tax surplus to retire public debt. As bondholders are paid off, much of this money finds its way into real investment either by the initial recipient or by his lending to investing firms. Thus, a surplus budget raises the equilibrium rate of growth and has the added advantage of reducing the public debt.

Alternative monetary-fiscal combinations Monetary and fiscal policy can be used together to combat inflation in ways which either encourage or retard economic growth. Suppose that government relies mostly on monetary policy. By raising interest rates sufficiently, investment can be reined in until it tends to increase no more rapidly than saving. This seems to have been the policy pursued in the latter 1950's. The cost is a reduced rate of growth.

Alternatively, government could keep interest rates low and raise saving to match intended investment by the methods just mentioned. In this way, inflation is overcome without reducing the actual rate of growth. In fact, if interest rates are lowered and business saving is increased, a higher rate of growth may be achieved. In sum, it would seem better to deal with demand-pull inflation by raising the propensity to save or by creating a government surplus than by reducing the inducements to invest.

Dealing with market power Policy for cost-push inflation is designed to deal with market powers of business and labor. One approach would be to institute comprehensive wage and price controls, such as those used in wartime. However, this medicine would be worse than the disease. Government officials are too removed from production and marketing problems, too subject to popular pressures, and too poorly coordinated in their policies. Rigidities and inequities would be bound to develop, with resulting malallocation of resources and restricted growth.

Another radical approach is to reduce employment to the point where men are so threatened by replacement and inability to find jobs that union demands are tempered. Creating a "reserve army of unemployed," to use Marx's descriptive term, in this way would permanently lower the rate of growth.

Recruiting the reserve army would require reducing the rate of

growth in jobs below the rate of growth in the labor force for some time, perhaps by means of recession. However, even after the army is recruited, growth will remain at a reduced rate. The labor force itself grows less rapidly. Housewives and others are not tempted to seek employment. People remain on the farm or in marginal jobs. Union rules to protect jobs are likely to increase, so that mobility is reduced. Overtime labor nearly disappears and unions press for reduced hours to spread the work.

Still another radical approach would be to outlaw unions and collective bargaining. This would enjoy as much success as Prohibition. Moreover, this and the previous suggestion imply that wage hikes solely account for cost-push. Administered prices are as inflationary as administered wages. It is neither equitable nor effective to deal solely with the market power of labor. Rising costs of steel, for instance, have been as much due to profit hikes as to wage hikes.[7]

Antitrust policy. Now, let us turn to some more promising policies. Vigorous application of the antitrust laws and legislative modifications in them to deal more effectively with mergers and price leadership arrangements are ways of dealing with market power by promoting competition. Liberalizing foreign trade policy by reducing tariffs and other barriers puts both business and labor under salutary competitive pressures from abroad.

Why not bring unions under jurisdiction of the antitrust laws? It is argued that collective bargaining is, by its nature, monopolistic and to apply antitrust laws would be to deny the right to bargain collectively. This is a poor argument. If taken literally, present antitrust laws would require breaking industries up until something like pure competition among many firms is brought about. Instead, the courts have followed discretion and a "rule of reason" in applying the law to business. Legislative safeguards and judicial restraint could be used to develop a rule of reason for dealing with labor monopolies.

A major argument against applying antitrust laws to unions is that bargaining is already decentralized in most industries. It is the locals, rather than national unions, which do the bargaining with manage-

[7]Otto Eckstein and Gary Fromm, *Steel and the Postwar Inflation*, Study Paper No. 2, Study of Employment, Growth, and Price Levels by the Joint Economic Committee, 86th Cong., 1st sess. (Washington, D.C.: Government Printing Office, 1959).

ment. In the few industries where industrywide bargaining occurs, this has been generally at the insistence of employers, wanting to gain power by concentrating their own strength, rather than unions. However, where industrywide bargaining occurs, whoever initiates it, or nationals dominate in local bargaining, we have clear evidence of monopolistic power. This can be dealt with by antitrust law.

Government intervention. Another approach is to have government intervene in the "key" wage negotiations of major industries, whose wage-price decisions set precedents and materially affect costs for the rest of the economy. Such intervention can run all the way from appeals to consider the public interest to outright wage-price controls, with their undesirable effects on resource allocation and economic freedom.

Intermediate approaches have merit. Government can sit in on wage negotiations as moderator and negotiator for the public interest, as it has done in steel disputes. Fact-finding boards can be established to review demands, publish findings, and recommend equitable and less inflationary solutions. Public support for such boards puts pressure on both sides to accept their recommendations. Wage or price increases could be suspended by law for a period long enough to permit the board to do its work.[8]

Increasing the rate of growth. A final approach to the problem is to foster a higher rate of economic growth. Demands for more income by both stockholders and workers can be satisfied by expanding total real income, rather than by attempting to redistribute a given total by inflationary means. In connection with promoting growth, steps taken to increase mobility would serve to reduce structural inflation as well.

The apparent conflict between the goals of full employment and price stability promises to be one of the major economic issues of the future and one of the hardest to resolve. Other policy suggestions may be offered. The main thing is to weigh the medicine against the disease. Creeping inflation is a mild cost compared to either chronic widespread unemployment or rigid controls on wages and prices. The

[8]A number of suggestions along these lines are in Emmette S. Redford, *Potential Public Policies to Deal with Inflation Caused by Market Power*, Study Paper No. 10, *op. cit.*

solution most consistent with freedom, efficiency, equity, and progress seems to be in promoting competition and economic growth.

Summary

Most Americans probably favor a high rate of growth, full employment, and stability of the price level. The way to stimulate growth is to increase the marginal efficiency of investment or reduce the rate of interest. Policy designed to effect saving should be used to adjust the equilibrium rate to the actual rate in an accommodating way. In this manner, growth in aggregate demand can be maintained at a rate which fully utilizes growing aggregate supply without inflation.

Aggregate supply and the marginal efficiency of investment are both raised by measures to expand the labor force, improve its quality, and increase its mobility. Maintaining a high level of demand for labor has the effect of increasing its supply. Growth in natural resources is essential. Specific bottlenecks are removed by innovation and the price system, so that limitations in supply are not an important threat to growth. Government can and does promote invention and innovation in numerous ways. The supply of capital is increased as growing aggregate demand, technological progress, and increased supplies of cooperating resources increase returns to investment.

Restoring full employment after a business decline calls for active use of monetary, fiscal, and lending policies. Various financial reforms and the full-employment commitment of government help to prevent recessions from turning into depressions. The major tool of monetary policy is open market purchases of government securities. This not only augments bank lending power, but also directly influences the rates of interest in securities markets.

Nondiscretionary fiscal policy operates through the built-in tax and transfer stabilizer. Discretionary policy consists of reducing tax rates or increasing purchases and transfers. It is probably preferable to plan public works on the basis of need and to carry them out irrespective of the state of business. Tax cuts provide a quicker and almost as powerful lever in today's economy. To make them still quicker and reduce political manipulation, tax changes might be tied to indexes of depression and inflation, a proposal known as formula

flexibility. Fiscal policy should be supported by expansionary monetary policy to relieve competition for investible funds.

Many of the stabilizing mechanisms are of recent origin or importance and this has led some people to believe that there will never again be a major depression. It does seem appropriate to view growth at full employment as the normal behavior of the modern economy, rather than recurring business cycles. Nevertheless, past generations have been overly confident of prosperity and some seeds of depression are still with us.

Demand-pull inflation is fought by reversing the fiscal, monetary, and lending policies of depression. Monetary policy is apt to be more effective against inflation. The equilibrium rate of growth can be brought up to the actual rate by policies to raise the private propensity to save or by government saving. The actual rate of growth is stimulated if interest rates are kept low and saving is raised, whereas the reverse policy controls inflation at the expense of growth.

Policies to reduce cost-push inflation must deal with market power of labor and management. Wage and price controls, creation of a reserve army of unemployed, or outlawing unions are medicines worse than the disease. Better approaches would be antitrust law enforcement against both labor and business monopolies, and some measure of government involvement in key wage-price decisions. A third way is to meet demands for more income with a higher rate of economic growth. Cost-push inflation promises to be a continuing issue in the future and other remedies may be proposed.

Reading and Research

General bibliographic references are cited at the end of Chapter 1. Some fiscal policy references are provided at the end of Chapter 9.

Raising aggregate supply. E. F. Denison, whose article was cited in a footnote, has made a comprehensive study of growth for the Committee for Economic Development: *The Sources of Economic Growth in the United States and the Alternatives Before Us*, Supplementary Paper (New York: Committee for Economic Development, 1962). A number of recommendations, growing out of the Joint Economic Committee's Study of Employment, Growth, and Price Levels, are contained in the *Staff Report* of this study. See the end of Chapter 1 for a full citation.

On growth and improvement of labor see Theodore W. Schultz, "Investment in Human Capital," *American Economic Review*, vol. 51, no. 1 (March 1961), pp. 1–17. A major study of America's natural resource base was made by the President's Materials Policy Commission (Paley Commission). See its five-volume report entitled *Resources for Freedom* (Washington, D.C.: Government Printing Office, 1952). Henry H. Villard discusses policies to promote basic and applied research at length in his *Economic Development* (New York: Holt, Rinehart & Winston, Inc., 1959), a very readable textbook.

Monetary and fiscal policy. A basic primer on monetary policy is the Federal Reserve System's paperbound book, *The Federal Reserve System; Purposes and Functions* (Washington, D.C.: Board of Governors of the Federal Reserve System, 1954). The three-year review of monetary and related policies by the Commission on Money and Credit, whose *Report* is cited in a footnote, is the first major study of such policies to be made by a nonacademic commission since the Federal Reserve System was established.

An introductory text is James A. Maxwell, *Fiscal Policy* (New York: Holt, Rinehart & Winston, Inc., 1955). More advanced discussion, by a well-known expert in the field, is Richard A. Musgrave, *The Theory of Public Finance* (New York: McGraw-Hill Book Company, Inc., 1959). On a more theoretical plane is Challis Hall's, *Fiscal Policy for Stable Growth* (New York: Holt, Rinehart & Winston, Inc., 1960). There are several important discussions in *United States Monetary Policy*, papers presented at the Fourteenth American Assembly (New York: Columbia University, 1958).

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