FIVE

THE STRUCTURE OF PRODUCTION: THE BUILDING BLOCKS

There can be fewer fields of economic enquiry today which promise a richer harvest than the systematic study of the modes of use of our material resources.—Ludwig M. Lachmann, *Capital and Its Structure*

Economists have traditionally visualized the structure of the whole economy in two ways. The first method, the current neoclassical approach, characterizes the economy in a *horizontal* fashion. It pictures the market in a timeless dimension wherein land, labor, and capital are separate coexisting entities. In essence, it is a view which denies any time structure at all. Using this description of the production process, one might see the economy in terms of workers earning wages, employers making profits and losses, landlords collecting rent, and capitalists earning interest on their investments, without examining how they are interrelated.

While this standard method of economic analysis has its advantages, it also has its limitations in that it obscures many critical elements of the economic forces at work (see chapter 1).

The purpose of this chapter is to develop an alternative method of looking at the whole economy, the so-called "vertical" approach, one which John Hicks has appropriately called the "typical business man's viewpoint, nowadays the accountant's viewpoint, in the old days the merchant's viewpoint."[1] L. Albert Hahn calls it "common sense" economics.[2] As I will demonstrate, this revitalized concept resurrects the importance of time in economics. The amount of time it takes to produce and consume

goods and services is a key variable that is missing from almost all popular macroeconomic models. Failure to include this critical factor has led to much mischief in macroeconomic analysis and policy recommendations.

THE BUSINESSMAN'S APPROACH AND THE ROLE OF THE ENTREPRENEUR

What is this "businessman's common sense" approach to economics? It is to visualize the entire market as a long series of production processes that are in various stages of completion. This alternative is far more involved than the simple one-stage distinction that neoclassical economists make between production and consumption goods.

The businessman is an entrepreneur who chooses which area of the hierarchical marketplace he wants to develop, based on his estimation of the risk and profit potential in that particular product or service and what his abilities are as a manager and creator. He sees himself as a mediator between unfinished resources and final products, placing himself somewhere along the conveyor belt of intertemporal activity, whether it be as a retailer, wholesaler, manufacturer, or extractor of natural resources. Whichever position he chooses in the process of production, each businessman undertakes a similar purpose involving three time-consuming steps: (1) to purchase inputs, (2) transform these inputs into a new product or service, and (3) sell the output to the next stage of production.

The factors needed to produce these goods or services may be simple or complex. They may simply involve hiring a secretary and leasing a small office; or hiring hundreds of workers, purchasing heavy machinery and raw products, leasing property, and raising capital. Whatever it takes for the business to produce its goods or services, the important consideration is that the transformed product be sold for more than the cost of the inputs, so that the "value added" is comparable with other business projects. Maximizing short-term profits may not be the overriding objective of a firm —in fact, many companies endure losses or low profit margins for years— but adequate profitability is essential for long-term survival. Otherwise, the producer will stop operating, and will seek alternative opportunities. More often than not, the whole production effort is a discovery process, as Kirzner has emphasized, both in terms of the final products sold to customers and the level of profit or loss.[3]

Piquet explains the risk the businessman undertakes when he is involved in the production process:

> A businessman, knowing the prices of the inputs which he needs to produce something, which he thinks he can sell for a certain price a few months hence, knows how much he is able to pay to acquire those inputs. The price of the inputs incorporates time-discount as a result of market forces in the economy as a whole. Most of the inputs have multiple uses which are reflected in their market prices. Because individual rates of time-discount vary, some of the inputs are either overpriced or underpriced, relative to any particular line of production. To the extent that they are underpriced, the businessman can make a profit over and beyond the price he must pay for borrowed funds. Conversely, to the extent that inputs are overpriced, he is in danger of incurring losses.[4]

The businessman is, of course, often unaware of the *whole* production process, the transformation process from raw commodities to final consumer goods, unless the firm is "vertically integrated." The book publisher, for example, may not be concerned about the intricate details of paper manufacturing, or where logs are milled. The publisher's principal concern is the supply and price of the paper used to print books. In general, it does not matter where the producer is located along the chain of production as long as the firm's long-term profit margin is achieved. But, as we shall demonstrate, from the perspective of the economist in search of a realistic macroeconomic model, visualizing the whole structure of the economy is imperative.

ECONOMIC ACTIVITY AS A PROCESS IN TIME

All businessmen and entrepreneurs are deeply concerned about the time factor—how long it is going to take to obtain a particular input, complete a project, bring the final product to market, receive payment for services rendered, and so forth. Waiting is a fact of life in the business world.

Commercial builders, for example, are extremely conscious of the time it takes to put up an office building, especially when the builder has financed the construction through a bank loan, effectively increasing his production costs with each passing day. The time period varies, but generally it may take two to three years to construct a major office building.

Waiting is a fundamental factor in nearly every market decision. It may take one year to write a book, four years to earn a degree, seven years to build a major highway, or ten years to realize a return on a long-term

investment. The investor, whether seeking a return on a hotel, an apartment building, an oil-drilling project, or a corporate bond, recognizes the universal existence of time and waiting in the real world.

In short, the Clark-Knight theory of the production process as a continuous, repetitious round of synchronized production and consumption is a static model, and as such is a fictitious account of the marketplace. Even companies which have established their markets witness constant change in their products, customer base, and personnel. A firm may have the same number of corporate officers and employees year after year, yet people are aging, their financial status is changing, and they are moving from job to job. Entrepreneurs just starting a business sense change more than anyone, and often expect long periods of investment (waiting) before achieving a return of their funds.

The time dimension is, as management expert Peter F. Drucker has indicated, "man's most perishable resource"—and man's most critical element. Unlike money, which as a store of value can be used at a later date, time must be used immediately or lost forever. Thus time becomes an integral cost of production at every stage.

RELATIONSHIP OF PRODUCTION TO CONSUMPTION: LOOKING AT THE "SNAPSHOT" ECONOMY

Having noted the basic characteristics of a market economy, let us visualize the overall economy, beginning with a look at final consumption, since that is ultimately the end of all economic effort. Economists from Adam Smith to John Maynard Keynes have recognized this universal principle. The work behind the transformation of resources, the manufacture of tools, machines and instruments, and the retailing of goods and services all have one goal in mind: to fulfill the consumer's demands.[5] Exactly how does this causal nexus of production to consumer demand function?

To see this critical linkage, imagine for a moment that time is at a standstill, with everything and everybody suddenly frozen. If we were permitted to walk around and be bystanders, what would we see in this worldwide snapshot of the economy?

Economists see things from many different perspectives but, from our current standpoint, we will discover that goods and services are at different stages of completion. We may notice first that goods are completely fin-

ished, having already been purchased by final users, and are now in varying stages of depletion. They are being used up or consumed.

Next, we may look at items currently being produced and those about to be sold to final users. We note that many goods in our snapshot economy are in retail department stores, grocery stores, car dealerships, and so on, and are ready for *direct* use by consumers. As Taussig states, "Matter reaches the stage of complete utility when it is directly available for satisfying our wants; when it is bread that we can eat, clothes that we can wear, houses from which we can secure shelter and enjoyment."[6]

The automobile may be a good example of the snapshot economy that we envision in this time suspension. Millions of cars have already been built and are being used on the road today, in varying degrees of condition (some cars are old, some are new). Thousands of other cars are in the showrooms, ready to be purchased. Thousands more are in transit to the car dealers. Others are parked temporarily at the production plant waiting to be ordered by the car dealers. And still more are just coming off the assembly line.

THE MARKETING VIEWPOINT

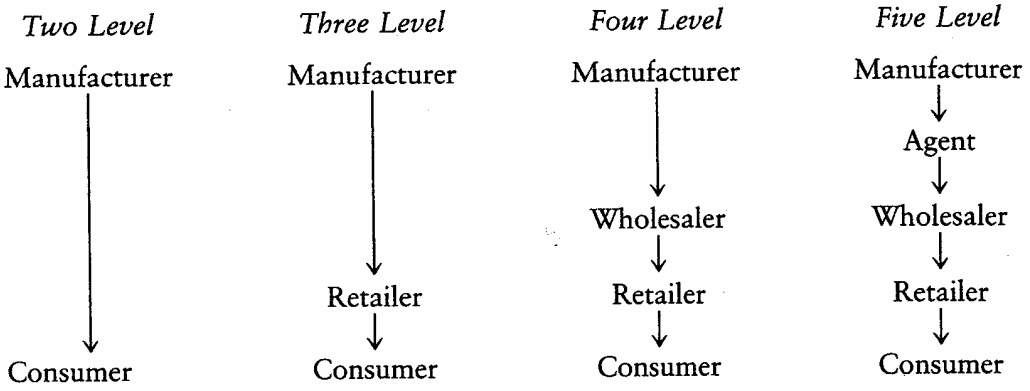
This chain of production is clearly evident in the field of marketing, which deals with a product from the time it is manufactured to the point when it is purchased by its final user or consumer.

Suppose you are in a supermarket. You see the myriad of products on the shelves. But this consumer point of purchase is merely the final stage of a long series of activities which brought the product to this point. As marketing expert Bert Rosenbloom states:

> For behind this commonplace activity of shopping at the supermarket—or most any other type of store for that matter—lies a host of rather complex activities that have made the act of shopping so ordinary and simple. Thousands of people in perhaps hundreds of different organizations have been involved "behind the scenes." These organizations and the people working in them make up the marketing channels that have performed all the tasks and activities necessary to make those products in the store so conveniently available to the consumer.[7]

Rosenbloom portrays a typical marketing channel structure with the following diagram:

Figure 5.1. A Typical Portrayal of Channel Structure for Consumer Goods.



Source: Rosenbloom, *Marketing Channels: A Management View*, 18. Copyright © 1983 by The Dryden Press, a division of Holt, Rinehart and Winston, Inc. Reprinted by permission of the publisher.

Obviously, there are a number of supply stages prior to the manufacturing level. But the field of marketing does not normally concern itself with the construction of the product itself, only with its distribution to the final user once it is manufactured.

THE ASSEMBLY LINE OF PRODUCT TRANSFORMATION

Now let us carry the period of production back further, before the product is manufactured. We wish to develop a more complete model than the overly simplistic neoclassical one, which divides production into only two major groups: consumer goods and capital goods. Consumer goods, such as automobiles and groceries, are the ultimate end product. And to that end, producer goods or capital goods are created and used. They are the *indirect* means to satisfy *direct* individual wants and needs.[8]

Let us return to the case of the automobile industry in our snapshot view of the economy. Besides the cars which are just coming off the assembly line, we note that some are only half built or partially assembled by the car manufacturer. Others aren't built at all, but are only represented by parts in inventory, on order, or being manufactured by secondary car-related industries. If we go back even further, we could look at the rubber producers, the steel plants, and the raw-commodity producers who ultimately make up the components of automobiles and numerous other manufac-

tured goods. The car is the final user good, but literally thousands of capital goods—from steel to plastics—are used to produce the final consumer good (see the vertical column under "transportation" in an input-output table to calculate the components which go into the production of automobiles and other forms of transportation).

WORKING CAPITAL VERSUS FIXED CAPITAL

At this point, it's worth discussing an important distinction made by economists between circulating (or working) capital and fixed capital. The automobile itself, moving from its raw materials to the final product, can be viewed as circulating capital, representing "goods in process." It moves along the assembly line toward ultimate consumption. As Shackle defines it, "Capital is *potential* service and usefulness . . . intermediate products, embryonic items *not yet* ready for application or consumption. To make a tool for productive purposes is to take an indirect but ultimately more fruitful route to that production. . . . In short, *capital is time.*"[9]

At the same time, there are numerous machines and tools which are used at specific junctures in the car-making process. These are fixed capital, because they are stationary and do not move along the assembly line. Moulton defines this form of capital as "implements, tools, machines, industrial buildings, railroad tracks, power houses, and the other concrete material instruments which aid man in the processes of production."[10] But one must not forget that fixed and circulating capital are always interrelated, because the precise purpose of fixed capital is to move circulating capital along the conveyor belt toward its final use.

There is another way of comparing circulating with fixed capital. Circulating capital can be defined as essentially *unfinished* goods. Fixed capital may be regarded as *finished* goods. This distinction makes sense because circulating capital, i.e., unfinished goods, tend to *appreciate* as value is added throughout the production process. But when the circulating capital reaches its final stage, to be used as a household product or commercial input, it becomes a fixed good, and immediately begins to *depreciate.* In short, fixed capital, like consumer goods, is consumed.[11]

As the earlier chapters on the history of capital indicate, there are essentially two contrasting views on the nature of capital goods. The neoclassical fundists (Clark, Knight, Harrod, Keynes, et al.) envision all capital as basically "fixed," providing an eternal flow of income or services with-

out moving through stages. The Austrians (Menger, Böhm-Bawerk, Hayek, Machlup, et al.) characterize capital primarily as "circulating," a multi-period intermediate good moving through stages.[12]

Clearly, a complete macroeconomic model must deal with both kinds of capital. My view is that both fixed and working capital involve significant periods of production, and in this sense, they are more alike than different. In the case of fixed capital, one must consider the time it takes to make machines, buildings, and so forth, and once they are put to use, one must not ignore the years of service such machines and instruments provide in transforming unfinished goods through the pipeline. The manufacturing and marketing of circulating capital goods also involves a considerable period of production, and may provide years of consumer service if the final goods are durable in nature. Since long periods are involved in the production and use of either fixed or working capital, it does not seem appropriate to abandon the idea of an intertemporal capital-using economy.[13]

THE PROCESS AND ORDER OF PRODUCTION

Capital goods and raw materials are used to make other producer goods, in a long chain of economic activity with the ultimate goal of satisfying the final demand of consumers.[14] As Rothbard writes, "At each stage, labor uses nature-given factors to produce capital goods, and the capital goods are again combined with labor and nature-given factors, transformed into lower and lower orders of capital goods, until consumers' goods are reached."[15] Income (in the form of wages, rents, interest, and profits) is paid at each stage for the various factors.

In sum, there is an ordering to the stages of production as they move through time toward final consumption.[16] "The product of one stage of the industrial process furnishes the materials for the next stage, and the product of that stage in turn supplies the materials for the next subsequent stage."[17]

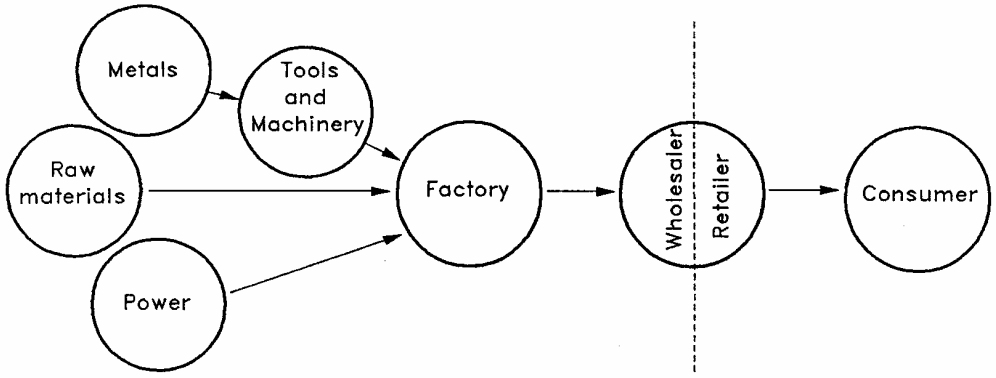
The direction of economic activity can be illustrated as an assembly line sequence, as indicated by Figure 5.2 below.

Another way to look at the transformation of goods through time is as the branches of a tree, per figure 5.3, which Morishima calls the "genealogy of production."

Morishima describes the makeup of economic allocation this way:

> Passing through these vertical processes, the raw materials gradually mature through higher stages of intermediate products in a form approaching the finished

Figure 5.2. The Industrial Process

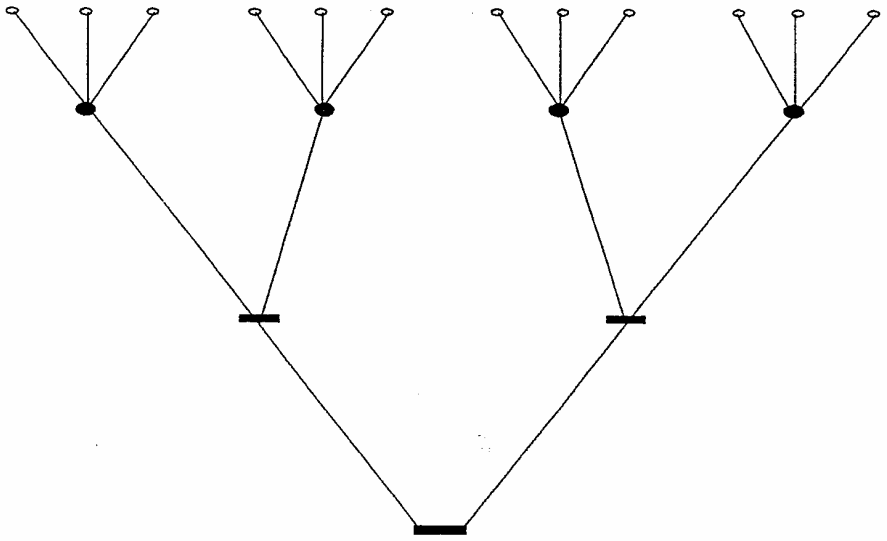


Source: Cornelius C. Janzen and Orlando W. Stephenson, *Everyday Economics* (New York: Silver, Burdett & Co., 1931), 89. Copyright 1931, renewed 1959 by Silver Burdett Company. Used with permission.

product. . . . Operations which have been organized into vertical channels take place simultaneously, and at certain stages the fruits of these several operations are combined. The combined result is then, at the next stage, united with the results of the chain of operations which have been taking place simultaneously in a separate vertical channel.[18]

Note that Figure 5.3 makes several simplified assumptions. First, we are assuming that all capital goods are *specific* in nature, that each capital good

Figure 5.3. The Direction of Economic Production



Source: Rothbard, *Man, Economy and State,* 282.

is utilized at only one point in time to be used in one specific production process. In reality, capital goods are almost always used in a variety of stages or at various points of production at the same stage (joint production). We will deal with the problem of nonspecificity later on.

Second, we have simplified the number of stages. In figure 5.2 the production process goes through only four stages on the way to making a final consumer good. In modern society, the number of stages is virtually always much greater.

MATRIX OF FINISHED AND UNFINISHED GOODS: THE TABLE OF SYNCHRONIZED PRODUCTION

Economists from Taussig to Baumol have illustrated the sequential branches of production in tabular form.[19] Baumol, for instance, shows this intricate relationship between finished and unfinished goods in what he calls the Wicksellian "dated input approach." It measures capital in values rather than physical quantity, based on the age of the capital good and the interest rate. The production process consists of an output requiring a sequence of outlays over a period of time, which can be months to years depending on the product. Baumol uses the example of a product which takes four years of outlays (x_1, x_2, x_3, x_4) to produce. In an evenly-rotating state, with the firm wishing to have a steady flow of output each year, we have most of the outlays "in the pipeline" as unfinished goods, per figure 5.4.

Thus we see that there is indeed a "synchronized" form of production and consumption, as Clark calls it, but both the Baumol example above and Taussig's example demonstrate that it is not a timeless process. The production of individual goods and services is continuous, but it is not simultaneous.

Figure 5.4. Dated Inputs for Finished and Unfinished Goods

Batch of Goods	*3 Years Ago*	*2 Years Ago*	*1 Year Ago*	*Now*
Finished	x_1	x_2	x_3	x_4
¾ finished	o	x_1	x_2	x_3
½ finished	o	o	x_1	x_2
¼ finished	o	o	o	x_1

Source: Baumol, *Economic Theory and Operations,* 644.

PRACTICAL EXAMPLES

Economists have used many common examples to describe and categorize how the whole economy is structured. In chapter 2 we noted the examples used by Menger, Clark, and Taussig. Menger refers to the case of wheat, a "good of the third order," being transformed into flour, a "good of the second order," and eventually into bread, a "good of the first order."[20] J. B. Clark uses several illustrations, including the production of bread, clothing, and houses.[21]

Taussig describes the process of transforming iron ore into various metal instruments and materials.[22] Black enumerates the specific stages: "Thus the mining of iron ore is one stage, the concentrating of it is another, the smelting of it is another, the converting of it into steel is another, and the rolling of the car rails is another. . . . The finished product of one establishment becomes the raw material of the next in line in the production process."[23] Alderfer and Michl separate the stages of the iron and steel industry into five general categories:

Stage #1. Mining the raw materials (iron ore, coal, limestone).
Stage #2. Smelting the iron from the ore.
Stage #3. Refining the iron into steel.
Stage #4. Shaping the steel into:
  (a) finished products such as rails, pipes, wires, and nails.
  (b) semifinished products such as steel plates, sheets, and bars.
Stage #5. Fabricating the semifinished products into finished goods such as tractors and railway cars.[24]

BUILDING A SIMPLE MODEL

To build a macro model of the economy, a rudimentary version of making bread can be a useful example. We will make use of several highly simplified assumptions:[25]

First, each stage of production will take an equal amount of time to complete.
Second, the total period of production will take one year or less to complete.
Third, there will be only one producer at each stage of production. No other capital goods will be bought from other businesses to be used in a particular stage.

Fourth, there will be only working capital, no fixed capital.
Fifth, there will be no durable capital goods.
Sixth, there will be no durable consumer goods.
Seventh, there will be no inventories.
Eighth, we assume that the economy will be "evenly rotating," meaning that at each stage of product development, the profit level will be the same. There will be no losses by firms.

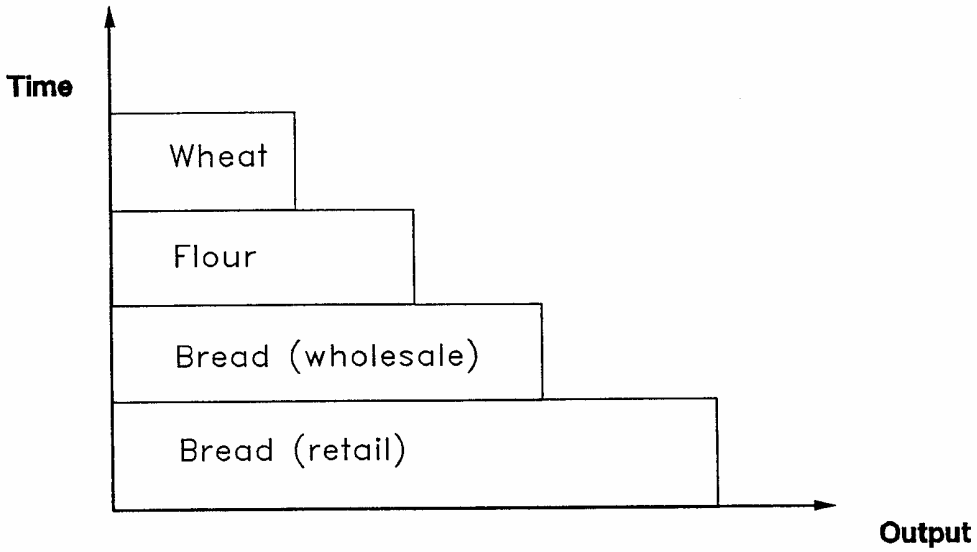
After developing this simple model, we will gradually eliminate each assumption as we move toward a more realistic model of the whole economy.

We can use the Hayekian triangles, as outlined in *Prices and Production,* to represent the structure of production for breadmaking. The two key elements are (1) the basic stages of production in the making of bread, and (2) the time it takes to produce bread from the raw commodity (wheat). Figure 5.5 expresses our four simplified stages of breadmaking, based on "gross revenues" for each stage in a year's time.

The horizontal axis measures the gross revenue obtained from the sale of the product at each stage of production during the season (one year). The vertical axis is a measurement of time.

The gross revenue increases at each succeeding stage. At each level of production, value is added as the final consumer good, bread, is approached. Let us assume that the first stage is the farmer growing wheat.

Figure 5.5. Four Stages of Bread Production



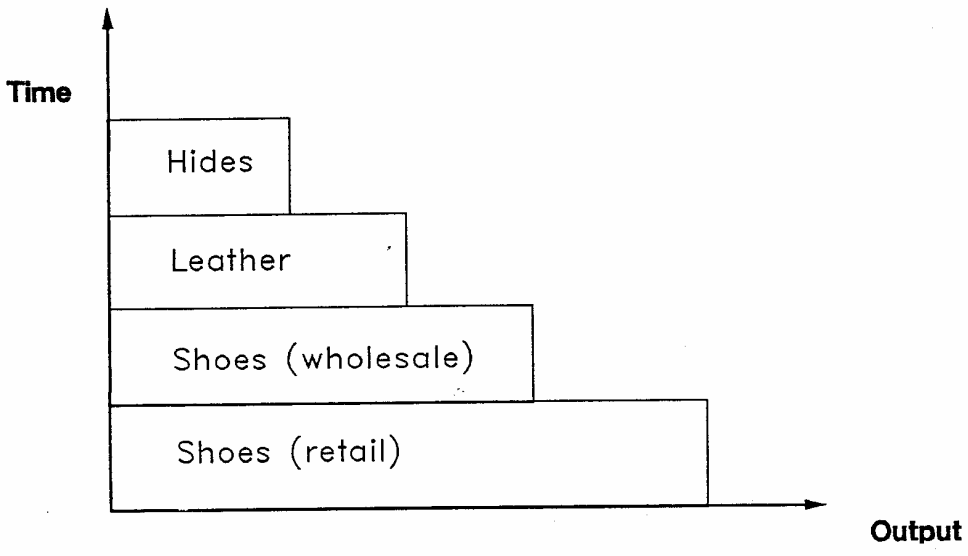
This incorporates the use of a plough in preparing the land. The farmer's cost is the price of the plough used to raise the wheat crop. The farmer plants, fertilizes and harvests the wheat at a certain cost, and then sells the wheat to the miller for a profit. The second stage is the miller's threshing of the wheat and grinding it into flour. Again, the miller must consider the basic costs of the mill equipment to turn the wheat into flour. He then sells the flour to the baker for a value-added price which assures the miller of a profit. The third stage is the baker who takes the flour and makes it into bread, and then sells the bread to the grocer, again at a price higher than his costs. The final stage is the grocer, who sells the bread to the consumer at still a higher price that insures a profit for the supermarket.

The making of shoes may be another rudimentary example. The first stage could be the raising of cattle to make hides. The second stage is tanning the hide and making it into leather. The third is the manufacture of the shoe itself, and the fourth and final stage is selling of the shoe to the retail customer. This production process is diagrammed in figure 5.6.

JOINT PRODUCTION AND THE COMPLEMENTARY NATURE OF PRODUCERS' GOODS

Now let us eliminate a few of our oversimplified assumptions. We know, for example, that every product involves the use of more than one input at

Figure 5.6. Four Stages of Shoe Production

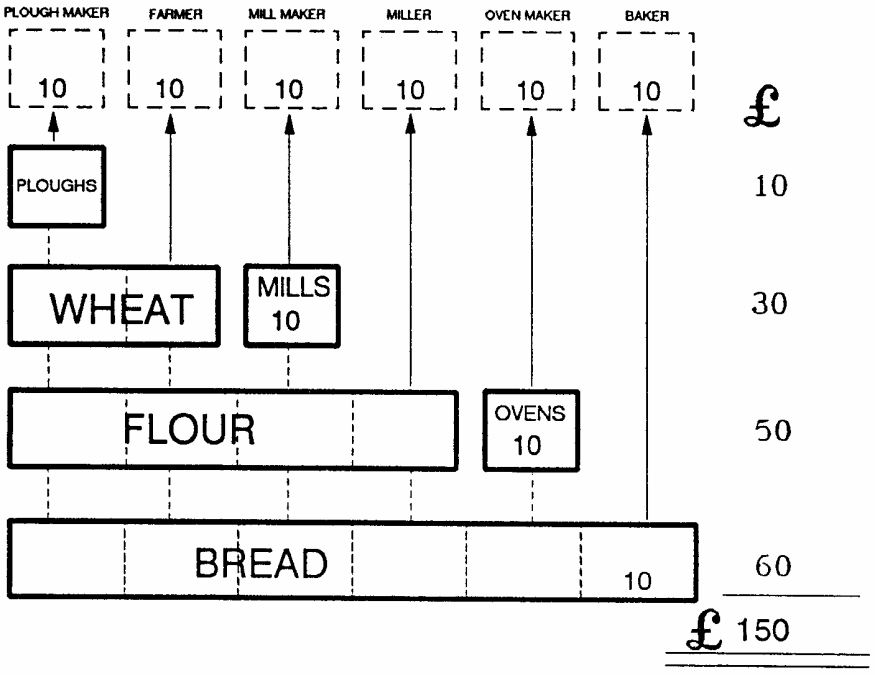


each stage. As Menger notes, "We see everywhere that not single goods but combinations of goods of different kinds serve the purposes of economizing man."[26] And Hayek adds: "At each stage of the process from the raw material to the finished product the main stream will be joined by tributaries which in some cases may already have run through a much longer course than the main stream itself."[27]

In many cases, these tributaries are machines, tools and other instruments that facilitate the production process, which we have called fixed capital. Fixed capital is generally specific in nature, i.e., used for a specific purpose at a certain point in time. For instance, in our breadmaking example, the plough and mill are considered a fixed capital good, while wheat seed and flour are working capital.

In order to complete our macroeconomic model of the entire bread industry, we must include joint production in the picture. The best way to include all the stages of the joint factors of production is through a generalized geometric structure.

To show how we can incorporate this new factor of joint production, let us return to our example of breadmaking, this time using an illustration similar to Durbin's example in chapter 3 repeated below.



Source: Durbin, *Purchasing Power and Trade Depression*, 54. Reprinted by permission of Jonathan Cape Ltd.

Let us slightly alter Durbin's example by placing the mills in stage two along with the output of wheat, and putting the ovens in stage three, along with flour. We start with the first three stages of the breadmaking industry, i.e., the ploughmaker, the wheat farmer, and the miller. Assume that the profit margin is the same at each stage. i.e.,

$$\pi_a = \pi_b = \pi_c = \pi_d.$$

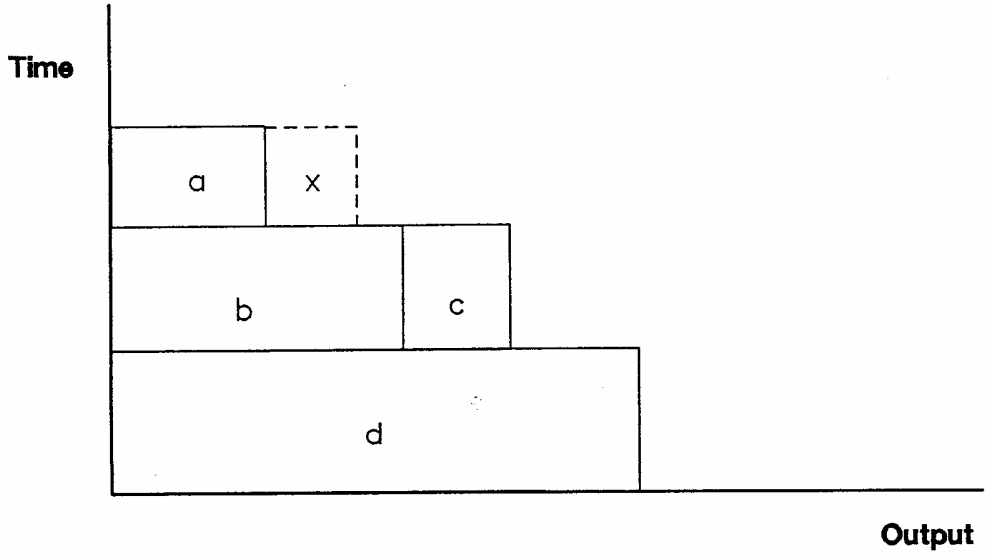
We also assume that we have only one joint input, a mill used by the miller in stage three. But since it is a cost to the miller, we place the mill in stage two, along side the miller.

Let the gross revenue of the ploughmaker (stage one) be *a,* the revenue of the farmer, *b,* the output of the miller, *d,* and the cost of the mill, *c.* Figure 5.7 illustrates the business relationship between the resources and products.

What are we trying to show? We wish to prove that the profit margin is the same at each stage of production even when joint inputs are involved in the supply chain.

The miller's cost of the mill, *c,* becomes the revenue of the millmaker. But the millmaker also has his own costs in manufacturing the mill. In order to make the bread industry a complete model, we must include the stages necessary to produce a mill. Let us assume in this algebraic example that the cost of producing a mill is *x,* and that the mill is produced in only one stage. Therefore we place *x* at stage 1 along with the ploughmaker.

Figure 5.7. Joint Production with Three Stages



If we assume that the profit margin for the millmaker is the same as it is for other businesses (a hypothetical assumption we can only make in the case of a risk-free, evenly rotating economy), we can then show that the *profit margin* at each stage is also the same, regardless of whether joint production exists at any level. We also make the important assumption that the time periods are the same for each stage. To prove that the profit margin is equal at every stage, we define the profit margin as,

$$\text{Profit margin} = \frac{\text{total profit}}{\text{total cost}} \text{ or } \frac{\text{revenue} - \text{cost}}{\text{cost}}$$

Therefore,

$$\pi = \frac{b-a}{a}$$

and

$$\pi = \frac{d-(b+c)}{b+c}.$$

If x is the cost to produce c, and the profit margin for c is the same for other producers, then we must prove:

$$\frac{(b+c)-(a+x)}{a+x} = \frac{b-a}{a} \qquad \text{(Eq. 5.1)}$$

Proof: Since the profit margin on c is $\frac{c-x}{x}$, and the profit margins on all businesses are equal, therefore

$$\frac{b-a}{a} = \frac{c-x}{x}.$$

Reduced,

$$x = \frac{ac}{b}.$$

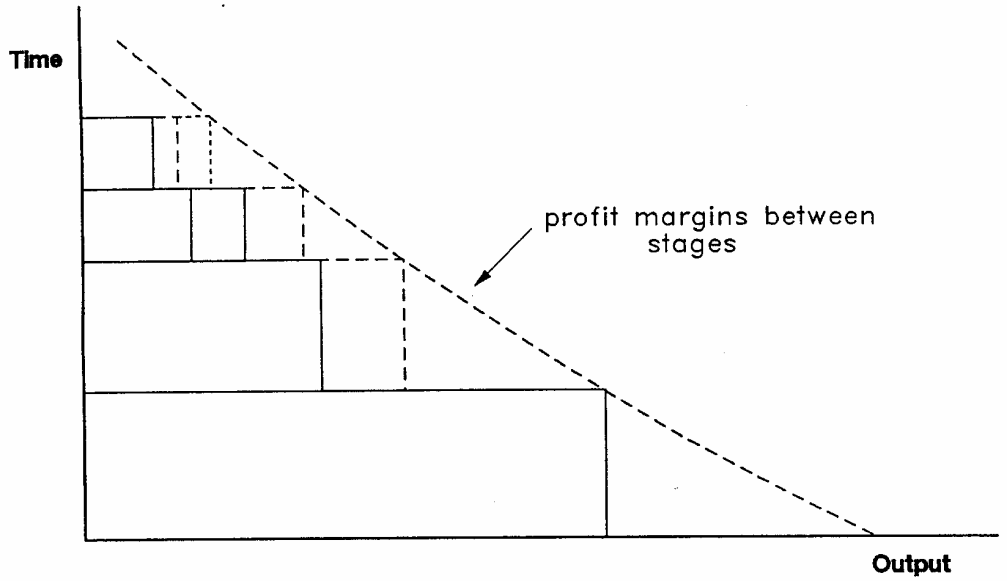
Therefore, substituting $\frac{ac}{b}$ for x in equation 5.1, we obtain,

$$\frac{b+bc-ab-ac}{ba+ac} = \frac{b-a}{a}.$$

Reduced,

$$\frac{b(b+c)-a(b+c)}{a(b+c)} = \frac{b-a}{a}.$$

Figure 5.8. Sector Model with Joint Production



The (b+c) cancel out in the left side of the equation, and the proof is complete.

The proof can be applied to more than one joint input, although it becomes more complex. Ultimately, the point is reached in an industrial economy where there are many stages of production with a multitude of inputs. Thus, the Hayekian triangle for the whole economy shows a smooth "profit margin" line running from top to bottom, per figure 5.8.

DIFFERENT TIME SCHEDULES

Another of our initial assumptions was that each stage takes the same amount of time, which is contrary to the real situation. In the case of breadmaking, the planting and harvesting of wheat may take four to five months, while the milling process may be less than a month, and the baker's time for making bread may be only a few days. The alteration in the triangular production figure can easily account for differences in the period of production. Figure 5.9 below shows how the breadmaking industry could look under the above differences in time schedules.

In this case, the revenue for the wheat farmer (indicated by stage one) remains the same as in Figure 5.5, but the vertical axis is longer (reflecting the longer time involved) and the horizontal axis is shorter. Note that the

NOTES

1. Hicks, *Capital and Time,* 12.
2. L. A. Hahn, *Common Sense Economics.*
3. Kirzner provides an excellent description of the role of the entrepreneur *qua* producer in "translating resources . . . into products in the market baskets of the consumers." Israel M. Kirzner, *Competition and Entrepreneurship* (Chicago: University of Chicago Press, 1973), 44, 43–52.
4. Piquet, *The Economic Axioms, 55.*
5. Smith: "Consumption is the sole end and purpose of all production." *The Wealth of Nations,* book 2, 179. John Maynard Keynes: "All production is for the purpose of ultimately satisfying a consumer. . . . Consumption . . . is the sole end and object of all economic activity." *The General Theory,* 46, 104. Eugen von Böhm-Bawerk: "All human production has as its object the acquisition of consumption goods." *Capital and Interest,* vol. 2, *Positive Theory of Capital,* 79. Such statements are not to suggest that consumption is more important than production—in fact, just the opposite is true. Increased consumption will not necessarily increase production, but higher production —of the right kind—will bring about higher consumption in the future.
6. Taussig, *Wages and Capital,* 3. Taussig also notes that after the completion of physical production, middlemen take weeks if not months to deliver the final goods to the consumer. "Months elapse, on the average, between the time when goods are finished, in the everyday sense of the word, and the time when they reach the stage of enjoyment." (14)
7. Rosenbloom, *Marketing Channels: A Management View,* 3.
8. Piquet, *The Economic Axioms,* 8–9.
9. Shackle, *Epistemics & Economics,* 304. Machlup distinguishes between fixed and working capital as follows: "The individual entrepreneur regards as working capital that part of his capital which is released when he stops

producing; fixed capital, in contrast, remains tied up even after he has stopped producing." Machlup, *The Stock Market, Credit and Capital Formation,* 202.

10. Moulton, *The Formation of Capital,* 8. For cotton shirts, the "fixed" capital requires plows, mechanical cotton-pickers, sacks, locomotives (to move the cotton), spinning machinery, looms, warehouses, retail stores, and so on. "The complete list would be staggering." Abbott, *Economics and the Modern World,* 179.
11. Black, *Introduction to Production Economics,* 35–36. I wish to thank Royal Skousen for making this point clear to me.
12. According to Martin Hill, the Böhm-Bawerkian view of capital is that "there is no place for the distinction between fixed and circulating capital: all intermediate products are regarded as passing more or less quickly into consumers' goods." Hill, "The Period of Production and Industrial Fluctuations," 600. Cf. E. F. Schumacher, "Inflation and the Structure of Production," 406. Böhm-Bawerk considers capital to include both fixed and working capital. His view of capital is "organic," like a seed that is planted, absorbs primary services, and over a period of time, is harvested as a consumption good. See Kuenne, *Eugen von Böhm-Bawerk,* 20. Hayek's model in *Prices and Production* excludes fixed capital. Machlup criticizes Hayek's implication that "there is one stage of production at which no tools and no instruments, but only the 'original' services of land and labor, are employed." Machlup calls this assumption "entirely unrealistic." Machlup, "Professor Knight and the 'Period of Production,' " 587. However, I do not see any insurmountable problems in incorporating fixed capital in the joint production of intermediate goods.
13. Haavelmo concludes that "the distinction between working capital and instruments of capital is not as profound as one might think." Haavelmo, *A Study in the Theory of Investment,* 78–79.
14. Piquet defines production as "the forward movement of use from the most indirect level through various stages of indirectness to the level of direct (or end) use. . . . To illustrate, iron ore is transformed into iron, which is made into steel, and then manufactured to form an oven which is used to bake bread for direct use. Together with labor, transportation, etc., these represent various use levels." Piquet, *The Economic Axioms,* 8.
15. Rothbard, *Man, Economy and State,* 282–83.
16. Gemmill and Blodgett refer to this transformation process as "form utility," which "consists of taking raw materials, or partly finished goods, and making them more desirable by changing their form." Gemmill and Blodgett, *Economics,* 71–72.
17. Hansen, *Business-Cycle Theory,* 125.
18. Morishima, *The Economic Theory of Modern Society,* 34–35. Morishima's representation of the "tree" process of production is the reverse of Rothbard's figure 5.2, so that unfinished goods move *higher* toward final consumption. But the analysis is essentially the same.
19. See also Taussig, *Wages and Capital,* 23–25. Machlup analyzes an agricultural example from the work of N. J. Polak, *Grundzüge der Finanzierung, mit Rüchsicht auf die Kreditdauer* (Berlin-Vienna: Industrieverlag Spaeth and

Linde, 1926) to illustrate the synchronized production process. In the case of wheat, it is sowed in March, harvested in September, processed in two successive stages, and held in inventory so as to sell to consumers continuously throughout the year. See Machlup, *The Stock Market, Credit and Capital Formation,* 217–18.

20. Menger, *Principles of Economics,* 55–57.
21. Clark, *The Distribution of Wealth,* 268–69.
22. Taussig, *Principles of Economics,* 60.
23. Black, *Introduction to Production Economics,* 34.
24. Alderfer and Michl, *Economics of American Industry,* 28. Also see the chart on 54.
25. "Any scheme, or diagram, or classification of the stages of production must have a rigid and arbitrary character, and cannot conform to the endless complexities of the living industrial world." Taussig, *Wages and Capital,* 25.
26. Menger, *Principles of Economics,* 118–19.
27. Hayek, *The Pure Theory of Capital,* 25.
28. Taussig, *Wages and Capital,* 2.
29. Knight, "Capitalistic Production, Time and the Rate of Return," 338.
30. Rolph, "On Austrian Capital Theory," 502.
31. Böhm-Bawerk, *The Positive Theory of Capital,* 88, 90.
32. Ibid., 89.
33. Rothbard, *Man, Economy and State,* 412–13.
34. Mises, *Human Action,* 489.
35. Machlup, "Professor Knight and the 'Period of Production,' " 588.
36. "It is really not necessary that we go back to a point in history where there was no capital." Haavelmo, *A Study in the Theory of Investment,* 42.
37. Mises, *Human Action,* 480.
38. Rothbard, *Man, Economy and State,* 414. "Resources that are being depleted [coal, oil, gas, and so forth] obviously *cannot* be replaced and are therefore *land,* not capital goods" (460n.15). However, once these natural resources are processed in any way, they become "working" capital goods, not land.
39. Ibid., 414.
40. Elliott-Jones, *Input-Output Analysis: A Nontechnical Description,* 3.
41. Shackle, "F. A. Hayek," 239.
42. Jevons, *The Principles of Economics,* 115.
43. Hawtrey, *Capital and Employment,* 240.
44. Sraffa, *The Production of Commodities by Means of Commodities,* 93.
45. Rolph, "On Austrian Capital Theory," 502. David McCord Wright uses the analogy of a group of ships to represent the economic structure. They are all "sailing *roughly* in the same direction," but it is a "disorderly huddle," not an organized military convoy. "They cross each other's bows. They signal back and forth. They even sometimes ram and sink one another. . . . They constantly observe and feel each other's behavior, they also read each other's reports." Wright, "What *Is* the Economic System," *Quarterly Journal of Economics* (1958): 207–8.
46. Shackle, "F. A. Hayek," 239. Harold Moulton notes the problem of some