Lesson-18

A Firm and its Production

The Theory of the Firm

Peter G. Klein
University of Missouri

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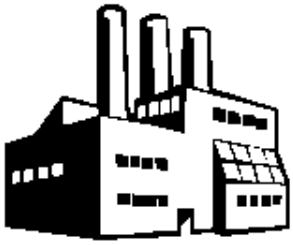

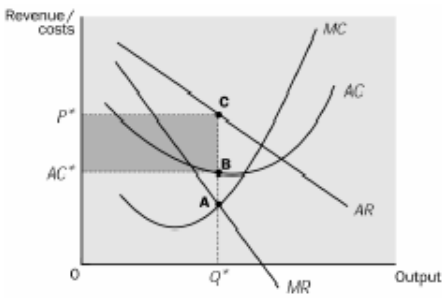

Suppose we are considering a firm that produces only one output. In this case we write the net output bundle as $(y, -\mathbf{x})$ where $\mathbf{x}$ is a vector of inputs that can produce y units of output. We can then define a special case of a restricted production possibilities set, the **input requirement set**:

$$V(y) = \{\mathbf{x} \text{ in } R^n_+ : (y, -\mathbf{x}) \text{ is in } Y\}$$

The input requirement set is the set of all input bundles that produce *at least* y units of output.

Note that the input requirement set, as defined here, measures inputs as positive numbers rather than negative numbers as used in the production possibilities set.

Two aspects of the "theory of the firm"

- Theory of production
  - The structure of production
  - Factor pricing
  - The entrepreneur's costs
- Theory of firm
  - Why firms exist
  - Firm boundaries
  - Internal organization

Production and cost

- The complexity of production
  - Entrepreneurship
  - Economic calculation

- The Austrian theory of imputation
  - Classical view: costs determine prices
  - Austrian view: prices determine costs
  - The marginal productivity theory: factor prices tend to be equal to their discounted marginal revenue products.

The nature of the firm

- Neoclassical view: firm as production function (a "black box")
- Nexus-of-contracts view: no such thing as firms
- Knowledge-based ("capabilities") view: firm as a stock of knowledge
- Coasian (1937)view: firm as ownership of assets

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The Coasian framework

- External and internal transaction costs
- The optimal boundary of the firm
- Further developments
  - Asset specificity and the holdup problem
  - Markets, hierarchies, and hybrids
- Compatible with Austrian economics?

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Kirzner on the Coasian framework

In a free market, any advantages that may be derived from "central planning" . . . are purchased at the price of an enhanced knowledge problem. We may expect firms to spontaneously expand to the point where additional advantages of "central" planning are just offset by the incremental knowledge difficulties that stem from dispersed information.

— Kirzner, *The Meaning of Market Process* (1992), p. 162

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Rothbard on the limits to the firm

- Conventional explanations
- Incremental limits: nature of the decision-making (ownership) factor
- Ultimate limit: ability to perform economic calculation
  - The calculation debate: a brief refresher
  - The organization of the large firm
  - The need for market-based transfer prices
  - Implications for firm size

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Rothbard on the Coasian Framework

Coase pointed out that there are diminishing benefits and increasing costs to each of these two alternatives, resulting, as he put it, in an "`optimum' amount of planning" in the free market system. Our thesis adds that the costs of internal corporate planning become prohibitive as soon as markets for capital goods begin to disappear, so that the free-market optimum will always stop well short not only of One Big Firm throughout the world market but also of any disappearance of specific markets and hence of economic calculation in that product or resource.

— Murray N. Rothbard, "Ludwig von Mises and Economic Calculation Under Socialism" (1976), p. 76.

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Summary

- Key elements of the Austrian theory of the firm: entrepreneurship and economic calculation
  - Factor pricing
  - Firm boundaries
- Policy implications
  - Need for free-market prices
  - "Freedom to fail"

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An exchange is a voluntary agreement between two people in which each gives something to the other and gets in return something that he considers of greater value. When John and Jim exchange baseball cards, John gets cards that he considers more valuable than those he gives to Jim. And Jim gets cards that he considers more valuable

than those he gives to John. Unless both sides of the exchange feel that the exchange benefits them, the exchange will not take place. Because both sides get benefit, exchange is, in the terms of game theory, a positive-sum game.

An alternative to interaction by exchange is interaction that involves coercion. With coercion, the actions of one side are not voluntary but forced. If Jim takes baseball cards away from John and threatens to beat him up if he complains, one has interaction based on coercion. Economics focuses almost exclusively on interactions based on exchange and ignores those based on coercion. As a result, it has much more to say about markets than about government which is the primary agent of coercion in society.

People engage in exchange to attain goals. Exchange is not just to take in order to get. People should do things that they do not want to do in order to get things that they desire. The unpleasant part of this process is work and production and the pleasant part is consumption. Work and production are pursued because without them one cannot consume. This division of economic life is illustrated below in what Frank Knight called the "Wheel of Wealth" but which is now more commonly known as "circular flow."

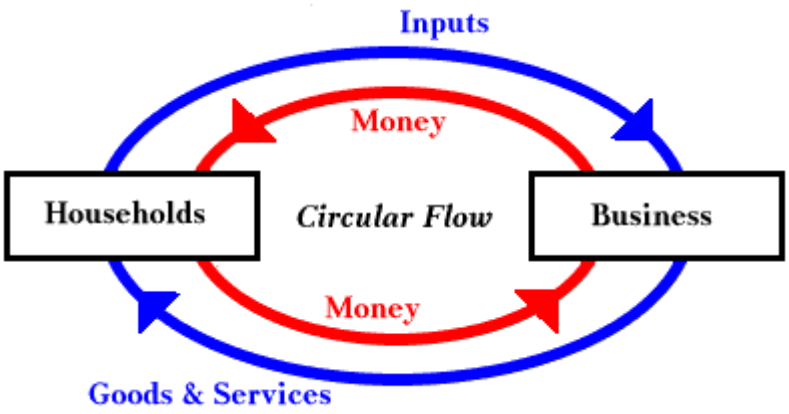

Figure 1.1

The circular flow diagram divides the economy into two sectors-- one concerned with producing goods and services and the other with consuming them. Resources are converted into goods and services by business and in this transformed state, travel back to consumers. Money flows in the opposite direction. These flows involve two markets in which exchange takes place-- the resource or factor market in which business buys resources and the goods and services market in which business sells goods. Some of the economists define a "factor of production" as the service of some resource. If resources are land, labor and capital, the factors of production are the services of land, labor and capital.

Both the model of supply and demand and consumer choice with utility analysis are key elements of an understanding of exchange economy. However, this group of readings emphasizes the right side of the circular flow diagram, examining the business firm and the constraints or limitations that it has to face in its fight for survival.

Three Fundamental Tasks

The right side of the circular flow diagram shows the three fundamental tasks of all the firms in an exchange economy. These are as follows:

1. A firm should obtain inputs-- Inputs include raw materials, energy, machinery, office space, workers and anything else needed to produce output.
2. A firm should combine or use inputs to produce output-- Output may either be a tangible good such as a pair of shoes or an automobile, or a service such as a haircut or a medical checkup.
3. A firm should sell its output to someone else.

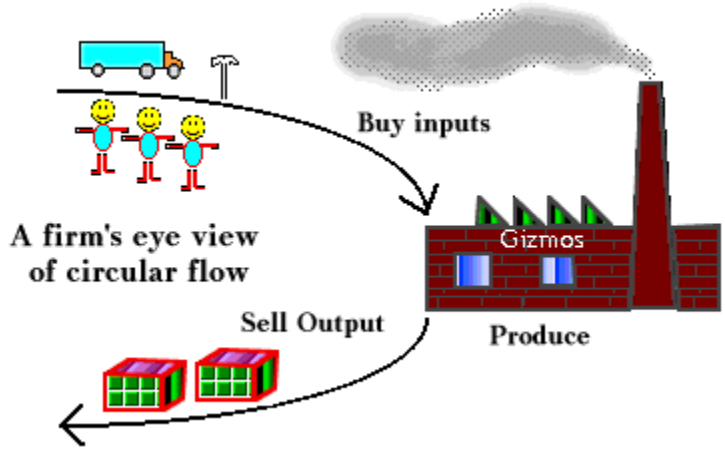

Figure 11.2

A firm that cannot do these three tasks well enough will not survive. When the automobile was developed in the early 20th century, firms that made carriages died because they could no longer do task three, selling their output in an effective manner. Almost all the baskets sold in the United States are imported. Baskets are handmade and no firm in the United States can hire workers at wages lower enough to be able to compete with wages that are acceptable in some other countries. Here is a case in which American firms (or firms in any industrialized nation) have difficulty coping with the first task. The development of the electronics industry is a case in which the second task has changed. New technology allows firms to combine inputs to produce goods that were not possible just a few years ago.

The economic theory of a firm is an analysis of the way a firm should perform the following three tasks to make a profit: (Each task can be described in mathematical or graphical terms)

1. Supply curves of resources-- They indicate how much a firm should pay for the amount of input it wants.
2. The production function-- It tells how much output a firm can produce from a set of inputs.

3. The demand curve for output-- It depends on people's wants or preferences and tells how much a firm can charge for output.

Each of these mathematical ways of representing the three fundamental tasks can be seen as a constraint or limitation that a firm faces.

A supply-of-resources curve tells at what prices various amounts of a resource can be bought or hired. Though one can view it in a number of ways yet it can also be viewed as a boundary. It tells a firm the minimum it can pay for any amount of a resource. The sellers of resources imposed this boundary on a firm which should buy resources in order to produce. Points to the upper left of a supply curve are attainable whereas those to the lower right are not.

The production function contains information about how much output can be obtained with various quantities of inputs. The production function is often discussed as a relationship between inputs and output, as its name implies. Mathematically, a function is a special sort of relationship. However, it too can be discussed as a boundary. It shows the maximum that can be produced with any combination of resources.

The demand curve can be viewed from a number of perspectives, such as a relationship between price and quantity buyers will buy, as a locus of points of consumer equilibrium, as a measure of marginal benefit to a buyer, or as a boundary. The view that a demand curve represents a boundary that buyers impose on the seller is most useful while developing the theory of a firm. The demand curve limits the amount that sellers can sell at each price. Points to the left of the demand curve are attainable while those to the right are not.

Production and Supply

For investigating the foundations of supply and demand, it is necessary to look at demand and supply as separate headings. Historically, the first stages of the economists' Reasonable Dialog were focused more on supply. In investigating the foundations of supply, you are investigating the economics of production and that was the central topic for the classical economists.

Adam Smith was very optimistic about the future economic development of the industrializing countries. With increased division of labor leading to higher wages and growing demand, he felt that production could continue to grow. However, Thomas Malthus criticized Smith's optimism. Malthus spoke for the pessimistic view and, ofcourse, Malthus is best known for his claim that increasing population would lead to poverty. In supporting this idea, Malthus began to study the limits on production. It was this study that has made his work important particularly for Neo-classical economics.

Limits on production stem from limited resources with a given technology. With a given technology, limited quantities of inputs will yield only limited quantities of outputs. The

relationship between the quantities of inputs and the maximum quantities of outputs produced is called the "production function."

The "production function" is a relationship between quantities of input and quantities of output that tells the greatest output that can be produced with each quantity of input. Malthus did not work out the details but he clearly had this idea in mind as he originated the key concept of diminishing returns.

Diminishing Returns

Malthus is best known for his pessimistic idea that population growth would force incomes down to the subsistence level. Malthus argued that land is a fixed input but the growth of population makes labor a variable input. Malthus proposed a general law of economics which is known as the Law of Diminishing Returns. This law is as follows:

When a fixed input is combined in production with a variable input, using a given technology, increases in the quantity of the variable input will eventually depress the productivity of the variable input.

Malthus argued that decreasing productivity of labor would depress incomes. And he was right. There is plenty of evidence both observational and statistical that the Law of Diminishing Returns is valid. For example, agricultural economists have carried out experimental tests of the theory. They selected plots of land of identical size and fertility and used different quantities of fertilizer on the different plots. In this example, land was the fixed input and fertilizer the variable input. They found that as the quantity of fertilizer increased, the productivity of fertilizer declined. This is only one of many bits of evidence that the Law of Diminishing Returns is true in general.

On the other hand, in the two hundred years since Malthus wrote, on the whole, population has increased but labor productivity and incomes have not declined. On the whole, they have risen. What seems to have happened is that the technology has improved. Malthus recognized that if technology improved (in agriculture, at least), that might postpone what he saw as the inevitable poverty as a consequence of rising population. Some of the economists and other people believe that the Malthusian prediction will eventually come true. Perhaps, in two hundred years it has not.

But that does not mean the Law of Diminishing Returns is wrong. A law such as this can be true in general but cannot be applied when its assumptions (such as an unchanging technology) are not true. The law is not wrong but just inapplicable to that case.

There are many valid and useful applications of the Law of Diminishing Returns in economics. Two of them are as follows:

- We will use diminishing returns and related concepts to get a better idea of the meaning of the phrase "efficient allocation of resources" and some guidelines for efficiency in that sense

- We will explore how a business firm should direct its production in order to get maximum profits for a better understanding of the economics of supply

The Production Function

Production is the transformation of inputs into outputs. Inputs are the factors of production, i.e. land, labor and capital plus raw materials and business services.

The transformation of inputs into outputs is determined by the technology in use. Limited quantities of inputs will yield only limited quantities of outputs. The relationship between the quantities of inputs and the maximum quantities of outputs produced is called the "production function."

But how do these outputs change when the input quantities vary? Let us take a look at the following example of a production function:

When most of the people think of fundamental tasks of a firm, the first thing that comes to their minds is that of production. The economists describe this task with the production function which is an abstract way of discussing how a firm gets output from its inputs. It describes, in mathematical terms, the technology available with a firm.

A production function can be represented in a table such as the one given below. In the table 1.1, five units of labor and two of capital can produce 34 units of output. It is, of course, always possible to waste resources and to produce fewer than 34 units with five units of labor and two of capital. But the table 1.1 indicates that no more than 34 can be produced with the technology available. The production function, thus, contains the limitations that technology places on a firm.

A Production Function			
Labor			
5	30	34	37
4	26	30	33
3	21	25	28
2	16	20	23
1	10	13	15
	1	**2**	**3**
Capital			

Table 1.1

The production function can also be illustrated in a graph such as the one given below. The figure 1.1 looks exactly like a graph of indifference curves because the mathematical forms of the production function and the utility function are identical. In one case, inputs

of goods and services combine to produce utility and in the other, inputs of resources combine to produce goods or services. A curved line in the graph shows all the combinations of inputs that can produce a particular quantity of output. These lines are called isoquants. As one moves to the right, one reaches higher levels of production. If one can visualize this as a three-dimensional graph, one can see that the production surface rises increasingly high above the surface of the page. The isoquants indicate a hill. A firm should operate on or below this surface.

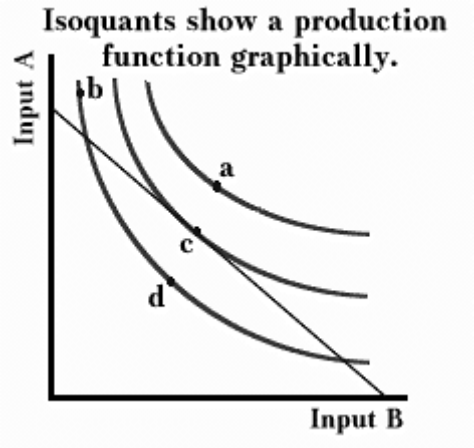

Figure 1.1

Marginal Productivity

Productivity, by definition, is a ratio of output to labor input. In most of the statistical discussions of productivity, one refers it to the average productivity of labor as follows:

$$AP = \frac{\text{Output}}{\text{Labor Input}}$$

Average labor productivity is an important concept especially in macroeconomics. In microeconomics, however, focus should be more on the marginal productivity. One can think of the marginal productivity of labor as the additional output as a result of adding one unit of labor with all other inputs held steady and ceteris paribus.

In algebraic terms, an equally correct definition is as follows:

$$MP = \frac{\triangle \text{Output}}{\triangle \text{Labor}}$$

Let us have a numerical example to illustrate the application of the theory. Suppose that:

- When 300 labor-days per week are employed, a firm produces 2505 units of output per week
- When 400 labor-days per week are employed, a firm produces 3120 units of output per week
- It follows that the change in labor input, labor is 100.
- It also follows that the change in output, output is 615.
- Applying the formula, one may approximate the marginal productivity of labor by the quotient 615/100 = 6.15.

This result can be interpreted as follows:

Over the range of 300 to 400 man-days of labor per week, each additional worker adds approximately 6.15 units to output.

Ofcourse, if one had more information, one could get a closer approximation. For example, if one had the outputs for 310, 320, ... 390 man-days of labor, one could see how marginal productivity varies within the range 300-400. But one can be sure that the values will be in the neighborhood of 6.15.

Let us extend the numerical example and see how marginal productivity varies over a wide range of labor inputs. Here is a hypothetical example of production with the inputs of land and labor held steady and varying quantities of labor, and the output and average and marginal productivities.

Labor	**Output**	**Average Productivity**	**Marginal Productivity**
0	0	0	9.45
100	945	9.45	8.35
200	1780	8.90	7.25
300	2505	8.35	6.15
400	3120	7.80	5.05
500	3625	7.25	3.95
600	4020	6.70	

			2.85
700	4305	6.15	1.75
800	4480	5.60	0.65
900	4545	5.05	-0.45
1000	4500	4.50	

Table 1.2

Average and Marginal Productivity

Both average and marginal productivity are important, but for a model of short-run profit-maximizing supply, marginal productivity is the more important.

Following is the average and marginal productivities for the same numerical example. It should be noticed how both average and marginal productivity decrease as the labor input increases. But the marginal productivity declines faster than the average productivity, pulling the average productivity down after it. The downward slope of the marginal productivity line expresses the Law of Diminishing Returns and the downward slope of the average productivity is also a result of the law.

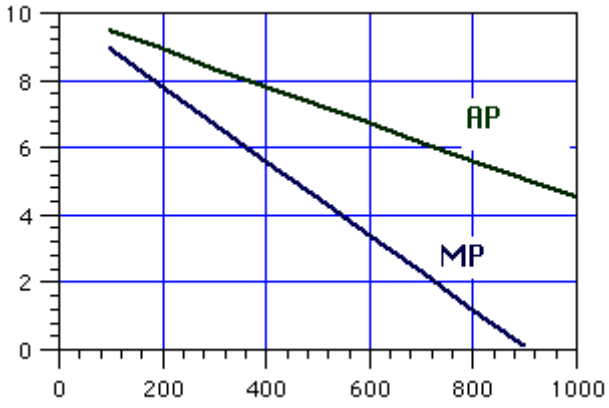

Figure 1.2

Average and marginal productivity

The relationship between average and marginal productivity in the diagram is important in itself. Average and marginal productivity will not always have the same slope. In general, whenever average productivity is greater than marginal productivity, average productivity will slope downward. And whenever, average productivity is less than marginal productivity, average productivity will slope upward.

Figure 1.2 does not show any values where average productivity is less but a more complicated example might show and then we would see the second part of the relationship visualized.

To understand the relationship, think as one adds labor input one unit after another, one adds a bit more to output at each step. When the addition is greater than the average, it pulls the average up toward it. When the addition is less than the average, it pulls the average down toward it.

The Law of Diminishing Marginal Productivity

In the discussions of the Law of Diminishing Returns, Malthus did not distinguish between average and marginal productivity. However, in modern economics, one thinks of diminishing returns primarily in terms of marginal, not average, productivity. Thus, the modern statement of Law of Diminishing Returns is as follows:

When the technology of production and some of the inputs are held constant and the quantity of a variable input increases continually, the marginal productivity of the variable input will eventually decline.

The inputs that are held steady are called the “fixed inputs.” The inputs that are allowed to vary are called the “variable inputs.”

Another way to express the Law of Diminishing Returns is as follows:

As the variable input increases, the output also increases but at a decreasing rate. The marginal productivity of labor is the rate of increase in output as the labor input increases. To say that output increases at a decreasing rate when the variable input increases is another way to say that the marginal productivity declines.

Figure 1.3 shows the relationship between the variable input and the output in the numerical example in the previous table. It should be noticed how the slope gets flatter. As the variable input increases, output increases at a decreasing rate. This is a visualization of the Law of Diminishing Marginal Productivity.

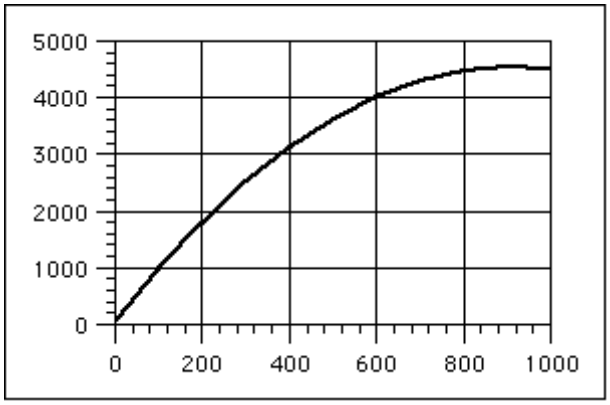

Figure 1.3

Production with Diminishing Returns

There is one rule that seems to hold for all production functions and because it always seems to hold, it is called a law. The Law of Diminishing Returns says that adding more of one input while holding other inputs constant results eventually in smaller and smaller increases in added output. To see the law in the table 1.1, one should follow a column or row. If capital is held constant at two, the marginal output of labor (which economists usually call marginal product of labor) is shown in the table 1.3. The first unit of labor increases production by 13 and as more labor is added, the increase in production gradually falls.

Marginal product is the change in output with the increase of one additional unit of input.

The Marginal Product of Labor	
Labor	**Marginal Output**
First	13
Second	7
Third	5
Fourth	5
Fifth	4

Table 1.3

The Law of Diminishing Returns does not take effect immediately in all production functions. It is possible for the first unit of labor to add only four units of output, the second to add six and the third to add seven. If a production function had this pattern, it would have increasing returns between the first and third worker. The Law of Diminishing Returns says that as one continues to add workers, eventually one will reach a point where increasing returns stop and decreasing returns set in.

The Law of Diminishing Returns is not caused because the first worker has more ability than the second worker and the second is more able than the third. By assumption, all workers are the same. It is not ability that changes but rather the environment into which workers (or any other variable input) are placed. As additional workers are added to a firm with a fixed amount of equipment, the equipment should be stretched over more and more workers. Eventually, the environment becomes less and less favorable to the additional worker. People's productivity depends not only on their skills and abilities but also on the work environment they are in.

The Law of Diminishing Returns was a central piece of economic theory in the 19th century and accounted for the economists' gloomy expectations of the future. They saw the amount of land as fixed and the number of people who could work the land as variable. If the number of people expanded, eventually adding one more person would result in very little additional food production. And if population had a tendency to expand rapidly, as economists thought it did, one would predict that (in equilibrium) there would always be some people almost starving. Though history has shown the gloomy expectations wrong, the idea had an influence on the work of Charles Darwin and traces of it still float around today among environmentalists. The second boundary that limits a firm is the demand curve for output.

Demand Curve for Output

Once a firm has produced a product, it has to sell it. The demand curve for output describes the limitations the firm faces in doing this task. The demand curve for output is a constraint on the firm because it gives the maximum price that a firm can charge for each level of production. Thus, if a firm in the figure 1.4 wants to sell 24, it can do so by charging Rs.5 or any price that is lower. It cannot charge Rs.10 and still sell 24 because buyers will not allow it.

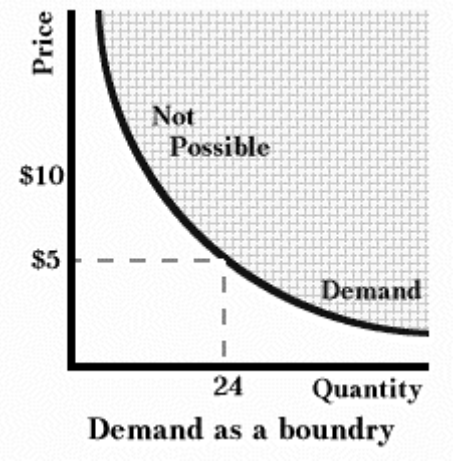

Figure 1.4

The demand curve facing a firm depends both on the preferences of consumers and on how well other firms meet those preferences. One can derive a demand curve for an individual from a set of indifference curves showing the individual's preferences and a

series of budget lines showing changes in price. To get a demand curve for the entire industry, one should add up all the demand curves of individuals. To get the demand curve for eggs, for example, one needs to add up the number of eggs that Smith, Jones and Nelson and all other consumers in the market want at each possible price.

When there is only one firm selling in a market, that firm is a monopolist. The Greek root *mono* means "one." The demand curve for the monopolist is the demand curve for the industry. A monopolist is a price searcher or a price maker. It will search along the demand curve for the price-quantity pair that is most profitable. When there is more than one seller, the demand curve that a seller sees is not the same as the demand curve for the industry. The industry demand is split up among sellers. When there are only a few sellers, the sellers will still be price searchers or price makers. These sellers or oligopolists (the Greek root *oli* means "few") are price makers because each recognizes that if it wants to sell more, it should lower its price.

However, the demand curve of each oligopolist will be more elastic than the demand curve for the industry as a whole. Suppose, for example, there are two firms in an industry, each produces 50 units of output and the elasticity of the industry demand curve is one. If one firm increases its output by 10% to 55, the industry output increases to 105 which is a 5% increase. Since the price elasticity of demand is one, price should decline by 5%. But for the original firm, a 10% increase in production and a 5% decline in price indicate a price elasticity of two, not one.

As firms get more and more numerous in an industry, the demand curve each sees gets more and more elastic. When there are many sellers in a market, a change of output by any one of them has an insignificant effect on price. To each firm, the demand curve will look perfectly flat. The firm will seem able to sell whatever amount it wants at a fixed price. In this case, each firm is a price maker and sells in a perfectly competitive market. An example of this type of market is the market for wheat. There are many wheat farmers in many countries and none has any noticeable control over the price at which it can sell in the world wheat market.

However, even when there are a great many sellers, each firm may have a downward-sloping demand curve. If buyers expend time and effort to discover prices or the characteristics of the product, they pick a seller and stay with it as long as they find the exchange satisfactory. These downward-sloping demand curves of small sellers are results of the ambiguous definitions of an industry. The products which are produced by most of the firms differ in some way, such as in quality, service or location and from the products of other firms in the industry.

From the viewpoint of a firm, it is not the demand curve but the child of the demand curve, the marginal revenue curve, which is of vital importance. Marginal revenue is the extra revenue which a seller gets when it produces and sells another unit. For the price maker, the marginal revenue curve is the demand curve. For a farmer who can sell corn at Rs.4 a bushel, the extra revenue from selling another bushel is Rs.4. The demand curve for this farmer is flat at Rs.4 and so is his marginal revenue curve.

Table 1.4 illustrates why marginal revenue will be less than price for a price searcher. If a firm charges Rs.3, it can sell one unit and total revenue will be Rs.3. If it sells one more unit, it will be forced to cut price to Rs.2 and total revenue will rise to Rs.4. Selling the extra unit adds only Re.1 to revenue. Although the second unit sold for Rs.2, the firm had to cut the price it was previously receiving for the first unit by Re.1, so the net increase in revenue was only Re.1. By similar logic, selling the third unit reduces total revenue by Re.1, so marginal revenue is Re.1.

Demand and Marginal Revenue		
Price	**Quantity**	**Marginal Revenue**
Rs.3.00	1	.
.		Rs.1.00
Rs.2.00	2	.
.		-Rs.1.00
Rs.1.00	3	.

Table 1.4

The previous analysis assumes that a firm can charge only one price. If it charges more than one price, i.e. charge higher prices to those willing and able to pay them and lower prices to others, it can move the marginal revenue curve closer to the demand curve by increasing profits or reducing losses. This pattern of pricing is called price discrimination.

The economists generally assume that a demand curve is fixed but many businesses do not regard it that way. It can vary seasonally with the general level of business activity or with a trend. The demand for turkeys has a pronounced seasonal movement. The demand for automobiles changes during recession. The demand for baby food follows the trends in birth rate.

A business may also be able to move its demand curve through advertising. Advertising may simply give people information, it may change their goals or it may change their perception of the product. For a firm, it does not matter which happens. The result is the same-- good advertising moves the demand curve to the right.

The demand curve can move for other reasons also. If a firm lowers its price and later raises it back to its previous level, it may find that sales at the old price have changed. The lower price may attract new customers who have not tried the product before and who find they like the product enough to stick with it when the old price is restored. Alternatively, some customers may expect prices to be cut again sometime in the future and may decide to postpone its purchase until it happens again. The opposite can happen if a firm temporarily raises price. It may encourage some customers to try substitutes which they may find suit them better than the original product. Or it may encourage the customers to buy more when the price comes down to prepare for any future increase.

A firm may also be able to change its demand curve by changing the characteristics of its product. Finally, many firms sell several products that may be interrelated and any pricing decision on one product will affect not only that product but others also. For example, the prices that General Motors charges for Chevrolets will affect the demand curve for Pontiacs.

The third and final boundary the firm faces is the supply curve for resources.

Supply of Resources

The third task of a firm is to obtain resources needed to produce a product. For each resource, a supply curve shows limitations that a firm faces. These supply curves are based on the preferences of sellers and on the actions of other firms which use the resource.

Because a market demand curve can be derived from utility curves and a budget line, it may seem surprising that a supply curve can also be derived from the same procedure. To see that it can, refer to figure 1.5 which shows indifference curves for income and leisure. Income is desirable because one can obtain other desirable things with it and leisure is desirable because it lets one enjoy his/her income.

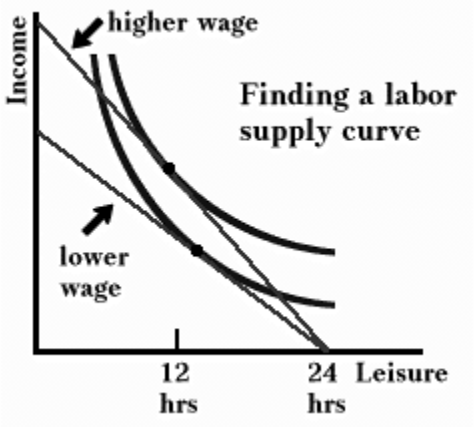

Figure 1.5

In today's world, a greater amount of income needs to be purchased with more work which means less leisure. The tradeoff between leisure and income as shown by the budget line depends on the wage rate. If the wage rate is Rs.10, options open to an individual include 24 hours of leisure and no income or 20 hours of leisure and Rs.40 of income, or 10 hours of leisure and Rs.140 of income.

To get a supply curve for labor, one should see what happens if the wage rate changes. Two wage rates are shown in the figure 1.5. At the higher wage rate, an individual wants less leisure which means he will work more as wages rise, but one could easily draw indifference curves that show the amount of leisure rising as wages rise which means he will work less as wages rise. Higher wages have two effects on the leisure-work decision

and these two effects pull in opposite directions. A higher wage rate increases the benefits of working, causing people to substitute work for leisure. This is called the substitution effect and is caused by changes in the slope of the budget line. Higher wages also increase income and people want more leisure with a higher income. This is called the income effect of a price change and is caused by changes in the distance of the budget line from the origin.

Usually the substitution and income effects reinforce each other but they pull in opposite directions and almost cancel out each other in the case of labor. Most of the economists believe that the market supply curve for labor found by adding up all the supply curves of individuals is close to a horizontal line.

Supply curves for other resources can be obtained in similar ways. The supply curve for capital, for example, depends on decisions of people to consume now or to consume in the future. People who prefer to consume in the future will save and make funds available to finance capital. Their "time preference" determines the shape of indifferent curves. The slope of the budget line depends on the interest rates. The budget line tells how much one can get in the future if one sacrifices consumption now.

Although the market supply curve for labor may be almost vertical yet a few firms see this supply curve. If many other firms are also buying labor, what one firm does may have little effect on the overall market. If a firm is so small in the market that it can see no effects at all on the wage from its hiring decisions, it is a price taker. If it has some effect on wages so that it finds that wages rise when it wants to hire more, the firm is a price maker. The extreme case of a price maker is a monopsonist, i.e. the case of only one buyer in the market. The supply curve for a resource that a monopsonist sees is the same as the market supply curve.

The supply curve for a resource is a constraint or boundary on a firm because it shows the minimum that a firm can pay for a level of the resource. If a firm is a price taker in the resource market, it will face a horizontal supply curve such as that in the figure 1.6. This curve indicates that any number can be bought at P1 with no effect on price. There is no way a firm can attain point "a" even though it might prefer to pay less than P1 because no one will sell at less than P1. Sellers will not sell because of the assumption that there were many other buyers of the resource who will pay P1. Point "c" is possible but a waste of money because the same amount of the resource could be bought for less.

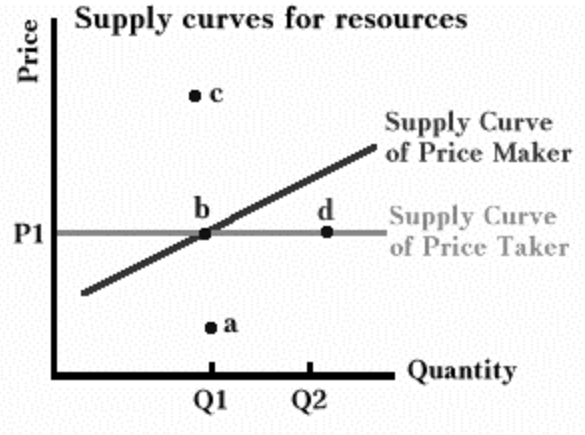

Figure 1.6

If a firm is one of a few buyers or the only buyer of a resource, it may face a supply curve with an upward slope making it a price searcher. It can obtain quantity Q1 if it pays P1 but it should pay more than P1 if it wants quantity Q2.

There are similarities between a supply curve for a resource and a demand curve for output. Both are boundaries and the curve a firm faces may differ from the market curve. The similarity goes further because there is a counterpart for marginal revenue called "marginal resource cost" which measures the extra cost to the firm for hiring one more unit of the resource.

When a firm is a price taker, marginal resource cost is the same as the price of the resource. If a firm can hire as many workers as it wants at Rs.10 per hour, hiring one more hour of labor adds Rs.10 to costs. Marginal resource cost and the supply of labor are both horizontal lines in this case.

When a firm is a price searcher facing an upward-sloping supply curve, the extra cost of hiring another unit of the resource is different from the price of the extra unit. Table 1.5 illustrates the reason for this difference. If a firm wants to buy two units, it cannot pay Re.1 and get two. It should be willing to pay Rs.2 for each. However, the added cost of the second unit is not Rs.2, but Rs.3. This can be shown by comparing the total cost of two units and one unit or Rs.4 less Re.1. The added cost of the second unit is not only the two rupees that should be paid for it but also an added rupee for the first one. By the same logic, the added cost of a third unit is Rs.5.

Computing Marginal Resource Cost		
Quantity	**Price**	**Marginal Resource Cost**
1	Rs.1.00	Rs.1.00
2	Rs.2.00	2.00 + 1.00
3	Rs.3.00	3.00+2.00

Table 1.5

The marginal resource cost curve lies above an upward-sloping supply curve because of the assumption that a firm can pay only one price. This is often a realistic assumption. If a firm hires two clerks who do exactly the same work and pays one Rs.4.00 per hour and the other Rs.6.00 per hour, the lower-paid one will be unhappy and may refuse to work for the lower pay. On the other hand, many firms do not publicly disclose their payments to various people and discourage employees from discussing salaries. To the extent that people are unaware of what others are earning, a firm may be able to pay different prices for the same resource, or in an economists' jargon, to price discriminate. Price discrimination will pull down the MRC curve in the graph closer to, or perhaps even onto, the supply curve.

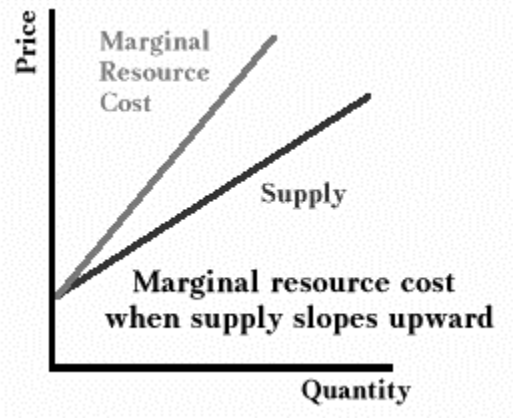

Figure 1.7

Summary

A business should deal with three constraints or boundaries which are as follows:

1. The demand curve for output
2. The production function
3. Supply curves for inputs

Table 1.6 shows how these concepts are related to the functions of the business and to the marginal concepts that are central in microeconomics.

The Constraints Facing the Firm				
Task	**Economic Concept**	**Limitation Imposed by**	**Relationship between**	**Marginal Concept**
Buying inputs	Supply of resources	Resource owners	Price (money) and amount of resource	Marginal resource cost
Producing	Production	Technology	Inputs and	Marginal

output	function		output	product
Selling output	Demand curve	Customers	Output and price (money)	Marginal revenue

Table 1.6

The importance of these three constraints can be seen in a product that no firm can produce at a profit. Any one of three changes, if large enough, can change the situation and make a profit possible. The cost of the inputs may drop in enough price to make a product profitable. Technology may also improve enough to make the product profitable. People may also increase the amount they are willing to pay for the product enough so that it is profitable. These three changes are changes in the supply-of-resources curves, the production function and the demand curve respectively.

Application

Diminishing returns plays an important part in the efficient allocation of resources. For efficiency, ofcourse, one wants to give more resources to the use in which they are more productive. But as one gives more resources to a particular use, one will observe diminishing returns whose use will become less productive. That may sound frustrating but, infact, it leads to a very important principle which one can apply to the problem of efficient allocation of resources.