EFFICIENCY IN MARKETING

At first glance, the concept of efficiency would seem to be relatively simple. If we know what inputs are used in a particular process and we know what output results, a simple ratio of output to input provides a measure of productivity. An increase in this ratio from one time period to another would clearly seem to be an improvement in the efficiency of the process. However, many plants produce two or more products and, thus, we encounter a problem in measuring the aggregate output of the several products. We may find that it is difficult not only to measure outputs but also to measure inputs associated with output during a particular time period. This is related to the fact that some inputs produce streams of services that extend over several production periods, although other inputs are consumed immediately. Another difficulty is associated with the measurement of changes in efficiency brought about by the substitution of capital for human labor. If we simply consider changes in the inputs used, we may overlook some of the costs incurred in shifting resources out of this process and, in particular, the costs incurred by the persons who formerly were employed in the process and are now forced to find other lines of employment. Finally, we may find that there is a relationship between the particular marketing system in use and the set of prices that emerge. Since prices are the allocators of resources and of products in a market economy, we clearly must give consideration to the pricing aspect of efficiency as well as to the production process itself. This is the task that we face in this final chapter.
21.1 EFFICIENCY OF MARKETING FIRMS

How does one measure the relative efficiency of different firms in an industry? To simplify matters, we limit our discussion to the case of a single plant, single product firm. One answer is to construct simple input-output ratios, such as labor used per unit of output or capital investment per unit of output. The difficulty with simple ratios of this type is that, although a firm may rank high in efficiency when measured in terms of output per unit of labor, it may do this only at the cost of a large amount of capital per unit of output. That is to say, the firm with a low labor/output ratio may have a high capital/output ratio and vice versa. Clearly a method is needed by which all of the important inputs can be considered simultaneously.

Figure 21.1 is an illustration of the two-input, single output case. The two axes represent the rate of use of each input per unit of output. The curve SS' is to be regarded as the efficient unit isoquant. This curve represents the smallest quantity of factor 1 that can be used to produce one unit of output as the amount of factor 2 used is varied. All points on this line and the ones more distant from the origin are attainable, but all points between the line SS' and the origin are not attainable.

Now consider a firm represented by point P. We draw line OP from the origin to that observation. This line intersects the efficient unit isoquant at point Q. The length QP then is a measure of the excess use of the two

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factors relative to what is technically feasible, represented by the length $OQ$. We measure technical efficiency as the ratio of the length $OQ$ to the length $OP$. All points on the efficient unit isoquant are 100 percent technically efficient, and all points lying above the line are less than 100 percent efficient.

Let the relative prices of factor 1 and factor 2 be represented by the slope of line $AA'$ which is tangent to the efficient unit isoquant at point $Q'$. It is clear that although point $Q$ lies on the efficient unit isoquant, the resources required at this point are more costly than the resources that would be required at point $Q'$. This is true because any factor price line parallel to the line $AA'$ but farther from the origin represents a larger outlay for the factors $F_1$ and $F_2$. The length $RQ$ is a measure of the price inefficiency associated with the selection of the technically efficient but more costly point $Q$ as compared with the minimum outlay point $Q'$. We construct the index of price efficiency by forming the ratio $OR/OQ$.

We may now combine these two indexes to obtain a measure of economic efficiency. This is the ratio $OR/OP$. It is equivalent to the product of technical efficiency and price efficiency $OQ/OP \times OR/OQ$. In summary then, given the efficient unit isoquant, the relative prices of the factors, and any observed position of a firm either on that isoquant or above it and to the right of the isoquant, it is possible to form an index of technical efficiency, an index of price efficiency, and the product of the two—economic efficiency.

**Estimating the Efficient Unit Isoquant.** To empirically estimate an efficient unit isoquant requires data on individual firms within an industry, like the ones illustrated in Figure 21.2. One procedure for describing these firms would be to estimate a regression line for the scatter of observations by least-squares or some similar procedure. On occasion, the Cobb-Douglas function has been used for this purpose. The disadvantage of this procedure is simply that it describes the average of all firms instead of providing information about the most efficient firms.

The proposal made by Farrell is that we describe the relationship for the most efficient plants by constructing an envelope-type curve that passes through the points nearest the origin. In Figure 21.2 the efficient unit isoquant is drawn through the observations for firms $a$, $b$, $c$, and $d$. Firm $a$ lies furthest to the left of all observations, indicating that it uses least of factor 2. The isoquant is therefore drawn vertically from point $a$. Similarly, firm $d$ uses least of factor 1 per unit of output, so that the isoquant is drawn horizontally to the right of this observation. Between these two points, the curve consists of a series of line segments that connect the four firms $a$ through $d$. 
The technical efficiency of firm \( e \) which does not lie on the efficient unit isoquant, is found by drawing a line to this point from the origin. The line \( oe \) crosses the efficient unit isoquant at point \( e' \) which lies on the line segment \( cd \). Technical efficiency is measured by the ratio \( oe'/oe \), as suggested earlier. Two choices are open for estimating price efficiency. One procedure is to use the tangent representing market prices of the factors. However, if there is reason to believe that substantial differences exist among firms in the relative price of factors, it is possible to substitute a factor price line that represents "own" prices for the line representing "market" prices of factors.

**Scale and Efficiency.** Of particular interest to economists is the relationship between efficiency and scale of operation. Individual firm data may be sorted by size group and efficient unit isoquants that are constructed for each group, as outlined above for the industry as a whole. It is then possible to separate the efficiency index of each firm into components associated with its performance relative to other firms in its size group, as well as with the performance of one size group relative to other groups.

Economic efficiency is equivalent to the inverse ratio of average cost (Bressler, 1967). The relationship between the index of economic efficiency and the index of average cost is illustrated in Figure 21.3. The horizontal axis represents the scale of operation of the firm measured in terms of output per production period. Firm observations are arrayed along this axis with the vertical distance below the 100-index line a measure of the economic efficiency of each firm relative to the firm having the highest
economic efficiency index. We then construct an envelope curve “from above.” The inverse of the efficiency index of a firm is an index of average cost and is measured vertically above the 100-index line in Figure 21.3. As previously, the average cost for each firm is measured relative to that of the firm having the lowest average cost. We then construct an envelope curve “from below.”

The envelope curve to economic efficiency observations is strictly equivalent to the envelope curve to average cost observations. Notice that both economic efficiency and average cost indexes are independent of proportional changes in factor prices but that, in general, they are not independent of changes in relative factor prices.

**Industry Efficiency.** It may be of interest to compare the efficiency of two or more industries. For this purpose it is necessary to weight individual firm observations by their contribution to industry output. Measures of both technical and price efficiency are possible as well as the
overall or economic efficiency of the industry. This method eliminates the necessity of devising a common measure of output for the several industries. Instead, comparisons are made with efficient firms in the same industry where outputs are more homogeneous. Interindustry comparisons of indexes are then possible.

The measurement of changes in efficiency within a given industry over time is also possible where individual firm data are available for several production periods. Shifts in the efficient unit isoquant might well provide a more sensitive measure of the effects of efforts to raise productivity in an industry than methods that rely on shifts in all firms in the industry such as have been generally employed.

**Technological Change and Efficiency.** The effect of technological change on the efficiency of production is also a matter of widespread interest. Technological change can be visualized as a drifting of the efficient unit isoquant toward the origin over time.

With respect to development prospects in many regions of the world, it is important that measures be developed that make it possible to identify those sectors and industries where substantial improvement is possible. Figure 21.4 illustrates the potential for change in the production of barley in the sierra region of Peru. Coffey (1966) has identified four levels of technology: the traditional, the transitional, the modern, and the potential. They are represented by the corner points on the rectangular

![Figure 21.4](image-url)

**FIGURE 21.4** The land and capital required to produce a metric ton of barley in the Peruvian sierra under various levels of technology [Technology code: D = traditional, T = transitional, M = modern, and P = potential; 1 = nonmechanized, 2 = partially mechanized, and 3 = fully mechanized (Coffey, 1966, p. 51).]
isoquants in Figure 21.4. The isoquants are rectangular because it is assumed that no variation in factor proportions is possible within a given technology. The technological changes illustrated here do suggest that it is not possible to produce a unit of barley with less of all inputs but that it is possible to reduce substantially the amount of land required per unit of output.

The effect of technological change, then, is to expand sequentially the set of input combinations that are attainable. Only occasionally will it be possible to make the type of breakthrough where the isoquant will shift toward the origin in such a way as to dominate all previous input combinations. The shifts illustrated in Figure 21.4 represent, by far, the most common type of technological change that occurs in the real world. This has important economic implications. Notice that the incentive to adopt new technology will depend on the relative prices of the factors of production.

Suppose that technology levels $D$ and $T$ are attainable. If the relative price line passes through points $D_1$ and $T_1$, this indicates that the two techniques are equally profitable. If, on the other hand, the price of capital is higher than the one suggested by the line $D_1T_1$, this would increase the slope of the factor price line and would indicate that the traditional method is more efficient. The separation of technological changes that dominate existing methods from the ones that offer new profit opportunities only within specific ranges of relative prices would be highly desirable.

The Farrell approach to the estimation of the technical, price, and economic efficiency of firms offers an opportunity to improve substantially our ability to measure interfirm differences in efficiency, to measure the rate of adoption of new technology, to study the relationship between scale and efficiency, and to make interregional or interindustry comparisons. Although we have dealt only with the single product, two input case, the logic is directly applicable to the more general case.

### 21.2 ALTERNATIVE MARKETING SYSTEMS

Market organization is a general term embracing all aspects of a particular marketing system. There are three generally recognized components of market organization. Market structure refers in a descriptive way to the physical dimensions involved: that is, the approximate definitions of industry and markets, the number of firms and/or plants in the market, the distribution of firms or plants by various measures of size and concentration, the descriptions of products and product differentiation, the conditions of entry, and the like. All of these descriptions, to be sure, are
geared in some way to our concepts and value judgments of elements that affect market competition. Market conduct refers to the behavior of firms under a given market structure and, especially, to the types of decisions that managers can make under varying market structures. Finally, market performance refers to the real impact of structure and conduct as measured in terms of variables such as prices, costs, and volume of output. Performance is the significant element in this classification scheme. In fact, descriptive studies of structure are of value only in so far as they explain performance.

Microtheory provides us with analyses of firm operations under a variety of market settings that range from competition at one extreme to monopoly at the other. Each of these situations is characterized by descriptions of the institutional setting within which the firm operates—descriptions in terms of numbers and size of firms, product characteristics, conditions of entry, and so on. These theoretical developments have been utilized by students of market structure to construct the familiar classification system or tableau—competition, monopolistic competition, dominant firm, dominant oligopoly, oligopoly, duopoly, bilateral monopoly, monopoly, and so on.

Given fairly readily available characteristics of an industry—number and size of firms, the degree of product differentiation, the proportions of the total business handled by the largest or the 4 largest, or the 20 firms—the industry can be assigned to its appropriate place in this classification system. Theoretical analyses are then used to develop generalizations about conduct and performance and particularly to contrast the expected or suspected performance with the results anticipated under competitive conditions. At either end of the market classification tableau (competition or monopoly), generalizations about conduct and performance derived from structural descriptions seem most valid, although even here it is seldom appropriate to conclude that the advantages of competition would come from the breaking up of a monopolistic firm into many small (and inefficient) firms.

The area intermediate between competition and monopoly is most characteristic of real life, and it is also the area where our theoretical conclusions and value judgments as to the relations between structure and performance are most suspect. What does theory tell us about performance in a market where the top 4, 10, or 20 firms control 60 percent of the business? In the absence of direct collusion, which reduces the case essentially to one of monopoly, it is difficult to find clear-cut guidelines in theory. Yet, hundreds of studies have been made that describe changes in the number of firms in an industry and in the concentration ratio—the percentage of total business handled by the top firms. It is perhaps most
revealing that research work and application in this area have found it convenient to constantly increase the number of firms considered in the "dominant" group—from 1, to 4, to 10, to 20—while also implying that a stated percentage of the total business in the hands of the 20 largest firms is just as much a cause for public concern as would be that percentage in the hands of 1 or 2 firms.

The "numbers game" can be well illustrated by two divergent facts. Recently, the FTC ruled against a merger of two small food chains when the combined volume of the two was well under 10 percent of the local market and, of course, a very much smaller proportion of the national total of retail food-store sales. At about the same time, studies of 6000 retail stores operated by 9 major chains failed to reveal significant relationships between the percent of local market business and any of the variables that might be expected to accompany changing degrees of local market concentration (see recent studies by the National Commission on Food Marketing).

The foregoing is not intended to make the point that "market organization" is unimportant in agricultural markets but instead to stress that the connection between market structure and market performance is often too tenuous to be of great value. As we have observed, the classic approach is to study structure and then to attempt to draw generalizations about performance. In what follows, we urge the reverse attack: that is, to study market performance, at least in some aspects, and then, as required, to move into detailed studies of the institutional factors that might properly be called structure. Although performance is more difficult to study than descriptive structure, nevertheless, at least two major dimensions can be researched effectively in most agricultural markets. These studies will provide meaningful bases for industry decisions and public policy in these fields. These two dimensions are (1) productive efficiency and (2) pricing efficiency.

21.3 EFFICIENCY OF MARKETING SYSTEMS

The question of efficiency runs even deeper than that of firms and industries. It has to do with how well a particular job might be done under alternative systems. We have identified two attributes of an efficient marketing system. They are (1) to provide efficient and economical services and ownership transfers in the movement of commodities from seller to buyer, and (2) to provide an effective price-making mechanism. In a sense, the first is merely a specific aspect of the second. That is, the creation of marketing services does not differ from other productive
processes which, given the efficient operation of the pricing mechanism, bring about the economical allocation of resources. The direct objective of the marketing system, therefore, can be described as providing for and participating in price formation with the understanding that the pricing system has as its prime function the guiding of the flow of resources into production (including marketing) and of goods and services into consumption. It will be convenient to consider separately the productive efficiency aspect and the pricing efficiency aspect of marketing systems.

**Productive Efficiency.** In the creation of marketing services, productive efficiency has two dominant aspects: (1) the extent to which firms in the industry make reasonably full use of their available facilities—the "load" factor or the amount of excess or unutilized capacity—and (2) the extent to which firms and/or plants are organized to take full advantage of economies of scale—the "scale" factor. We might add (3), the technical progressiveness of the industry, but here we encounter the difficulty of distinguishing between the problems of industry application and of basic scientific and technological development. This area of productive efficiency possesses real potential for improvements in marketing efficiency and, thus, is an area where major emphasis should be placed by marketing economists.

"Structuralists" have been known to view with alarm the fact that the number of country creameries in the Midwest has decreased during the past 25 years by approximately one-half. Although this decrease may seem to be a basis for major concern to one whose stock in trade is the numbers game, to a "performist" who knows anything at all about the nature of this industry, such a change can only be a cause for rejoicing. It seems clear that many country creameries of a past decade were using only part of their available capacities and that many were much too small to realize the potential economies of scale. Moreover, technological change within the plant but especially in transportation equipment and highway quality has made for rapid increases in the scale of operation that would give reasonable approximations to minimum costs.

Perhaps it is premature to suggest a "taxonomy" based on "scale and load" factors, but something like this is required. For any particular agricultural marketing industry, the marketing economist should have general information as to the influence of scale and load on costs and efficiency. Notice that they are performance and not structural factors. He can collect information on volume distributions and, more difficult to be sure, capacities. With them, he should be able to make a preliminary appraisal of the performance of the group of plants in a particular locality.
If his preliminary analysis indicates reasonably efficient levels of performance, then he would be well advised to move on to other localities and/or other fields. If, however, the preliminary classification suggests a combination of too small scale and too much excess capacity, then specific studies of the particular local situation are in order. For example, the study of the optimum number, size, and location of pear-packing plants by Stollsteimer and Sammet referred to the specifics of a single producing district in California and drew on detailed researches on costs, efficiency, and economies of scale that had been completed previously. The essential approach was to describe the geographic location of production in the district and, through elaborations of the transportation model, to check the effects of numbers and the location of plants on the combined costs of assembly and plant operation. By comparison with the existing organization, this provided an appraisal of the present scale and load efficiency, an indication of desirable directions for future evolution, and an estimate of the cost of savings that could be expected from this rationalization.

A second example that illustrates this approach concerns the consolidation of orange packinghouses in another small district of California. The general nature of orange packing operations and the effects of volume and scale on packinghouse costs were well known. Preliminary investigations in the district in question, where total fruit volume was decreasing as a result of urban encroachment, suggested that plants were not large enough to be efficient and that, even more important in this situation, most plants were operating well below 50 percent of capacity even in peak seasons. This "diagnosis" of trouble and its probable causes is about what marketing economists can expect from general research.

The development of an action program, then, depended on the careful exploration of a number of local factors: the available facilities and capacities of plants, the present and future trends in available fruit, present and probable future levels of unit costs, the financial situation in each house; the possibilities for liquidation of physical assets, and a host of "personal" questions, including the present and possible composition of boards of directors, the positions of present managers, and the disposition of present labor forces. This particular project considered a half dozen plants and finally resulted in the actual merger of three (two cooperatives and one private plant), with a more than doubling of plant volume, a satisfactory disposal of unneeded facilities, and a significant reduction in costs and/or increase in returns to growers. This represents a substantial improvement, even though it falls short of the "ideal" that pure research might suggest. Of all the institutional factors that stand in the way of load and scale improvements in performance, the most difficult and pervasive seem to be the personal factors.
Pricing Efficiency. Pricing efficiency can be thought of as the positive aspect of the main concern of market structure: that is, what happens to prices. Pricing efficiency studies attempt to appraise this directly by contrasting actual prices with the ones that are generated by some "efficiency" model (The reader is reminded that efficiency models are closely related to and sometimes identical with competitive models.) Our theoretical constructs here must come largely from the theory of the perfect market in space, form, and time. To repeat, we expect that an efficient market will establish prices that are interrelated through space by transportation costs, through form by costs of processing, and through time as a consequence of the costs of storage. Although such models are admittedly simplifications of reality, nevertheless, they can often be used to spot distortions in pricing performance.

Suppose it is alleged that prices paid dairy farmers for milk delivered to local creameries are "inefficient": that is, these prices do not accurately reflect market demands for finished products, with appropriate allowances for processing and transportation costs. The perfect market concept gives us a diagnostic tool by which we can test this hypothesis; the results either indicate reasonable performance or wave a red flag that warns us something is amiss. In the latter case, careful and specific explorations of local institutions are in order.

Again, research gives only the general picture. A good example of these general results is the study of pricing efficiency in the manufactured dairy products industry (Hassler). His findings indicated that this market operated with a relatively high degree of consistency and pricing efficiency. More important in our present context, they suggested an approach and provided much of the information needed to appraise local specific situations. Thus, it might be true that the "national" market for butter operated efficiently as judged by price comparisons among major cities, but it also could be true that wholesale butter prices and/or returns to farmers for milk were depressed below "normal" levels in parts of California or Iowa. Specific studies would then be required to determine how these price results could be explained and, hence, to suggest what might be done about it.

To encourage efficient marketing, the economist must make special or local studies of this kind and then, if the results so indicate, mount action programs to improve the situation. This last may not be easy when dealing with a marketing system. Yet, effective programs are often possible. If prices are depressed locally as a result of trade barriers that discriminate against the products of the district, publicity and public action seem indicated—perhaps even action through the courts to throw out barriers to interstate commerce. If prices are low because of the structure
of the local industry (and we must always recognize that efficient size will usually pose the dilemma of numbers too small in the local district to insure aggressive competition), then continuing publicity that compares local prices with "computed normal" prices may be sufficient to bring the local industry into line. In many cases, although this is less true now than in the past because of improved communications, the development of an effective market news system may be the answer. And in some cases, the traditional establishment of a cooperative to serve as a competitive yardstick may be effective. Although the use of public regulatory power is not common in agricultural markets, this also is a possibility (for example, the establishment of maximum charges for marketing services under state milk control).

21.4 THE "IDEAL MARKET" AND MARKETING RESEARCH

To summarize, we return to the "ideal market" model and its relevance for research. The objectives for the marketing system have been defined in terms of "efficiency" and "economy." However, these are relative or comparative words. A marketing firm, function, or system cannot be judged as efficient or economical in any absolute sense, but only with respect to alternatives or to some standard. Studies may be designed to show how the existing marketing methods could be improved, that is, made more efficient and less costly. To be more useful, however, marketing research should be oriented with reference to a concept of an ideal or perfect market. Such a concept should make possible the most meaningful appraisal of the existing system both in terms of the delineation of problem areas and of the indications of the magnitude and importance of the distortions. Also, it should provide a framework within which individual studies could be fitted, past work evaluated and integrated, and future research planned.

What, then, can we use as a model of perfection? A partial answer is suggested by the above-mentioned objectives for the marketing system, since they correspond in general to the results that would characterize an economy of perfect competition. For such an economy, economic theory describes an interdependent system of pricing for factors of production, for goods, and for services. Within this system, factors will be shifted among alternative employments in response to higher and more profitable returns. In turn, these returns will change and adjust with changes in technology and with shifts in consumer tastes and preferences. In equilibrium, the costs of production (including the production of marketing services) will be at the minimum consistent with the given conditions.
of resources, technology, and demands. Prices for goods and services will reflect and differ only by these production and marketing costs.

Competitive economic theory can thus provide the framework for our ideal market. Confronted with any marketing and pricing problem, the research worker can plan his attack by asking himself questions such as: How would this marketing process be organized if it operated under the conditions of perfect competition? This does not imply that competitive conditions could be completely attained nor that the solution to marketing problems is simply a "return" to the system of free and perfect competition. A realistic view of the industrial economy of today indicates that it would be both undesirable and impossible to attain many of the characteristics of a competitive market. Two main types of modifications are necessary: first, the inclusion of welfare considerations that modify the distribution of income, such as progressive income taxes and minimum wages; and second, the possible advantages of a limited number of firms in those areas where economies of large-scale operation are important. In this last case, these are the significant questions: What organization of this process would minimize costs? How can these costs be reflected in prices?

Attempts to improve marketing by approximating competitive conditions will be appropriate in many instances. They include steps such as the curbing of large-scale organization where its effects are primarily to exact charges not commensurate with costs and perfecting knowledge through research, education, and market news. In certain other areas, however, this approach will not be productive and, here, the stress must be on approximating the results of competition in terms of costs and prices. As previously mentioned, large-scale organization may frequently result from technological factors that give rise to economies of scale, and the curbing or breaking up of these large units would necessarily lead to higher costs. This is a much more common situation in marketing than is sometimes supposed, since economies of scale are frequently of sufficient importance relative to the size of local markets to result either in (1) a considerable degree of local and spatial monopoly or in (2) a number of small and high-cost competing firms. In country marketing and processing plants, for example, this conflict is clear. The problem may be one of how to achieve and to regulate low-cost monopolies in the public interest.

The following list suggests some of the benefits that this ideal market concept can bring to marketing research.

1. It makes it possible to judge the existing system by standards of socially desirable results or ends. This is not to deny that welfare considerations will sometimes define other results, but in most instances the
The competitive model appears consistent with the general welfare in terms of results.

2. The underlying principles are well developed and widely understood, and with careful thought they can be expanded to apply to such detailed problems as the organization and operation of local marketing facilities or to such broad issues as the allocation of resources among marketing and the other major sectors of the economy.

3. It stresses the importance of theorizing and of logical analysis in the planning phases of research; relationships are not determined by random gathering and tabulating of data, but must be inserted as well-conceived hypotheses and then tested by carefully designed empirical studies.

4. By suggesting the general form for particular studies, it will help insure that the findings can be used in succeeding and more advanced studies. This should facilitate and promote effective integration of research and cooperation among research workers.

5. By stressing the important interrelationships and interdependencies in the workings of the economic system, the ideal market concept should encourage researchers to go beyond superficial and gross relationships. The real market mechanism is complex, and an appreciation of these complexities is essential if research simplifications are not to destroy the usefulness of the estimates of basic relationships.

6. Finally, by providing a "goal" that will frequently differ significantly from the status quo, the ideal market concept should encourage the exploring and developing of new areas of knowledge. Innovation is essential to progress, and research that contributes to progress is simply a scientific approach to innovation.

It has been said that economists often view the existing market organization as given but invariably turn over to the next generation a far different organization. Hopefully, these chapters will provide a foundation for a systematic evaluation of some of these alternative systems.

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