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Frank H. Knight, *“Cost of Production and Price Over Long and Short Periods”* [1921]



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COST OF PRODUCTION AND PRICE OVER
LONG AND SHORT PERIODS

Great difficulties are met with in stating a clear and straightforward exposition of price theory because of the fact that the given conditions or data of the problem are so different according to the length of the time period which the explanation takes into account. The forces which immediately regulate prices are different from those which ultimately control, and there are degrees or stages in both immediateness and ultimateness. The average student of economics is likely to be quite baffled by these distinctions and to get no clear ideas at all; but he is still more baffled by differences in degree, where distinctions are not sharply drawn and statements are left in the form of "it depends." This paper looks rather to the problem of exposition from the standpoint of the student than to the correction of errors in accepted doctrine, but the course of the argument will have to note cases in which current phraseology is misleading to unwary readers if it does not represent fundamental misconceptions on the part of economists themselves.

I

The most familiar device for separating certain short-time and long-time aspects of economic problems is the fiction of the "static state," and our first critical duty is to raise serious question as to this conception in its current form. The writer doubts whether its popularisation has represented an advance in clearness of ideas or a service to the science. Passing over the technical point that there is no discoverable analogy between the meaning of static and dynamic in economics and their established meaning in mechanics, our objections are more serious. All science is static in the sense that it describes the unchanging aspects of things. There is no sense in making statements that will not continue to be true after they are made. The possibility of saying anything about a thing rests on the assumption that it preserves its identity,

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A pioneering article on the cost of production which was published in one of the leading professional economics journals in the early 20th century.

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Cost Of Production And Price Over Long And Short Periods *JPE*, 1921

Great difficulties are met with in stating a clear and straightforward exposition of price theory because of the fact that the given conditions or data of the problem are so different according to the length of the time period which the explanation takes into account. The forces which immediately regulate prices are different from those which ultimately control, and there are degrees or stages in both immediateness and ultimateness. The average student of economics is likely to be quite baffled by these distinctions and to get no clear ideas at all; but he is still more baffled by differences in degree, where distinctions are not sharply drawn and statements are left in the form of "it depends." This paper looks to the problem of exposition from the standpoint of the student rather than to the correction of errors in accepted doctrine, but the course of the argument will have to note cases in which current phraseology is misleading to unwary readers if it does not represent fundamental misconceptions on the part of economists themselves.

I

The most familiar device for separating certain short-time and long-time aspects of economic problems is the fiction of the "static state," and our first critical duty is to raise serious question as to this conception in its current form. The writer doubts whether its popularization has represented an advance in clearness of ideas or a service to the science. Passing over the technical point that there is no discoverable analogy between the meaning of static and dynamic in economics and their established meaning in mechanics, our objections are more serious. All science is static in the sense that it describes the unchanging aspects of things. There is no sense in making statements that will not continue to be true after they are made. The possibility of saying anything about a thing rests on the assumption that it preserves its identity, or continues to be the same thing in the respect described, that it will behave in future situations as it has in past. The essential fact in economics is that different changes take place at different rates, that for certain time periods certain aspects of the situation may be assumed to remain unchanged, while for longer periods some of these will undergo change. The data or given conditions are different when different periods of time are under consideration.

It may not, however, be true, and generally is not, that the different changes can be completely separated in this way. The effects of long-period changes are not generally in fact practically negligible over the shorter periods. But scientific treatment, in view of the mere limitations of the human mind and the necessity of considering one thing at a time, is forced to treat the separation as absolute. We must ascertain the separate effects of the different causes and combine them after we understand them. This would have to be done just the same if the causes did not generally operate in different periods of time, but the latter fact greatly simplifies our thinking. It is more realistic and intelligible to isolate a short-period effect, abstract entirely from

perturbations due to the operation of more slowly working forces because for short periods the effects of the latter are in reality relatively less important. There are thus, in fact, as many "static states" as there are economic problems worth studying. All that is really involved in the static method is the use of analysis, the assumption in studying the effects of any one cause that the operation of other causes does not interfere.

Another serious confusion in connection with static hypotheses relates to the conception of equilibrium. It is true practically if not altogether without exception that the changes studied by any science tend to equilibrate or neutralize the forces which bring them about, and finally to come to rest. The simplest example perhaps is that "water seeks its level"; the movement is always the effect of a difference in level and its result is to obliterate that difference and come to a stop. In the same way the wind is caused by a difference in air pressure, the transfer of radiant energy is due to a difference in temperature, of electricity to a difference in electrical potential, and so forth, the change or movement in every case being of a character to equilibrate the forces which cause the movement.

In consequence of this fact it is a practical necessity to describe the action of any force by stating the *final* condition which it tends to bring about, the conditions under which it would cease to work. Any other description is partial and arbitrarily so. The only complete or logical procedure is to state the ultimate goal of the tendency in question. Such a statement or description does not imply at all that this final condition is likely to come about. When we say that the movement of water or air is of such a character as to obliterate the stresses which produce the movement we do not mean that these movements are likely soon to cease on the earth, just as we define north as toward the North Pole without implying that everything moving northward is bound for that goal. The final effect of even a short-period change may be an indefinite distance in the future, involving the practical certainty that in the meantime the original cause will change in character or cease to operate or be interfered with by innumerable other causes; it may be never so improbable that the final result will ever be reached, yet the proper and only proper way to describe the situation at the moment is to state a "tendency" toward this theoretical final result.

The static method therefore involves two fundamental but badly confused ideas. The first is simply that in describing any change it is assumed that "other things are equal." The second is that changes are described by stating the condition of affairs to which they would lead if they continued without interference until they equilibrated the forces at work and came to a natural end. These principles are the same in economics as in mechanics or any other science which attempts to predict effects from the knowledge of causes. Goods move in response to price differences from points of low to points of higher price, the movement tending to obliterate the price difference and come to rest. Productive services are shifted from one field of use to another in response to differences in remuneration and the transfer tends to bring the remuneration to equality in all fields—produce equilibrium.

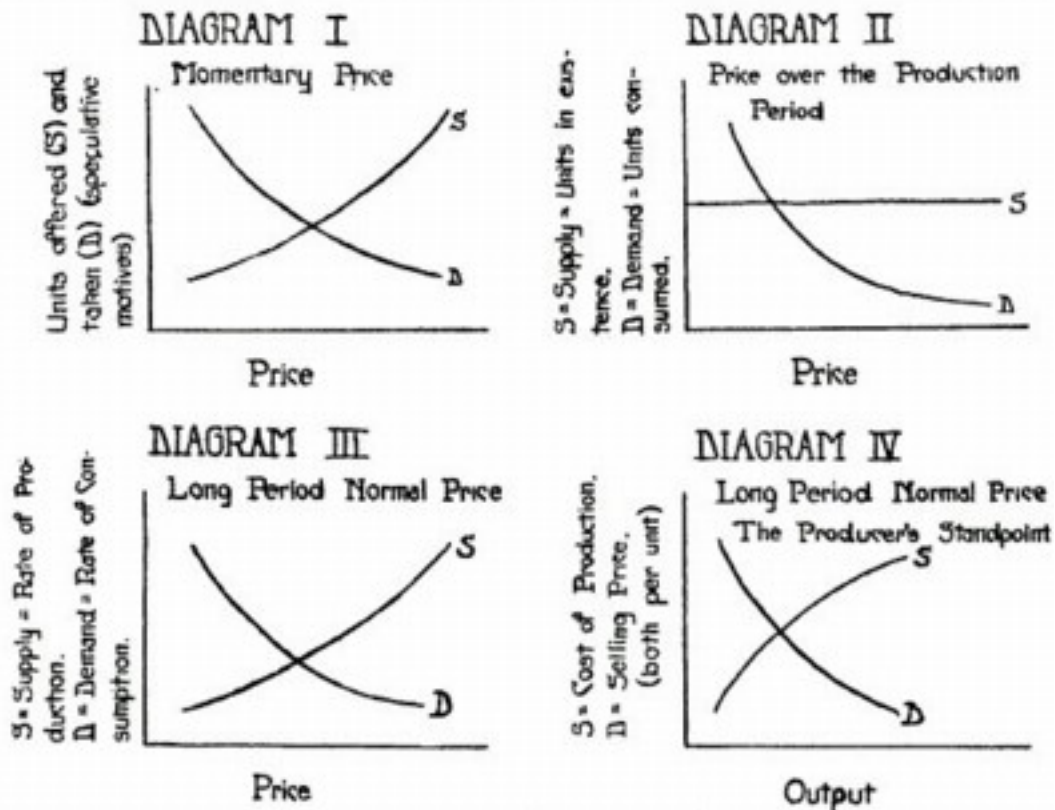
After a considerable amount of experimentation the writer has tentatively settled, for instruction purposes, upon a division of the problem of explaining prices into four, or

possibly five, stages, relative to the time length of the changes to be discussed.¹ In all these stages or "cases" the general principle is that price is adjusted to the point at which supply and demand are equal. They differ in that supply and demand have different meanings, especially the supply. The first stage in the explanation is to state the character and condition of equilibrium of the forces operative at a given instant of time. Here the motives of both sellers and buyers are based on speculative considerations, the former entirely and the latter almost so. Supply and demand are both functions of price, meaning that the amounts that sellers will offer and the amounts that buyers will take depend upon the price. In general, sellers will offer more and buyers take less, the higher the price. The reason is that the higher the price the less is the likelihood that it will go higher and the greater the likelihood that it will go lower in the immediate future. In the primary markets, where prices are determined, this is the only consideration in the mind of sellers, and the buying is almost entirely speculative. For the moment, the demand for goods for *immediate* consumption is practically negligible, and purchases are determined by opinions as to the probable course of prices in the near future.²

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II

The second stage of the explanation deals with the production period for the good. From this point of view the supply is fixed and is on the market without reserve. The data are not sharply definable, but in general there is a fairly definite period within which supply is fixed. The situation is clear enough in the case of an agricultural product such as corn or wheat. Taking the season as a whole there is no possibility of a change in the supply between the time when final commitments are made for one season's crop and the time when the next crop becomes available. The growers may indeed market less of the crop, using more themselves, if the price is low, but if so³ the fact is exactly like increased consumption by non-producers under the same circumstances. If the demand of the producers themselves is taken into account at all it should be regarded as demand and added in with the demand of non-producers, and not treated as a deduction from supply. In this case the suggestion made by Davenport⁴ seems to be by far the most realistic manner of viewing the situation. The demand from the standpoint of the production period as a whole is the consumer's demand and is a decreasing function of price, represented by the same sort of curve as in the former case. The supply curve (again taking price as the independent variable) is a horizontal straight line (see Diagram II). The theoretical price is the marginal demand price of the existing supply, the highest price at which it will all be consumed within the period before new supply becomes available.



Even in the case of wheat some qualification of this formulation is necessary. Some wheat is carried over from one production period to another and variations in this amount with anticipated changes in conditions in the next period may be appreciable. And the facts are somewhat complicated from the standpoint of any one country by the fact that the market is international. But from the standpoint of the world market as a whole the description is a fair approximation to the facts.

With respect to manufactured goods more serious reservations must be made. The production period is less definite and the amount of carrying over from one production period to another is much more important. For extreme price changes the supply, meaning the amount produced, is more flexible over short periods of time and anticipated changes in the conditions of production make themselves felt more quickly by affecting the rate at which existing stocks are thrown on the market. If prices promise to be higher, middlemen hold back supply, raising prices before the new conditions actually become effective, and if they promise to be lower, stocks are reduced below the normal levels, reducing prices.

These two cases, the situation at a moment and over that more or less definite production period within which supply is not subject to change, are thrown together in the conventional treatment of market price. It seems to the writer absolutely necessary for clearness to separate them. In neither, it is obvious, do conditions of production affect price. For a given supply once produced, the price which competition tends to establish is determined by demand alone. The costs of production are ancient history. The producer will get as much as he can, whether it is more or less than his costs. The *tendency* is to establish over the production period the highest uniform price at which the supply will be consumed and momentary price fluctuates around this level in response to the speculative estimates of traders.

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III

Over longer periods of time supply and demand take on still different interpretations, especially important in the case of the supply. The supply now means the amount produced, viewed as a continuous average rate, and becomes a variable, controlled by producers' calculations. From this point of view price tends toward the point where the rate of production and the rate of consumption are equal, both being functions of price. It is axiomatic that goods cannot permanently be consumed more rapidly than they are produced and will not be produced more rapidly than they are consumed.⁵ For short periods of time this equality does not necessarily hold, for the reason that accumulated stocks serve as a sort of buffer between production and consumption. Consumption may exceed production for a considerable time, drawing down accumulations, and production may exceed consumption by building them up; but it is evident that neither difference can exist permanently or for very long.

The form of the functional relation between rate of production and price is the most complicated problem in price theory and to this problem the remainder of the discussion will be devoted. But one more distinction must be drawn by way of defining the data or given conditions of the problem. A change in the production of any given commodity may be associated with a change in the total productive power of the society as a whole or it may be related to a shift or transfer of productive power from one use to another. In general, again, it is a matter of the time interval taken into account. Over relatively short periods of a few years or a small multiple of the production period for the commodity, referred to under Case II, changes will generally represent transfers of productive resources and will be correlated with opposite changes in the production of some other good or goods. For such periods of a few years the total productive power of society does not greatly change. It is therefore as natural as it is necessary to separate the consideration of effects of changes in total productive power from those of transfers from one field to another.

The effects of these long-period changes in the total situation will not be taken up in the present discussion at all. We assume that the fundamental conditions of economic life in the aggregate, on both the supply and demand sides of the relation, remain unchanged. These fundamental conditions include (a) the total supplies of productive resources ("land, labor, and capital"); (b) the "state of the arts" or the knowledge of productive methods and processes; and (c) the "psychology," tastes and habits of the people. Significant changes in these things are generally progressive in character, in contrast to the readjustments to accidental fluctuations which make up the changes considered under the three cases already enumerated, and may be grouped under the heading of *Social Progress*. A social setting in which all such progressive changes are abstracted but in which unlimited time is assumed for all adjustments to the given conditions in these fundamental respects to work themselves out to their natural equilibrium results, is approximately what is meant by the "static state" or Marshall's conditions for the establishment of long-time normal price.⁶

We turn now to the crucial problem of the relation between the supply of a commodity and its price (meaning by supply the rate of production of the commodity) or in other words the problem of the form of the long-time supply curve. If supply is some function of price the meaning of the price point as the condition of equality between production and consumption is clear. Diagram III is drawn on the superficially natural assumption that an increase in price, other things being equal, will increase the production of the good, that supply is a direct function of price. Demand (rate of consumption) is of course an inverse function, as in the other cases.

The production of the commodity depends on the action of producers who are governed by profit-seeking motives and it is in this connection that cost of production exerts its effect on price. It goes without argument that cost affects price only as it affects supply, that any given supply put on the market will sell at a price determined by the demand, irrespective of its cost. The general character of the reasoning is simple. If the price is above the cost of production (including a profit representing payment at the general market rate for the entrepreneur's own services), production will be stimulated and the increased supply will bring down the price. If price is below cost, production will be decreased and the price raised.

From this point of view it is obvious that the costs which influence supply and price are the money outlays necessary to production. Ultimately these are the payments for the use of productive resources. We shall neglect the effects of taxation. We have no concern with the pains or subjective sacrifices involved in production, since it is not at all in terms of such "costs" that the entrepreneur makes his calculations on the basis of which he decides whether to produce the good or on what scale. He takes account of sentimental costs only in so far as they influence the outlays he must make to secure the services necessary to production. That is, he is concerned only with the price measure of his costs. Their magnitude in some other aspect will not influence his decision. Pains and sentimental repugnances are undoubtedly influences in limiting the supply of some sorts of services and raising their price, but in the aggregate they form a relatively unimportant element, and no one now contends that there is any tendency for the prices of productive services, still less of final goods, to bear any correspondence with these magnitudes. The relation between them is a separate inquiry, pertinent perhaps to an evaluation or criticism of the competitive economic order, hardly so to an explanation of its workings.

It would seem also to be almost too obvious for argument that in those costs which influence the entrepreneur's decisions and affect the supply and the price of a commodity, rent payments take their place among and in all respects on a parity with the outlays for other necessary productive services. They condition production. The entrepreneur must make these payments for the same reason that he must pay, say, wages; he must meet the offers of competing bidders for the use of the productive capacity represented. Even when all of these competing bidders are other producers of the same commodity the service being useless in any other industry,⁷ the payments are socially necessary as a means of effecting the distribution of the land among the different users and its rational combination with other agencies.⁸

Closely connected with the confusion involved in the interpretation of cost in subjective terms and the exclusion of rent is the notion of marginal cost, and the whole idea that one unit or portion of a supply costs or may cost more or less than another, under the conditions assumed for long-time normality. This point will be developed as we proceed,⁹ but since other confusions are also involved in the error, it should be mentioned here.

For the present let us first be clear as to what the assumptions or given conditions of our problem are. Progressive changes are eliminated, but *unlimited* time is assumed for the making of productive adjustments. That is, we are describing the tendencies operative in the relation of production to demand in terms of their *final* results in the absence of interference, as insisted upon at the beginning of the paper. Later on will be taken up the question of the advisability of a separate formulation of their effects when they operate for more limited periods (Marshall's short-time normals).

Under these conditions the supply curve is identical with a cost-of-production curve. The supply is a function of price because the cost of production per unit is a function of the supply, the amount produced. It follows at once from the relation between cost of production and price (see above, p. 313) that the amount which will be produced at any selling price (per unit) is the amount which can be produced at that cost per unit. That is, the same curve which shows output as a function of price shows cost as a function of output. In order to discuss the relations from the producer's point of view it is therefore advisable to reverse the axes of the diagram, treating supply as the independent variable and cost and selling price as functions of supply. This gives the same curves as before, but as seen in a mirror or looking through the paper from the back. (It is also evident that the demand curve may be regarded indifferently as showing selling price as a function of supply or the amount salable as a function of price, that these are two ways of looking at the same set of facts.) On the new diagram (IV), which represents a mirror image of Diagram III, the intersection of the curves shows in the more natural graphic way the equality between cost and selling price, which is the goal of producers' adjustments, though on either diagram, according to the direction in which it is read, it shows either equality of cost and selling price or equality of production and consumption.

Looking at the supply curve from this new point of view, it is evident that decreasing costs would mean that at higher prices less of the commodity would be produced than at lower prices. This certainly seems paradoxical and suggests that there is something wrong with the notion of costs decreasing as supply increases. The further course of the argument will show that decreasing cost as a long-run tendency is indeed impossible under a natural competitive adjustment of industry. Under the conditions assumed, an increase in the production of any commodity means a transfer of productive resources into the industry and a decrease in the production of some other commodity. But, other things being equal, this decrease in the production of other goods will raise their prices and increase the strength of the competing attraction which they exert on productive resources against the industry in question in which output is being increased. In simpler terms, an increase in the output of any industry involves increased demand for the productive goods used in it, which increased

demand raises their prices, that is, raises the costs of production of the commodity turned out.

The implications of perfect competitive adjustment may now be briefly summarized and decreasing costs shown to be incompatible with the long-run tendencies of productive adjustments. In the first place, a perfect market for productive services is implied, that is, uniform prices over the whole field. The costs cannot be different to different producers or for different parts of the supply of any one producer, on this account. In the long run the same productive goods will cost the same prices and all differences of every sort in productive situations will be evaluated at their true worth under the influence of competition and be converted into costs which function in the same way as all other costs in the producer's calculations. Most of the apparent differences in production costs are undoubtedly due to imperfect evaluation of cost goods, and the *tendency*, however slowly it may work itself out, is manifestly toward a correct, uniform evaluation. Every productive good tends toward that position in the total productive system in which it has the greatest possible value, and tends to be priced at the value which it has in that position.

In the second place, the conditions of perfect competition include the production of every commodity by an indefinitely large number of competing organizations, *each of the most efficient size*. The confusion between variation in the scale of operations of the single productive establishment with variation in the output in the industry as a whole is perhaps the most prolific source of error in this whole field of reasoning. Under perfect competition, neither increasing costs nor decreasing costs in the individual establishment affect output or price. All establishments will be forced to the most efficient size, and variation in the output in the industry means a change in the number of establishments, without change in their scale of operations individually. This does not mean that all must be of the *same* size, but that each, in the conditions in which it works, must be of the most efficient size and that the *efficiency* of all must be the same. This again is not the actual character of the competitive situation at any given time, but is its actual *tendency*, and it is the long-run tendencies which must first be grasped as a basis for discussion of conditions under which they are but partially realized.

The specification of a plurality of establishments each of the most efficient size eliminates at once both the possibility of decreasing costs due to increased efficiency under larger output and also the entire notion of marginal costs, referred to above (p. 314 [See footnote 9—Econlib Ed.]). If increased economies are available through larger-scale operations, then larger-scale operations will be introduced under competition, through an increase in the size of the establishment with a *reduction in the number* of establishments and *without an increase in the output of the industry as a whole*. The tendency to an increase in size and reduction in the number of establishments will go on, independently of change of output in the industry, until either all establishments reach a size of greatest and equal efficiency (not necessarily equal size) or else until there is only one establishment left in the industry. Competitive production is possible as a final adjustment only if the technological conditions and the demand for the product are such that a large number of

organizations are left in the industry when all are at the size of greatest efficiency. Otherwise the tendency is toward the establishment of monopoly.

In the same way the notion of marginal cost is meaningless in relation to any final adjustment. Competitive price can never be determined in the long run by an equation of the cost of the final unit of the supply to the selling price, leaving a profit on earlier units. The final unit cannot be more costly than any other unit in the ultimate competitive situation; for (a) costs must in the long run be the same to all producers, as shown, and (b) there cannot be increasing costs in the individual establishment because that would mean that smaller establishments are more efficient than larger, and if so they will put the latter out of business or force their reduction to the most efficient size.

The same reasoning applies to different productive methods. In the long run all producers are forced to use the most efficient methods or give place to others who do. The long-run tendency is toward a price determined by the cost of production under the best possible conditions, not the worst, as so commonly stated, nor those of the average or representative establishment.

The final consideration and in some respects the most difficult of all is the relation between output and the capacity of fixed or specialized equipment in the industry. A considerable fraction of the productive equipment in an economic society can be transferred freely from one industry to another and another fraction can be transformed by being replaced by a different kind instead of the same kind when it wears out, but of another large part neither assertion is true.¹⁰ From our long-run point of view the two former are equivalent; both amount to effective fluidity or mobility. But even ultimately it is not admissible to assume perfect mobility for all types of productive goods. Even if the tendency is finally toward some degree of mobility for productive goods generally, the time involved would be so very long that it is pertinent to grant the point and raise in the present connection the question as to the effect upon the cost function of assumed permanent specialization of cost goods.¹¹

It is commonly and naturally assumed that if there is fixed equipment in an industry, not transferable to other uses, payment for its use represents a fixed cost and that a reduction in the output of the industry will be accompanied by an increase in the cost per unit. But if the entrepreneur's, that is, the realistic, point of view is rigidly retained, it will be seen that this is not true. The entrepreneur's costs are the *payments for* the services of the cost goods, and if the demand for a product decreases, the rigidly specialized productive services used in making it will be *revalued* at lower levels and these costs also will decrease. In the long run, of course, such considerations as the fact that entrepreneurs may have contracted for these goods for a considerable period of time at fixed rates fall away.

What is true is rather that payments for permanently and rigidly specialized productive agencies do not exert a *causal* effect on the price of the good in whose creation they are employed. There is no exception to the principle that an increase in output represents an increase in cost per unit and conversely. Moreover it is difficult

to give any definite practical meaning to questions of the causal relation between cost and price; such questions are metaphysical, having little bearing on problems of policy. The practically pertinent facts are summed up in the statement that under all conditions (a) every productive resource *tends* to be employed in that way and place in which it will make the greatest possible contribution to the output of consumption goods as measured by pecuniary demand, and (b) that it (that is, its "owner") *tends* to be paid for its use the value of the contribution which it makes. The statement that the cost of production and the price of any good are equal really signifies simply that productive resources are divided between the production of that good and the production of other goods for which they might be used in such a way that none of the resources can produce more value by being transferred either way. If cost is above price, some productive services are being used for the good in question which are worth more somewhere else, and if cost is below price, some productive services are being used for other goods which would be worth more to produce the good in question. To avoid false inferences commonly drawn it should again be emphasized that there is no necessary connection between pecuniary demand and real worth and hence this reasoning in no wise vindicates the competitive system, and would not do so even if its tendencies came to literal realization. Our present concern is merely the question of accuracy in describing its workings, in terms of their final, long-run tendencies, which should be done correctly before critical judgment is passed. Under the conditions necessary to competitive production, and looking to the final results of competitive tendencies, the cost of production is without exception a direct or increasing function of output.

A more or less important qualification relates to the *extent* to which cost necessarily increases with output. For commodities which do not represent an appreciable fraction of the demand for any productive resource which goes into them, the change in cost corresponding to probable changes in output may indeed be practically negligible. The function may represent virtually constant cost. For example, the case of steel rails may be contrasted with that of carpet tacks. A considerable change in the demand for steel rails means a considerable change in the demand for the ultimate resources used in producing them, and will make a marked difference in the prices of these resources, that is, in the cost of production. No probable change in the demand for carpet tacks would make an appreciable change in the demand for any ultimate productive resource and hence within the limits of accuracy of economic measurement the long-run tendency is represented by constant cost. The supply curve of Diagram IV is for such goods a horizontal straight line, in Diagram III a vertical one. But constant cost is the "limiting case" which in strict accuracy is never met with. There is no place for a tendency to decreasing costs, when the conditions are correctly stated.

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IV

All of this reasoning relates to the ultimate goal of the competitive tendencies, with unlimited time allowed for the adjustment of production to given conditions of demand (but with long-period progressive changes in the general conditions of both supply and demand eliminated). The next question is that of the relation between cost of production and price, the shape of the curve showing cost as a function of output and hence output as a function of price, over moderate periods of time. Two main sets of facts differentiate the short-period from the long-period tendencies. The first is the *physical immobility* of productive resources between different uses and the second is the comparative inflexibility of the prices of productive services, in terms of which the producer makes his calculations. When the price of a product changes, owing to a change in demand, the entrepreneur cannot commonly change his price offers for productive goods immediately into correspondence with them. For many of these he is under contract over a longer or shorter period at specified rates. For others, notably labor services, psychological and social considerations prevent quick and accurate readjustments, not to mention that the entrepreneur himself does not come instantly and automatically into accurate knowledge of the facts. And when the price remunerations for "land, labor, and capital" do change relatively in different industries, transfers of these agencies from one industry to the other do not always follow quickly or freely. Even those agencies which are transferable without physical modification encounter a large amount of inertia and resistance. Others cannot be transferred without changes involving costs and still others are only indirectly movable; they must be allowed to wear out and be replaced with others of a different type. That is, the *ultimate* resources are largely mobile, but they are embodied in intermediate forms which are not; and finally, to some extent the ultimate resources are specialized and the only change to which they are subject is a revaluation.

In consequence of these facts of immobility the adjustment to changing conditions of demand is generally far from complete. And especially when it can be foreseen that the new condition of demand will probably be short-lived in comparison with the time required for perfect adjustment to it, the tendency to make these adjustments is enfeebled and for those adjustments which require an especially long time to carry out the tendency may be entirely abrogated.

To fit the theory more accurately to the facts of life the doctrine of short-time normal price has been formulated, notably by Marshall. The idea is that over short periods supply is a different function of price, cost a different function of output, from what is true of the ultimate adjustment. Marshall separates the two cases by saying that for short periods of a few months or a year supply means the amount which can be produced for the price in question with the existing stock of plant, personal and impersonal, in the given time, while for long periods, of several years, it means the amount which can be produced by plant which itself can be remuneratively produced and applied within the given time. [12](#)

We question the validity of a separate formulation of short-period tendencies along the line adopted by Marshall or the recognition of a special "case" along any lines. It seems rather that the facts are sufficiently covered by recognizing that in a limited period only a corresponding part of the readjustment described as the final goal will be brought about. We argue that there is no division between short-period and long-period changes; that they are of the same character and differ only in the degree of completeness and that this variation in degree of completeness is smooth and gradual, without break or sudden change of character as the time interval considered is longer from zero up to indefinitely long periods.

Marshall's distinction between variation in output from the equipment, personal and impersonal, already in an industry and a variation due to a change in the amount of equipment itself, seems to involve confusion and difficulty if not definite error. It may be doubted whether a variation in the output from given equipment in response to variation in price is to be regarded as probable on a significant scale. To some extent the productive life of machinery in terms of total output may be greater at lower speeds (enough greater to offset the interest charge connected with stretching the yield out over a longer time) and if so machinery could be economically operated at higher speed as the price of the product increased. But it is improbable that this factor would be important, and the discussion quickly narrows down to the human element in the equipment. The argument assumes that at higher product prices, higher wages will be paid and that at higher wages, the same labor force will work the material equipment more intensively and turn out a greater output, through speeding up or overtime work.

Examination of this reasoning raises serious doubts. Everything depends on the assumptions as to the psychology of the workers. Suppose to begin with that the working day and speed are normal. It is pretty well demonstrated that what industry considers a normal¹³ working day is too long and normal speed probably too high for maximum efficiency over even moderate periods of time. Labor cannot produce more than normal output except for a temporary spurt. Moreover, if the inducement is a simple increase in piece wages, it is at least as likely that workers will choose to work less hard as that they will choose to work harder, and if they behave like the rational economic man they will be more likely to choose the former. They will take *part* of their increased income in the form of leisure time, earning more money but doing less work as the rate of pay rises. We are therefore thrown back upon special forms of wage payment such as bonuses for extra production, higher rates for overtime, and the like. It is undeniable that such expedients may stimulate production to some extent for a short time, but accumulating observation, notably the experience of the recent war [World War II], shortens the time to very narrow limits, and emphasizes the stupendous cost of the temporary increase through reduced efficiency later on.

Moreover, it is quite clear that in fact the temporary increase in output going with high prices does not come altogether from the equipment, material and human, already in the industry. When prices rise the less specialized forms of labor and tools are taken on and when prices fall they are laid off; the longer the time available, and the greater the price change, the more highly specialized is the equipment, material and human, which will be involved in this change, varying continuously and smoothly in both directions and without limit.

When the fluctuation is below the normal (usual) working adjustment in the industry, the case is somewhat different. Here the dominating fact is that the entrepreneur usually bargains for his fixed equipment, or the capital which it represents, on long-term contracts and has to pay for its use whether it works or not. Under these conditions it is indeed true that the industry will be subject to decreasing costs. If the entrepreneur owns the equipment himself or hires it on terms of its momentary value to him, the long-run principle applies with the modification that *with reference to time periods for which* any particular equipment is specialized, its remuneration is not a price-determining factor, and this element in cost will be reduced by revaluation of the service in question. In regard to labor, the more expert and specialized branches are in much the same position as fixed equipment. The entrepreneur cannot generally afford to lay off such men and their wages are in large part a fixed cost with reference to short-period changes. With unskilled labor the tendency is to keep piece wages fairly constant for actual employment but reduce the number employed or the hours of work or both. It is by no means a negligible element in the actual calculation that both these facts mean increased labor efficiency at lower outputs, since in general the men laid off are the less capable, and the psychological influence of a depression in the industry works in the same direction in other ways.

The facts as to the relation between output and price are represented roughly in Diagram V. The point *b* corresponds to a normal adjustment in which price and cost are equal, which is assumed as a starting-point. For increases in price the output may be assumed to increase in greater degree as the time for readjustment is longer, little or not at all for very short periods as shown by curve 1 and more steeply without limit as the time increases (curves 2, 3, 4, and 5).¹⁴ For decreases in demand the same curves would be continued to the left as shown, again becoming steeper with increase in the time interval taken into view. It may aid in visualizing the situation to imagine that the curves to the right of the intersection (*b*) represent output of some commodity, demand for which is greatly increased by the outbreak of a war, while the portion to the left of the intersection represents the facts for some luxury good, for which the demand is largely cut off; the different curves showing production according to different anticipated durations of the war. (It is to be assumed that the productive readjustments are effectuated by price motives alone.) With reference to a new commodity not previously produced the curves will start from a zero point on the price axis as shown in Diagram VI. The dotted curves in Diagram VI relate to the possibility of producing the commodity on an entirely different scale by an entirely different, more highly organized, and more efficient process; this possibility will be discussed presently (p. 332). By this large-scale process small amounts of the good would not be produced or if they were the price would have to be very high; beyond a minimum point the rate of production will be an increasing function of both the price and the time allowed, as in the previous case.

DIAGRAM V

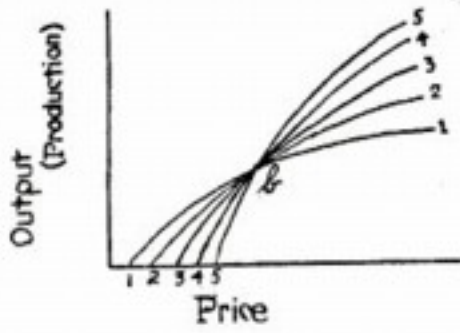


DIAGRAM VI

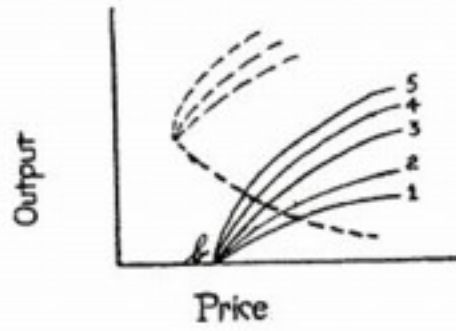


DIAGRAM VII

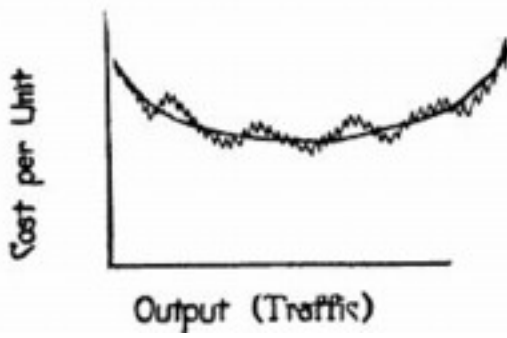
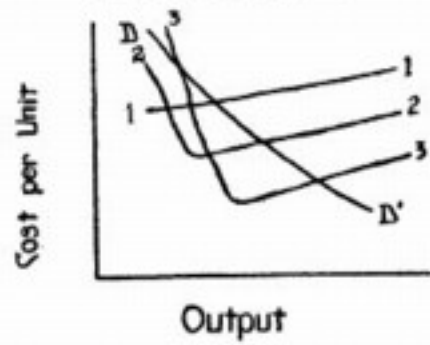


DIAGRAM VIII



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V

The foregoing abstract formulation of principles may be brought down to earth, made concrete and connected up with practical social policy by a brief discussion of what is in a sense the stock example of decreasing costs, the railway industry. The effects of so-called fixed charges or burden and the resulting decrease in cost per unit as output (traffic handled) increases are as conspicuous and as familiar here as in any field. The decrease in cost is a concomitant of *surplus capacity* in important elements of the equipment.¹⁵ The crucial question is, *why* do certain elements of the equipment contain surplus capacity? The answer, in the case of American railways, is obvious. The roads were built in the first place long in advance of the economic development justifying the investment, in order to pre-empt the locations and to speculate upon the unreflecting optimism of a frontier community, where every junction point habitually looks upon itself as a budding metropolis. And being built, they were (more or less wisely) laid out upon large lines, with a view to future expansion in the traffic. It requires no explanation that such an establishment, *while it is working up to the capacity for which it is designed*, will show large fixed charges and diminishing costs. It is just as obvious that this is a temporary condition.

The present confusion in the railway field in this country is in no small degree a product of the fact that for more than a generation the roads and the public were habituated to thinking of the industry as one of decreasing costs. The roads were encouraged by publicists and writers on railway affairs to make rates that would enable the traffic to move, oblivious even of the fact that the traffic increases were largely at the expense of other lines operating under the same conditions. The result is our impossible system of rate-basing and traffic classification. In the early years of the present century, the country grew up to its railway system; since then the equipment has been behind rather than in advance of the needs and railway finance has been floundering in bewilderment trying to find itself in relation to a situation in which increased business is no longer an advantage.¹⁶

The actual shape of the curve showing cost as a function of output (traffic) is intended to be suggested by Diagram VII.¹⁷ Beginning at an exceedingly high cost for the first small increments of business—so high that a railway would not of course be built for them alone—the cost descends for a time, rapidly on the whole but very irregularly. There is an upward "kink" in it not only for every new car, train, track, etc., but for every freight-handler, freight shed, bookkeeper, etc., necessitated by the expanding traffic. For a time the drops in the curve are much larger than the rises and the trend is sharply downward. A ten-car train is more efficient than a one-car train, and a double-track road, than a single track. But soon this tendency slackens, and still later it is reversed. The writer is not a railway expert, but is told that beyond somewhere around three or four tracks the efficiency falls instead of rising, and surely it need not be argued that a road of twenty tracks would be quite unmanageable.

The foregoing assumes a *rapid* expansion. If the growth is slow and related to conditions accurately known far enough in advance, the curve will be smoothed out to

the trend line, as shown. Cars can be built a little larger instead of adding standard cars one at a time. Even a man, the most indivisible productive unit, can generally be employed for part of his time only in any one occupation, or "smaller" men can be replaced by "larger" ones. Even the capacity of the given number of tracks can be increased by varying the amount of auxiliary equipment, and additional tracks may be added gradually, beginning with the busiest sectors.

Diminishing costs are generally real in the very early stages of the expansion of the demand. There are minimum limits to the divisibility of important elements in cost. If a pipe is to be laid, a ditch must be dug wide enough for a man to work in, and the right-of-way for two railway tracks will not cost nearly twice as much as for one. Such gains, however, decrease very rapidly with expanding size, and though many of them will never fall to zero, they are quickly offset by just as inevitable losses which increase from the first, the varied and multiplying costs of maintaining internal stability as size increases. No fallacy is more pernicious with reference to intelligent economic policy than the popular illusion that large-scale business is in general more economical than small-scale. If the scale of operations expands very far, it will always run into increasing costs; and as the facts stand the gains are more conspicuous than the losses so that even careful study inevitably overestimates the advantages and underestimates the critical size at which increasing costs set in.

But it may naturally be objected that if decreasing costs are significant up to the capacity of two tracks and real, even if small up to three or four, the operation of the greater part of the railway mileage of the United States would still in fact be subject to decreasing costs. This is doubtless true, in an accurate adjustment; and it may also be true to some extent that in a rapidly growing society it is wise at certain stages to overbuild the fixed equipment of public utilities in relation to current needs. It may even be true that a certain amount of price classification may be theoretically justifiable. But all consideration of the merits of the case serves to emphasize the very limited extent to which any of these conclusions hold and the importance of the practical considerations on the other side. The outstanding fact is that most if not nearly all the actual consequences of these policies are bad. Price differentiation either gets business at the expense of competing equipment operating under the same conditions or develops traffic which ought not to move, artificially distorting the natural lines of social growth, while the monopoly rate on the traffic which will "bear" it encourages socially unwise investment in the industry which makes the charge.

Getting business away from competing establishments similarly subject to decreasing costs raises again the question earlier discussed of the tendency of competition to force all the establishments to adopt the most efficient size. If a four-track railway is most economical, how can lines on a smaller scale continue to exist? The answer obviously is that only a part of the service rendered by a railway (the through traffic) is subject to competition, while a large part (local traffic) is a natural monopoly. The social problem as to how far the possibility of securing monopoly prices for local service ought to be allowed to influence railway-building is a vast and intricate problem which cannot here be gone into in detail. While the effect of free competition in railway-building and rate-making would be to concentrate economic development

to some extent along favored transportation routes, the effect of forbidding new lines to compete with established ones at rates which would cut their traffic below the point of maximum efficiency would be to concentrate it much more. The policy of permitting free railway-building (and still more that of fostering competition), if consistently followed out, tends to diffuse population and industry over a wider area, reducing the natural advantage of proximity to superior transportation routes. As noted above, the writer would favor the policy of restraining competition. Then if "society" wants to encourage artificially the development of the newer regions or subsidize the movement of any particular class of freight,¹⁸ it should be done directly and consciously, out of taxation levied so far as possible according to the benefit conferred. But again, in practical politics, it is doubtless rash to suggest that society should do anything consciously and deliberately where it is possible to "muddle through."

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VI

The foregoing discussion is all relative to an *expanding* demand. In our rapidly growing society contractions in demand are a relatively short-period phenomenon. When from any temporary cause an industry is working below the *correct* capacity of the fixed equipment, there is a tendency toward decreasing costs with their concomitant of cutthroat competition. Here the fixed costs represent either contractual remunerations not subject to quick readjustment or the physical immobility of the intermediate forms in which ultimately mobile ultimate resources are temporarily embodied. The amount of such physical immobility depends upon the suddenness and extent of the change. At one extreme a large part of both the material and human productive resources of society would be included. At the other, practically nothing. It is the writer's belief that if we abstract from the disturbances due to progressive change in demand and in productive methods and from those affecting business as a whole (the "business cycle") the assumption of perfect mobility corresponds closely with the facts for all changes not so short in duration as to iron out through the mere tendency of business calculations to base themselves on average conditions. [19](#)

This high degree of mobility is to be sure largely the result of social growth or progress, making possible a shift in the relative investment in different industries through differential growth, without an actual transfer of equipment from one to another. Productive power, to repeat, is in its ultimate form either transferable from one use to another or else is not price-determining in its one special use; but at any particular time it is more or less largely committed to particular forms specialized to particular uses. It cannot be quickly recovered in its fluid form without loss, and for much of it the commitment is permanent or practically so. There is no contradiction between assuming a degree of mobility dependent in fact on the steady accumulation of capital and assuming at the same time the absence of disturbances due to progressive change. For, though accumulation is a phenomenon of progress, it is a type of progress which has no appreciable effect in upsetting business calculations or producing fluctuations. In any case it is legitimate methodology to separate the effects of mobility from *other* effects of progress even if there is some connection between the two, if there is also a large degree of independence of one upon the other.

One of the most serious oversights in the discussion of decreasing cost is the neglect of the mixture of competition and monopoly which is a general characteristic of the type of business supposed to exhibit this type of cost function. Just as part of the traffic of a railroad is competitive and part monopolistic, nearly every manufacturing and mercantile business has a monopoly on *some feature* of its product; its good or service is differentiated from others in some manner and to some degree. To the extent that any business is monopolistic it may manifest decreasing costs due to the "economy of large-scale production." We have only argued that such a cost curve is incompatible with long-run competitive conditions.

The correct approach to the explanation of price in the case of partial monopoly would seem to be to apply the theory of monopoly, not that of competition. Instead of

attempting to allow for a degree of monopoly in the supply, which there is no easy way of doing, it is vastly simpler to allow for partial competition as a phenomenon of *substitution*, on the demand side. No difficulty whatever is involved in assuming control of the supply (of the commodity defined in the narrowest sense) and allowing for competition by substitution of more or less similar goods in drawing the demand curve. And this is the more realistic view as it represents the way in which the producer would naturally envisage the situation.

In still another sense the presence of partial monopoly is a qualifying factor in determining short-run price. When an industry is in a depressed state, working below the capacity of equipment not transferable within the period in which reduced demand operates, a feeling of community of interest tends to prevent that reduction of prices to the level of prime costs which would follow from perfect competition. It is to be emphasized that a considerable degree of one or both sorts of monopoly exists over a large part of the field of manufacturing industry. The influence of both sorts of monopoly on price, that is, of the striving after the greatest possible degree of real or fictitious uniqueness in product by different makers and the strengthening of a sort of "professional ethics" against price-cutting, has been emphasized by Professor Spurgeon Bell in his paper on this subject.[20](#)

One more phase of the problem of decreasing cost with decreasing output should be mentioned in conclusion. Without considering new inventions or the introduction of methods not previously familiar, there may be a possibility of using different systems of production in making a commodity, one method being more efficient for a smaller supply and another for a larger. This is under any probable conditions another phase of the variation in size of establishment, but in any case a confusion in the definition and plotting of the cost function should be pointed out. If it is true that a small output would naturally be produced by primitive methods while a larger one would justify a more elaborate organization with greater efficiency, it may well seem that the case is one of decreasing costs. There is a fallacy in overlooking the fact that any amount of the commodity *could* be made by any one of the methods available. A correct treatment of the cost in relation to output should plot a complete cost curve for each method separately, extending from zero output up to one of indefinite magnitude, as shown in Diagram VIII. For the simplest method we shall have the curve of slightly increasing costs which represents the normal situation as shown early in the discussion (curve 1). For a more elaborate technology the smaller magnitudes of output will be much more costly, but as output increases up to the capacity of the equipment, costs rapidly decrease, to a level below that of the first method. Beyond this point the curve becomes parallel with the first (curve 2). And similarly for a still more capitalistic method, as shown in curve 3. The significant part of the figure presents therefore, not a curve of decreasing costs, but a series of curves of increasing costs at different levels. It is hardly supposable that there can be a plurality of equilibrium points in such a situation, at which production may go forward *under competitive conditions*. The substance of the matter is, as already brought out, that if more efficient methods, connected with larger-scale operations, are available, the number of organizations in the industry will be reduced until all are on the most efficient scale. Then if the demand is sufficient to maintain a plurality of organizations, each will be subject to increasing costs; if the demand is not large enough for that, the industry will be a

monopoly, in which case there is no tendency for cost and price to be equal (monopoly revenue not being counted as a part of cost).

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VII

The main conclusion which we have attempted in this paper to establish is that decreasing cost with increasing output is a condition incompatible with stable competition in the industry. A significant degree of the phenomenon is probably rare outside of industries which are *both* naturally monopolistic *and* greatly overbuilt in speculative anticipation of future growth in demand. The significance of fluctuations also is sure to be greatly overestimated. The effective physical mobility of capital and labor, considered as physical productive power, is probably great enough in our society to make possible a very close adjustment of production to demand under ordinary conditions. The changes which upset business relations and throw costs and prices out of correspondence are *price phenomena*, and are due to miscalculated speculative contracts and to changes in the value of the circulating medium. They affect business as a whole rather than the relations between different industries. Productive services as a class tend to be undervalued or overvalued relatively to finished goods. When the latter condition arises, industry has to stop and readjust itself, for under competition a business cannot operate unless it makes a pecuniary profit.

An error very different from that of treating price-determining cost as a decreasing function of output, but not unconnected with it and very common, is the exaggeration of the economy of large-scale production and our highly organized industrial system as a whole. A spectacular saving is effected in certain operations, such as spinning and weaving; even when the labor which makes and maintains the equipment is considered, it is very large. But to make that saving possible large organizations must exist and the cost of internal cohesion in large groups of men is very high. Material must be collected and goods distributed over a wide area and the incredibly wasteful methods of purchase and sale are the best so far devised. There is much food for reflection in the smallness of the difference in cost between a tailor-made and a factory-made suit of clothes and the fact that the housewife who does her own sewing can often make higher wages than are paid to her sister for making the garments by "modern" methods.

F. H. Knight

State University of Iowa

[1.] This division differs from Marshall's four cases in important respects which will be developed at length. My fivefold division corresponds more closely to his fourfold one.

This article discusses the problem of the explanation of price. It is appropriate to say that I think we have talked rather too much about prices as such, and should strive to keep more in the foreground the forces which are measured by prices and the changes which they bring about. The real subject matter of economics is the organization of production and consumption. The desideratum is to get students to see how in our

social system, in so far as it is based upon private property and free contract, consumption is controlled by the prices of finished goods, how these prices are translated through entrepreneurs' calculations into price offers for productive services which control the utilization of the productive resources of society, and finally and most sadly neglected of all, the circular character of the whole process. The pecuniary demand for goods has little relation to their objective human significance. It depends on the existing distribution of ownership and opportunity and the facts as to consumers' tastes, both of which are largely molded by the workings of the system itself.

[2.]The situation in the market at a moment is represented by the familiar demand and supply curves. In the writer's view these gain enormously in reality and clearness by taking price as the base line, the independent variable, and interpreting the price point as the point where the amount offered is equal to the amount taken (see Diagram I). This is the procedure of the so-called mathematical economists. American textbooks generally plot quantity of goods horizontally and price vertically in order to make the demand curve identical with a curve of diminishing utility (utility as a function of supply). When it is remembered that utility in the sense in which it influences price is relative utility, measured in terms of money, the value of the utility analysis for explaining price becomes somewhat problematical, especially for purposes of elementary exposition. It is not clear that such utility curves add much to the mere statement that purchases are a function of price. Certainly they have to be translated into curves of purchases as a function of price before they are usable, for a utility curve can at most represent the facts for a single purchaser. There is no possibility of comparing or adding utilities for a group of individuals differing in taste and in income, and the only way of representing the social facts is to add the amounts of the good which different individuals are willing to purchase at the different prices.

In any case utility calculations are nearly negligible in relation to price at a given moment, since prices are fixed in primary markets where purchases are made far in advance of actual consumption. Purchases in advance of immediate needs by consumers, and still more by middlemen, and controlled by speculative motives, make up the effective momentary demand.

[3.]Moreover the fact itself is improbable. If the wheat is the grower's main source of income, it is at least as likely that he will consume more if the price is high, since the difference in his income due to the higher price of his produce is likely to be more important than the difference in the price as a deterrent to consumption.

[4.]*Economics of Enterprise*, pp. 48-52.

[5.]The latter part of the statement does not fit certain types of "durable" goods such as gold, jewelry, works of art, ideas, etc., which are not strictly speaking consumed at all. The theory of normal price (price determined by cost of production) is wholly inapplicable to such things, in the form which is valid for ordinary consumption goods.

[6.]The expression "unprogressive society," though less compact, seems to this writer much better than the "static state" to designate this situation. The word "static" suggests the absence of *change*. The idea is not however to eliminate change, but only *certain* changes while discussing the natural readjustment of other things to the given condition of those assumed as unchanging for purposes of the argument. The term "dynamic" contrasted with "static" is still more objectionable and "progressive" has in this case the advantage of being more euphonious as well. The distinction between progressive change and fluctuations seems to be important enough to justify a generic division along this line. It is not always true that progressive changes become practically important only over periods of time long in comparison to those in which fluctuations work themselves out, but it is so generally true as to make the division all the more significant and to make it easier to visualize the separation.

The advisability of distinguishing between short-time and long-time normal price will be taken up immediately. If this is done we have five cases or sets of data for our analysis in place of Marshall's four (*Principles of Economics* [6th ed.], p. 379).

It is fundamental to price theory as a whole, in which no sharp separation is possible between the prices of consumption goods and the prices of productive services or distribution (since the costs of production are identical with the distributive shares), that the data for the long-time theory of the former are the same as the data for the short-time theory of distribution. Over the period under consideration (say a few years) the supply of any consumption good is variable, a function of price, while the supply of any fundamental productive factor is fixed. The theory of progress will treat of the remunerations of productive services under the influence of changes in supply, and of what Marshall calls "secular changes" in normal prices (of consumption goods).

[7.]A condition doubtfully more often true of "land" than labor, bearing in mind that mineral resources are not economic land.

[8.]The separation of land from "artificial" productive goods is to the writer one of the hardest things to account for in the traditional economic speculation. It simply is not true that there is any productive power in land which has not been "produced" in the only sense in which men produce anything; its value is due to the form it is in, which represents previous investment, and the supply is determined by free investment in competition with other fields. The speculative element in such investment may be larger on the average but in the writer's opinion the reverse is more probably true.

These statements do not apply to mineral deposits and other *exhaustible* and *non-replaceable* natural wealth. There would be good ground for erecting these goods into a separate productive category; but this type of natural productive power is just what has been excluded from the category of land by the economists' definitions. But, detailed discussion of the classification of productive resources is outside the field of this paper.

[9.]See below, p. 317.

[10.] The division lines cut across all the conventional productive factors. Some "land," some "labor," and some "capital" (capital goods) are transferable, some transformable (over a longer or shorter period of time), and some rigidly specialized. Here as elsewhere the conventional division is irrelevant; the writer has yet to run across any real economic problem in relation to which it has practical significance.

[11.] It should be noted that it is impossible to be sure that we are adhering rigorously to the assumption that progressive change in total productive capacity is absent. When productive goods are changed in form there is no clear and definite meaning in the assertion that they remain the same in amount. The equivalence can be approximately preserved, in so far as the new forms represent the same amount of some more fundamental productive resource (such as homogeneous labor) as the old, but some differences in the kind as well as amount of the ultimate investment are doubtless always connected with differences in the immediate form of the production good. The question really is the extent to which production goods differing in form and specialized to certain uses do ultimately represent the investment of unspecialized resources. It is undoubtedly true that for the most part they do; but even then, some such investments never wear out and give back the unspecialized productive power which went into them for use in creating goods of some other specialized form.

[12.] *Principles of Economics*, 6th ed., p. 379. It is to be observed that even Marshall's discussion of long-time normal price does not relate to the *ultimate* adjustment of production to fit given conditions of demand. This is in line with his general tendency to avoid clear-cut formulations and "soften" his principles to make them cover a broader range of facts. The present writer is inclined to a very different conception of scientific procedure, though not necessarily to the exclusion or displacement of "looser" forms of treatment. Another case in point is the concept of the "representative firm" already referred to. In our view general principles are to be stated with the most rigorous accuracy attainable and pure theory sharply separated from its application to reality. From this point of view the failure of a scientific principle to fit accurately any case whatever, much less any class of cases, may be a merit rather than a defect. It is not the purpose of such principles to describe facts in realistic detail, but to state with the greatest possible accuracy general relations which form a *common element* in large groups of real situations, even though they may not be the whole story, may not necessarily even give an approximately complete description, of any single case.

[13.] Normal here means of course merely usual and has no connection with the use in "normal price" as the goal of tendencies at work.

[14.] A complete and accurate representation would require a three-dimensional drawing, the curves being located at successive points along a time axis perpendicular to the paper and blending into a surface increasing in inclination to the price plane with increasing distance from the zero point of the axis of time-allowed-for-readjustment.

[15.] A well-known problem book in economics contains the question, If a railroad is already in existence between New York and Chicago and trains are running, what added cost will the railroad incur in hauling a five-pound box from Chicago to New

York? Of course the Freshman is expected to answer that the cost would be slight, and to be duly impressed with the importance of fixed costs. No reference is made to the possibility that the trains already running may be full! The *added cost* of the particular small increment of traffic which compels the addition of even an extra car to a train will not be negligible. And locomotives also reach their capacity and new trains have to be added; and sometimes, new tracks must be built if the traffic continues to grow, and ultimately it would be impracticable to increase the number of tracks. Perhaps about eight is a maximum before it could be cheaper to start an entire new system far enough removed from the first to avoid interference in switching and handling the shipments.

[16.] In European countries generally the facts were different, the traffic demands being generally up to the capacity of the railways as they were built and expanded; the foreign literature on railways is relatively free from the heresy of decreasing costs and foreign railway policies from the disorganizing tendencies based upon the idea.

The doctrine that railway rates are determined according to the principle of joint cost seems to the writer especially hard to defend, since the operation of the equipment would be actually simplified if its capacity were all employed in handling a single class of traffic. The notion of joint cost adds nothing to the simple statement of diminishing cost unless different kinds of products result in *nearly fixed proportions* from the same productive operations. Compare Taussig, *Principles of Economics*, chap. lx, and a discussion of the subject by Taussig and Pigou in the *Quarterly Journal of Economics*, Vol. XXVII.

The writer is inclined to believe that the "wise social policy" would be to require railways to make all charges on a ton-mile basis, over the best route, with allowance for special handling costs and any special service such as extra speed or the like. Of course this does not mean that they should be required to change quickly to such a basis from the present system, nor is the proposal expected to be taken seriously from the standpoint of that complex of auto-hallucination, humbug, and knavery which we call practical politics.

[17.] The curve is of course a rough sketch and merely suggestive. Drawn accurately to scale it should never be steeper than a rectangular hyperbola through the point. A decrease in cost per unit at greater ratio than that of the increase in output would mean a smaller *total* cost for the larger output, which is absurd.

[18.] It is by no means meant to imply that this should never be done. The writer would hold—in opposition for example to Taussig (*Principles of Economics*, chap. lx, sec. 1)—that in this field social interests very often outweigh economic advantage, as measured by pecuniary demand.

[19.] Professor Friday's interesting argument against the concept of "normal profit" (in *Profits, Wages, and Prices*, chap. iii) does not affect the proposition as stated above, if indeed it applies to any doctrine which economic theorists have traditionally advocated. He has not in any sense disproved a tendency of profit toward a normal level, or even that this tendency is reasonably effective over a moderate period of time

if the variables are accurately measured in price terms.

In this connection it may be suggested that the conclusion of Professor Friday that an excess-profits tax will not discourage production may be hastily drawn. In the first place, we may question whether the anticipation of unusual profits is not in itself a vital element in the incentive to business activity. In the second place, it is admitted that profits are closely connected with fluctuations in industry and if the tax is levied annually a business which is actually losing money may pay a considerable amount of excess-profits taxes over a period of a few years.

[20.]The *Quarterly Journal of Economics* for May, 1918.