



## **An Efficiency Criterion for Marketing Design**

Birger Wernerfelt

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BIRGER WERNERFELT\*

The author proposes that the parties in vertical trading relationships allocate their efforts toward manufacturing and information exchange such that no other arrangement makes them all better off. In some cases this reduces to the suggestion that a change should be made if one party can pay others to do it.

## An Efficiency Criterion for Marketing Design

The marketing literature has devoted considerable attention to questions of the “how much to do” variety. Many authors have tried to answer questions such as the following: How much to advertise? Which price to advertise? How many sales assistants to employ? How much after-sales service to offer? How many catalogs to mail? In contrast, logically prior questions of the “what to do” variety have been the subject of much less work. We do have answers to questions such as, When should we advertise? When should we advertise a price? When should we use sales assistants? When should we offer after-sales service? When should we use mail order? However, taken as a whole, the answers form a rather inconsistent fabric; we have no framework for thinking about the design of marketing practices in a unified and consistent way.

My purpose is to propose such a framework in the form of an efficiency criterion. Specifically, the criterion compares pairs of marketing practices and selects one if both seller and buyer (or, more generally, all members of the channel, including the consumer) prefer it to the alternative. In many cases the criterion reduces to a question of whether one party could pay the other to agree on an alternative. Although this is a weak and natural criterion, it has significant discriminatory power because it allows comparison of radically different alternative designs of products, channels, and trading processes. Nested in each design, we can answer questions of the “how much to do” variety and use the criterion to compare across designs.

To illustrate the criterion, I start with a brief history of how I got my outdoor gas grill. First, the manufacturer produced a box containing a set of parts and assembly instructions. This box was then taken to a supermarket. Second, I drove to the supermarket; looked at an assembled grill; read about its price, brand name, and features; and bought it.

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\*Birger Wernerfelt is a Professor of Management Science, Sloan School of Management, Massachusetts Institute of Technology. The author is indebted to Kalyan Chatterjee, Wujin Chu, Anne Coughlan, Duncan Simester, and Bart Weitz, as well as three anonymous reviewers and seminar participants at the University of Florida, MIT, and the Northeast Universities Marketing Conference, for comments on earlier versions of this article.

Third, I took the grill home, assembled it, and had the gas tank filled. This reflects three classes of decisions:

1. *Several manufacturing tasks must be accomplished and responsibility for them must be allocated.* The implication of our criterion is roughly that tasks should be allocated to minimize joint costs, as long as the gains can be shared.<sup>1</sup> In this case, the manufacturer benefited from economies of scale in taking a large number of grills to the store, and I benefited from economies of scope in taking it home (because I could take several other products on the same trip). Furthermore, although the manufacturer (or the supermarket) can assemble the product more cheaply than the average buyer, there are significant savings in transportation and storage costs from deferring assembly.<sup>2,3</sup> It is obvious why the gas tank was shipped empty even though I then had to get it filled—in each case the decision roughly reflects lower joint costs.
2. *To explore the possibilities for mutually beneficial trade, the parties must expend efforts supplying and acquiring information. The magnitudes of these efforts must be determined.* The issue here involves the costs the buyer and seller must incur before they can use the information as well as the value of that information. In this case I decided that the reputation of the store warranted my sinking costs and effort into the prospect. So I incurred costs traveling to the store (shared with other products), looking at the assembled grill, and reading the package. The brand name and the guarantee made the information credible. I was still imperfectly informed when I bought the grill, but I considered it less costly to bear the risk than to read *Consumer Reports* or go to another store. The supermarket could have provided more sources of information (e.g., a sales assistant, brochures), but for most consumers, including me, the benefits of such sources do not outweigh the added costs. The criterion here implies that efforts toward supplying information (by enhancing the amount, ease of use, and credibility of it) as well as efforts toward acquiring information should continue until they are no longer justified by resulting benefits, provided that both parties can share the gains.
3. *The design of the consumable product must be determined.* The criterion suggests that one should maximize the difference between consumption value and total costs (of manufac-

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<sup>1</sup>I make these principles precise subsequently.

<sup>2</sup>Toys-R-Us and others actually offer assembly, for a fee.

<sup>3</sup>Another interpretation, suggested by Steve Shugan, is that the household can perform customizing functions more cheaply than manufacturers.

turing and trading), provided that both parties can share the gains. In this case I found the grill functional, low-priced, and easy to buy, but quite difficult to assemble.

The efficiency criterion can be related to similar reasoning in operations research, economics, and marketing. An implicit assumption in most operations research is that system costs should be minimized. Our setting here is only different because we are looking at a trading game rather than a decision. More recent work in operations management has begun to bring the customer into the system, aiming to maximize performance of the overall manufacturer-customer channel. For example, Hammer (1990, p. 109) suggests the question, Must technicians make repairs? Or can computers help customers make their own? As in the gas grill example, the idea is that tasks often can be shifted among channel members.

The economics literature has long used Pareto efficiency as a performance criterion, and the second theorem of welfare economics (Arrow 1951) states that outcomes of competitive markets are Pareto efficient. The allocation of manufacturing tasks between sellers and buyers has been considered in Becker's (1965) theory of household production, which also enables one to analyze the costs of supplying and acquiring information.<sup>4</sup> Whereas these theories use competitive pressures to achieve Pareto optimality, the transaction cost school (Coase 1960; Williamson 1985, 1989) notes that contracts in the absence of transaction costs can achieve maximization of joint payoff.<sup>5</sup> The idea is that, in the absence of contracting problems, even bilateral monopolists can agree on a Pareto improving change (the Coase Theorem). Most applications of this idea have to do with ownership of assets, rights to residual claims, and determination of contingent prices.<sup>6</sup> The process (the game) through which the possibilities for trade are explored is suppressed, the assumption being that it is optimal; or more precisely, that the parties will find the optimal process. Consequently, issues concerning the supply and acquisition of information are not addressed by this literature in the absence of contracting problems.<sup>7</sup> The economically inclined reader may find it useful to look at the present argument as an application of the Coase Theorem to questions of household production and time allocation.

In the marketing literature, the closest antecedent of the efficiency criterion is Bucklin's (1967, 1972) "economic" theory of distribution channel structure. Bucklin looks at the services provided by the channel and argues that the structure of the channel and the level of services it provides will be determined by costs and the consumer's willingness to pay. This is perfectly consistent with the efficiency criterion, though the latter is more general in two ways. First, the ef-

iciency criterion applies more widely, covering decisions about both manufacturing (broadly defined) and the mechanisms through which information is exchanged and price is determined. Second, whereas Bucklin essentially relies on maximization of the joint payoff of the channel and the consumer, we see that the efficiency criterion only reduces to maximization of joint payoff in certain cases. Nevertheless, the spirit of the two approaches is the same, and one could look at the efficiency criterion as a more general revival of Bucklin's "economic" approach to marketing.

The efficiency criterion has an interesting relationship with the most recent marketing literature on channel profits (Jeuland and Shugan 1983). The efficiency criterion looks at the consumer as a member of the channel and suggests that at least Pareto dominance and perhaps maximization of channel payoffs, including those of the consumer, should be achieved. In contrast, much of the marketing literature has focused on maximizing the profits of sellers, not maximizing joint payoff (see survey by Moorthy 1985). The idea of taking consumer surplus into account has received less attention, though one occasionally finds it (Taguchi 1986). One could conjecture that such concerns reflect an implicit use of the criterion.

In the next section, I formally define the efficiency criterion. In the arcane language of game theory, the criterion is expressed as the rule that players should not play equilibriums of game forms that are Pareto dominated in the set of all equilibriums of all game forms.<sup>8</sup> I define each of the terms in the present context and give several simple examples to clarify the idea. The examples show that the efficiency criterion may fail to eliminate practices that yield dominated joint payoffs. Because maximization of joint payoffs is a simpler and even more appealing criterion, I next discuss the conditions under which the two are equivalent. The essential result is that they are equivalent if the parties have unlimited contracting powers.<sup>9</sup> Once again, several examples are used for clarification. Then I present several real examples serving as corroborating evidence for the theory.

### THE EFFICIENCY CRITERION

Consider a specific directly consumable final product. To produce this product for the consumer, society must accomplish several manufacturing tasks. In addition to the manufacturing tasks, there are information exchange tasks, which are performed to make the consumer aware of the product and sufficiently informed that he or she will buy it. The nature and costs of these tasks are interdependent and depend on who performs them (a specialist or the consumer). For this specific product, one could imagine the set of all vertical allocations of manufacturing and information exchange tasks that can deliver the product. Our criterion applies to elements of this set.

In many cases, however, it is also useful to be able to compare different product designs. Think of word-process-

<sup>4</sup>In marketing, this line of work is represented by Betancourt and Gautshi (1990, 1991, 1993), Ratchford and Stoops (1988), and Ratchford, Lee, and Sambandam (1993). From the psychological side, Shugan (1980) and Russo (1987) discuss the firm's ability to lower consumer search costs. An elegant derivation of the information argument is found in Ehrlich and Fisher (1982) as well as Haller and Ioannides (1992).

<sup>5</sup>In marketing, this line of work is represented by Anderson (1985), Anderson and Weitz (1986), and Heide and John (1990).

<sup>6</sup>A contingent price contract specifies a set of states and a price in each.

<sup>7</sup>When contracting problems do exist, these concerns are given much more attention.

<sup>8</sup>A game form is defined by a set of possible states of the world, a set of players, a set of strategies for each player, and a set of payoff functions that give each player's payoff for each possible profile of strategies, in each state of the world. For a given state of the world, or for a given probability distribution over states of the world, the game form generates a game.

<sup>9</sup>That is, if they can write complete contingent claims contracts without cost.

ing capability. The manufacturing tasks consist of writing the software, writing the manual, getting the disk to the consumer, and teaching the consumer how to use it. The relative difficulties of these tasks vary across different product designs: It is harder to write software that is easy to learn. It is the same with the information exchange tasks; one could imagine that different product designs can be evaluated with differing ease. I define the efficiency criterion in a sufficiently general form so that it applies across product designs, as well as across different ways of producing and selling a given design.

To keep things simple, we look at a single trading interface. In more complicated settings, the criterion applies for any pair of adjacent channel members.<sup>10</sup> Think of two parties, S (seller) and B (buyer). At the outset, S has raw materials and labor as well as preferences for leisure and money, whereas B has money and labor as well as preferences for a class of finished goods, leisure, and money.<sup>11</sup> We furthermore take as given the parties' initial information about each other and the product category. Let us now define a *game form* as a specific product design, an allocation of manufacturing tasks, and a process (a game) through which S and B can explore the possibilities for trade. For a given ex ante probability distribution over the states of the world (the preferences and seller types), we can define a set of equilibriums of this game form. Ex post, this leaves open the possibility that no trade occurs. Depending on the preferences and the way the players explore trading possibilities, it may be that no mutually beneficial trade is identified; that is, the trading game may have equilibriums with no trade. For a given game form  $g_1$ , we denote the set of equilibriums by  $\epsilon(g_1)$ . Let us now define  $G$  as the set of all game forms that S and B could play for a range of product designs. A *marketing design* is defined as a pair  $(g_i, e_i)$  consisting of a game form  $g_i \in G$  and an equilibrium thereof  $e_i \in \epsilon(g_i)$ . The efficiency criterion compares marketing designs in terms of ex ante expected payoffs. Specifically, for the seller the ex ante expected payoffs are the expectation (over states of the world and buyer types) of the probability of trade, the price net of seller manufacturing costs, and the costs of supplying information. For the buyer, the ex ante expected payoffs are the expectation (over states of the world and seller types) of the probability of trade, the utility net of price and buyer manufacturing costs, and the costs of acquiring information (i.e., out-of-pocket and time costs, including inconvenience). We label a marketing design  $(g_1, e_1)$  as inefficient if expected net payoffs are such that one or both of the two following conditions hold:

- (1)  $\exists e'_1 \in \epsilon(g_1)$ , which Pareto dominates  $e_1$ .<sup>12</sup>
- (2)  $\exists g_2 \in G, e_2 \in \epsilon(g_2)$ , which Pareto dominates  $e_1$ .

<sup>10</sup>It is important that the two parties are trading directly (vertically) with each other. The criterion does not apply to horizontal relationships (between competitors).

<sup>11</sup>More generally, S may have money and preferences for finished goods and B may have raw materials. These are, however, not necessary for the argument.

<sup>12</sup>Recall that the expected payoff vector  $(u_b, u_s)$  weakly Pareto dominates  $(u'_b, u'_s)$  if  $u_b \geq u'_b$  and  $u_s \geq u'_s$ . A payoff vector is Pareto efficient if it is undominated.

Both conditions formalize the intuitive claim that if the parties can find a game form and an equilibrium thereof that allows both to do better, they will do so. For example, in the bimatrix game  $b_1$

		<i>Column Player</i>	
		left	right
<i>Row Player</i>	up	1, 1	0, 0
	down	0, 0	2, 2

the content of Equation 1 is that the up, left equilibrium should not be played. To understand the content of Equation 2, suppose that both  $b_1$  and the bimatrix game  $b_2$

		<i>Column Player</i>	
		left	right
<i>Row Player</i>	up	1, 1	0, 0
	down	0, 0	3, 3

are feasible. The content of Equation 2 is then that the down, right equilibrium of  $b_1$  should not be played. To give a pair of examples from  $G$ , let the sequence of events in  $g_1$  be [Manufacturing Step 1 by seller]  $\rightarrow$  [Manufacturing Step 2 by seller]  $\rightarrow$  [Take-it-or-leave-it offer by seller]  $\rightarrow$  [Trade?]. Similarly, the sequence of events in could be [Manufacturing Step 1 by seller]  $\rightarrow$  [Bargaining]  $\rightarrow$  [Trade?]  $\rightarrow$  [Manufacturing Step 2 by buyer]. For this example, Equation 2 suggests that equilibriums of  $g_1$ , which are dominated by equilibriums of  $g_2$ , be ruled out. As a result, if all equilibriums of  $g_1$  are dominated in  $G$ ,  $g_1$  is ruled out by Equation 2.

We now discuss several difficulties one runs into when trying to apply the efficiency criterion:

1. The typical firm has many customers, and one might ask how the criterion applies to situations with one S and many, perhaps heterogeneous, Bs. It is not appropriate to consider each dyad separately, because many costs will be subject to scale effects (e.g., advertising, retailing). Consequently, if there are several heterogeneous Bs, the criterion must trade off the costs and benefits of customizing. If there are many very different Bs, Pareto dominance over all players will likely be a very weak criterion. On the other hand, if one is willing to weight the Bs equally, one could look for dominance in terms of firm profits and average (ex ante) expected buyer surplus. Even this is unlikely to isolate a single efficient marketing design because heterogeneity of buyers (or sellers) often favors differentiated marketing designs (Betancourt and Gautschi 1993).
2. In practice, it may be hard to search  $g_1$  for all alternative equilibriums and impossible to search  $G$  for all alternative marketing designs. Therefore, one should think of the efficiency criterion in analogy to a test of a theory. It rules out marketing designs that are known to fail it and tentatively accepts marketing designs that are not known to fail it. Most normative applications therefore will consist of pairwise comparisons between alternatives. For example, one could use the criterion to compare the marketing designs in which I got my grill with alternatives in which the factory assembles the product, the product is sold through mail order, or the product has foldable legs. If any of these alternatives can make both seller and buyer better off, the current marketing design is ineffi-

cient. Of course, a nontrivial amount of market research is needed to assess this. In principle, however, the criterion suggests that another marketing design be adopted if all parties prefer it.

3. Another potential problem is that it may be difficult to measure the costs associated with acquiring information. Some consumers find search enjoyable, others consider it a major inconvenience. In principle, one could rationalize almost any marketing design by postulating an appropriate cost picture. We do, however, have the ability to measure these things, and in normative applications such measurement might well be worth the effort.
4. A final problem is that Pareto domination is a weak criterion that often fails to rule out a large number of equilibriums. For example, in the game  $b_3$

		<i>Column Player</i>	
		left	right
<i>Row Player</i>	up	2, 2	0, 0
	down	0, 0	4, 1

neither up, left nor down, right is inefficient. On the other hand, the joint payoff (the sum of the payoffs) is higher in down, right, and one could ask about the relationship between efficiency and maximization of joint payoffs. In many cases it is possible to strengthen the criterion considerably by looking at this question.

**MAXIMIZATION OF JOINT PAYOFFS**

In the game  $b_3$ , one could imagine the Row player making a payment  $u$  to the Column player in exchange for the latter's playing "right." This modified game, called  $b_4$ , is as follows:

		<i>Column Player</i>	
		left	right
<i>Row Player</i>	up	2, 2	0, 0
	down	0, 0	$4 - u, 1 + u$

If  $u \in (1, 2)$ , the up, left equilibrium is inefficient, and our criterion has picked out the joint payoff maximizing marketing design. All game forms can be modified by such side payments, and if we allow them, efficiency is identical to joint payoff maximization. Any marketing design that does not maximize joint payoffs is inefficient relative to one in which the players agree to maximize joint payoffs while sharing the gains. If this is possible, the efficiency criterion is much stronger. Instead of looking for Pareto dominance, we are asking if one player could pay the others to use a different marketing design. The only additional condition is whether a nonzero side payment can be sustained in equilibrium.<sup>13</sup> Let us now look at this.

Consider again  $b_4$  and assume that Column plays before Row. If Column receives  $u$  before he or she plays, it is not an equilibrium for him or her to play right. So Row will expect Column to play left for any  $u$ , making  $u = 0$  the only

equilibrium. Conversely, if Column can receive  $u$  only after he or she has played right, it is not an equilibrium for Row to pay  $u > 0$ . So we have identified a set of circumstances under which the possibility of side payments is insufficient to make efficiency equivalent to joint payoff maximization.

Of course, this problem can be solved by a contract specifying, in the first case, that Column pay Row a fine if he or she fails to play right, and in the second case, that Row pay Column a fine if he or she fails to make the side payment. So efficiency only differs from joint payoff maximization if such contracts are infeasible.

Examples of this abound and have been the subject of "incomplete contracting" literature in economics (Grossman and Hart 1986; Tirole 1986; Williamson 1985, 1989). This literature (including Jeuland and Shugan 1983) has identified several types of contracting problems. One is the inability to foresee all contingencies. In the context of the previous example, if the players observe a contingency that is not covered by the contract, Row may refuse to play Column, and the latter would have no recourse. When this is sufficiently likely, only the original up, left equilibrium exists.

A second contracting problem is that a court may be unable to verify whether a condition has been met. This problem is often associated with levels of quality. For illustration, everybody may agree that one hamburger tastes better than another, but such things cannot be proved in a court of law. In the marketing area, the main examples of this are the literatures on "experience" goods (Nelson 1970) and search costs. The basis for the problem in the case of experience goods is that the parties find it costly or impossible to write a contract that guarantees quality or "fit" with the buyer's tastes. Given this, the buyer may be reluctant to "sink" the purchase price into the project. The parties therefore incur significant costs to create credible signals. In the case of search costs, the problem is that it is hard to verify that such costs have been incurred. So unless something increases the buyer's confidence, he or she may undertake too little search. (We return to these examples subsequently.)

Another class of examples is that in which sellers have market power but are subject to certain restrictions on contracting.<sup>14</sup> One well-known problem is that a monopolist, not allowed or able to price discriminate, will produce too little output. A more complex but similar problem is illustrated by Schmalensee's (1978) model, in which firms may invest in too much product variety to preempt competitors. The change to lower levels of variety is blocked for many reasons, one being that it is illegal for the firms to write contracts with consumers agreeing to keep the best level of variety in return for boycott of any new entrant. It is important to note that this would not require horizontal contracts between the firms; the theory operates at the level of vertical contracts only.

In other cases, the costs of contracting outweigh the gains. In the preemption model, it would be very costly to write, enforce, and monitor the hypothetical contracts. As another example, note that in the employment relationship

<sup>13</sup>Because we are talking about a class of game forms with trade involving money, the case of nontransferable utility can be ignored.

<sup>14</sup>Here we are concerned with restrictions on contracting, which matter when competition fails to discipline a seller. Power differences between buyers and sellers are immaterial to the argument.

between a business executive and a secretary, it may be prohibitively costly to contract over each service as it comes up.<sup>15</sup> Another example (suggested by a referee) is that movie theaters prohibit customers from bringing their own food, even though the latter might fit their tastes better than that available in the theatre lobby. The reason for this is presumably that though maximization of joint payoff calls for varying the price of admission on the basis of the amount and type of food taken, it would be costly to develop and implement such a pricing contract. By taking the markup on the food in the lobby, the ideal is approximated.

Recall that the claim is that joint payoff maximization should be observed unless contracting problems exist. In many marketing applications it is hard to evaluate the extent and nature of relevant contracting problems and even harder to ascertain whether joint surplus maximization is achieved. The problems are that we lack a taxonomy of contracting problems, that (as in the preemption example) one often can suggest several candidates, and that it is difficult to scan the space of marketing designs. Some examples follow:

1. When a manufacturer introduces a new product, retailers often get a lump sum, the "slotting allowance," in return for putting the new product on their shelves. This runs counter to joint payoff maximization if we see "too much" space being given to failing or marginal products, given their odds of success. It is clearly very difficult to evaluate whether this is the case. If we judge that joint payoff maximization is not achieved, different interpretations suggest different contracting problems. In the typical interpretation, slotting allowances are a sign of retailer power, the idea being that the retailer threatens to "hold up" to manufacturers and extracts a "bribe." In this interpretation, this happens because the manufacturer cannot contractually commit to maintain lower prices even after he or she has established a consumer franchise. However, Chu (1992) shows that another explanation is feasible: The idea is that the manufacturer has better information about the likelihood that the product will be a success. His or her willingness to pay a slotting allowance may be a credible signal of this information. So the retailer can identify products with high and low probability of success by the manufacturer's willingness to pay slotting allowances. In this interpretation, the contracting problem is that the manufacturer's private information is unverifiable.
2. It is well known that a bargainer can maximize profits by committing to a take-it-or-leave-it offer. In cases in which the other bargainer has private information, this may result in lost gains from trade because that information only gets used in a very coarse way. It is therefore an apparent conflict with the hypothesis of joint surplus maximization that so many retailers commit themselves to firm prices through advertising. Once again, several explanations are possible. The illegality of price discrimination is one obvious contractual barrier to joint payoff maximization. Also, most incidents of advertised retail prices involve some travel or search investments by the buyer. If the parties bargain after the buyer's arrival, these investments will be sunk costs for which compensation cannot be expected. Therefore, the buyer may decide not to come unless guaranteed a certain price. In fact, Wernerfelt (1994b) shows that this may yield more joint payoff than bargaining<sup>16</sup>

<sup>15</sup>This can be used to justify the employment relationship (Wernerfelt 1993).

<sup>16</sup>Another practice, also analyzed in Wernerfelt (1994b), calls for several sellers to collocate, such that the buyer is guaranteed bargaining power.

(see also Chen and Rosenthal 1994; Simester 1992, 1993). Although this interpretation still does not suggest that joint payoff is maximized, it does suggest that the contractual difficulty lies in the impossibility of contracting prior to investments in search and travel.

These examples are intended to illustrate the difficulties one encounters if one tries to check whether joint payoff maximization is achieved or to ascertain why it is not. The space of possible marketing designs is very large, and we do not even have a workable taxonomy of contracting problems. Consequently, there are "too many" explanatory degrees of freedom, and the theory has a tautological flavor.

In general, it is hard to evaluate how frequent and important contracting problems are. Williamson (1991) has rather forcefully made the claim that such strategic (i.e., motivated by contracting problems) distortions are rare, and some of the admittedly sparse empirical evidence (e.g., Gilbert and Lieberman 1987) supports him. To the extent that this is true, efficiency is a much stronger criterion (because we are comparing scalars rather than vectors). On the other hand, one suspects that the payoffs from applying the criterion are larger in the more difficult cases in which joint payoffs cannot be maximized. From a practical perspective we do not need to know if joint surplus is maximized; we can use the criterion myopically by asking if one player can pay another to change to another marketing design. We now discuss the positive properties of the criterion.

#### SELECTED CORROBORATIVE EVIDENCE

I hasten to admit that the efficiency criterion is weak as a positive theory. Almost any marketing design can be explained with reference to suitably specified contracting problems, and the latter are hard to verify. The theory may be best when used normatively. On the other hand, I do believe that the theory has predictive powers. To illustrate the breadth of the theory and guard against the many possible alternative explanations, I will not present a single "test," but an array of suggestive facts.

Given that the strength of the efficiency criterion lies in trade-offs between different types of seller effort and between seller and buyer effort, I focus on implications in those areas. The chosen implications are clearly only a small subset of the set implied and each has several alternative explanations. However, the preliminary tests of these implications are supportive of the descriptive validity of the efficiency framework. Of course, an important task for researchers in the future is to subject other hypotheses that follow from positive use of the criterion to full-fledged empirical tests.

Efficient allocation of manufacturing tasks among channel members is consistent with Bucklin's (1967, 1972) "economic" theory of channel structure and is by now not a controversial idea. We therefore focus on some implications about the use of efficient marketing designs for information exchange. Of course, all implications are *ceteris paribus*.

The first set of implications are consistent with the general household production model:

1. *Products with lower unit sales are more likely to be sold through mail order.* This is the result of Lilien (1979), who finds more use of mail order (as opposed to sales forces) when

sales volume is small and customers are few. To understand the rationale, consider an item such as extra-wide shoes. It would be very expensive to provide low-cost inspection opportunities in the form of many retail stores; thus, the solution of mail-order sales with rights to return. Of the top 50 catalogs, 20 sell primarily apparel, 8 sell primarily gifts, and 5 sell primarily plant seeds (Direct Marketing Association 1991). In contrast, none of the *Fortune* 50 retailers fall in any of the last two categories (*Fortune* 1992).

2. *More knowledgeable buyers are more likely to purchase through mail order.* The argument is that if products are standardized, then the value of direct inspection and sales assistance in retail stores for these buyers is lower (Alba and Hutchinson 1987; Wernerfelt 1994b). Investigating this, Kim (1992) finds that second-time buyers are more likely to use mail order than are first-time buyers. For video cameras the percentages are 9.6% and 5.3%, and for personal computers, 28% and 5%. This is consistent with Lele's (1986) suggestion that retailers should add less value later in the product life cycle.
3. *Advertising most often is done by the most concentrated side of the market.* As an example, consider the fact that dated airline tickets often are advertised in the classifieds or elsewhere, as in the recent advertisement on an MIT bulletin board that offered to barter a Boston-New York City 12/13 airline ticket for a bike. Because the former is held by fewer people than the latter, the ticket holder should advertise rather than wait for the reverse offer. The idea is that advertising is most cost-effective if it reaches more people. Another way of putting this (suggested by a referee) is that a player chooses to signal (advertise) if the cost of search is high (because the other side of the market is thin). It is possible that one could test this more formally by some sort of taxonomy for "help wanted" and "available for employment" advertisements.

Similar evidence is found in other categories. If a shop wants to purchase antiques, the ad will say "antiques wanted," whereas a personal ad to sell will specify "antique pumpkin pine cupboard with ball feet." If there are more antique owners than shops and very few sellers of specific antiques, this is consistent with our hypothesis. As a final example we can look at the real estate market. The vast majority of ads are put in by sellers, whereas buyers advertise only when their needs are very unusual. In the limit, when the potential trading partners are few and known, they are contacted with addressable media. This is the case when, for example, professional athletes sell their services to teams.

4. *Products that require more search rely more on retail support.* This is essentially the hypothesis tested by the "household production" studies mentioned previously (Betancourt and Gautschi 1990, 1991, 1993; Ratchford, Lee, and Sambandam 1993; Ratchford and Stoops 1988). The idea is that if more search is required, the customer is willing to pay a higher price in exchange for search convenience; so there should be more sales assistants and/or more or bigger outlets, which again will imply fewer sales per employee or square foot and thus a higher margin.

As additional evidence, I looked at the sales per employee for selected types of retailers. On the assumption that women's attire is more differentiated than men's and therefore requires more search, I compared across gender. For women's shoes, the number (in 1987) was \$64.583, whereas for men it was \$85.714. For women's apparel it was \$62.053, whereas for men it was \$78.261 (*Census of Retail Trade* 1987). As documented by Pashigian (1988), the margins for women's clothing are higher than for men's (though there are also other reasons for this). An analog implication can be derived by focusing on the cost (instead of the productivity) of search.

5. *The seller incurs more information supply costs when the buyer's cost of time is higher.* The idea is that in this case it is more efficient for the seller to incur the expense to supply easy-to-use information. This explains the heavy reliance on personal selling in industrial markets and is also consistent with Betancourt and Gautschi's (1990) analysis of retail assortments. Extreme examples are private at-home showings of apparel for VIPs, videotapes of expensive homes, and free trial periods of luxury cars, as well as the recent success of the Home Shopping Network and QVC. A more mundane observation, which I will not document, is that discount stores have fewer sales assistants (and longer checkout lines). More systematic evidence is provided by Pashigian and Bowen (1990), who relate the use of brand names to rates of workforce participation. This logic enables us to develop a parallel implication about the allocation of manufacturing effort between consumers and other channel members.

6. *The seller performs more of the manufacturing function for more luxurious products.* The argument is the same as the previous implication, except now the focus is on manufacturing costs rather than information costs. If the buyer's cost of time is relatively high, it is more efficient for the seller to assemble and deliver the product. To support this, I performed a simple statistical test of the hypothesis that people with higher incomes undertake less do-it-yourself auto repair. As an estimate of need-adjusted do-it-yourself repairs in different U.S. states, I calculated PARTS, the ratio of retail auto part sales to gasoline sales in 46 of the lower states (*Census of Retail Trade* 1987). The idea was to see if states with higher income populations scored lower on PARTS. I use the label YPC for 1987 per capita income (*Statistical Abstract of the United States* 1992). The correlation between PARTS and YPC is  $-.29$ , which implies a  $t$ -value of 2.01. Although the result is not highly significant, it is consistent with the theory.<sup>17</sup>

To move beyond standard applications of the household production model, I now focus on contracting problems and their implications. A very pervasive contracting problem in marketing is caused by search costs, which are sunk and generally nonverifiable. As mentioned previously, this causes efficiency to differ from joint payoff maximization and may explain many seemingly inoptimal practices. Advertising of firm prices and competitive colocation, as discussed previously, are examples. So is a recent advertising campaign, in which a car manufacturer offered to pay \$100 to consumers who tried his car and yet bought another.<sup>18</sup> Another set of examples is provided by the literature on experience goods (Nelson 1970), in which search costs in some sense include the price of the product. The literature on this topic provides us with some simple implications.

7. *Higher levels of advertising are needed for higher levels of quality.* This view of advertising as public "burning of money" (and thus inconsistent with maximization of joint surplus) is due to Nelson (1970) and has been formalized by Milgrom and Roberts (1986). On the assumption that many consumers initially are uninformed about quality, the idea is that the firm can only afford to burn money if its quality is high, because otherwise it will get insufficient repeat business to make up the initial loss. Consumers are posited to understand this and make inferences. In the marketing literature a

<sup>17</sup>As usual, numerous alternative explanations exist. One, from Anne Coughlan, is that the average car is older in lower income states. Attempts to capture this in the data have not been successful, in the sense that this control variable tends to have the "wrong" sign. Another explanation, from John Little, is that the average car is harder to repair in higher income states.

<sup>18</sup>This has both a reimbursement effect and a signaling effect.

positive and significant relationship between perceived quality and advertising has been found by Kirmani and Wright (1989). An alternative to money burning is for the firm to post a reputational bond on which it does not expect to default. I have elsewhere (Wernerfelt 1988) interpreted this as umbrella branding. Given that this is cheaper, one would expect many firms to do so, and in Montgomery and Wernerfelt (1992), we find that fully 83% of products evaluated by *Consumer Reports* were umbrella-branded.

8. *Unconditional guarantees are important to the success of mail order operations.* Mail order purchase in some sense turns most products into experience goods, such that low search costs, in this case low purchase risk, is important. According to the *Statistical Fact Book* (Direct Marketing Association 1991), 85% of U.S. mail order sellers offer unconditional guarantees, whereas very few retail stores offer such guarantees.<sup>19</sup> Fanning (1993) asked a sample of U.S. mail order executives to rate the importance of 17 critical success factors. "Quickness of claims settlement" came in second, and "Having a full return guarantee" was fourth.

It should be clear that these implications are not "tests" of the positive applicability of the efficiency criterion. I knew what the numbers were before I selected them for inclusion. It will be important to perform "real" tests, in which hypotheses are stated prior to data collection. Given the generality of the criterion, one could imagine an unlimited number of tests. However, it will probably be most useful to focus on the areas in which the positive implications of the criterion differ most from more traditional views of marketing. One such area is the role of the consumer in the manufacturing and information exchange processes. It should be possible to develop some data on the relationship between gross consumer surplus and nonprice consumer costs. Because the consumer should be rewarded for participation in manufacturing and information exchange, this relationship should be positive.

### CONCLUSION

In this article, I explore the power of the simple criterion that vertical allocation of manufacturing and information exchange tasks should not include Pareto dominated marketing designs. The main value of the criterion is that it provides a metric for comparing very different marketing designs. The criterion does not enhance our ability to optimize given designs by, for example, choosing between prices or advertising campaigns. For these questions, we have known, unidimensional metrics (e.g., profits, awareness) at our disposal. The criterion enables us to go a step further by comparing individually optimized designs, such that we can make choices in matters of institutional and product design. For example: Given the best execution of each alternative design, should we charge a fixed price or bargain? Should we offer sales assistance or not? Should we sell through mail order or retail stores? Should we own our distributors? Should we locate in a mall with competitors or by ourselves? Should we offer installation? Should we offer a more user-friendly design? Should we reduce the weight and durability of the product? and so on. Compared with

tactical questions about price levels and copy choice, these design questions are more difficult but also logically prior.

As an example, consider Calyx and Corolla, a mail order company selling freshly cut flowers (Harvard Business School case 7-592-035). The main components of total surplus for the mail order format are growing costs, Federal Express costs, mail order information processing costs, and customer utility. For the competing flower shops, the main components are growing costs, retailing costs, shopping costs, and customer utility. For some segments, mail order offers much lower utility because of the one-day delivery lag. For others, however, their lower costs and longer-lived flowers dominate.

It is interesting to compare the efficiency criterion with the classical "4P" framework. Although the two perspectives pertain to the same class of phenomena, the ordering of them is quite different. The efficiency criterion suggests that design decisions be categorized as final product design, manufacturing process design, and trading process design. The channel ("place" in the 4P framework) may perform both manufacturing and information supply tasks. In fact, it has no function beyond its role in accomplishing these two tasks. The most important difference, however, is that the 4P framework emphasizes the decisions of the seller, keeping the buyer rather passive. In contrast, the efficiency criterion portrays the trading relationship as more symmetrical and makes explicit use of the buyer's participation in manufacturing and especially trading processes. The seller is seen as the designer of the process, rather than the outcome. For example, the seller may elect to post a firm price, but his or her first choice concerns a price determination process as part of a trading process. The two approaches can be characterized as "game theoretic" versus "decision theoretic." The decision-theoretic approach starts out looking for the design that is "best" for the seller, whereas the game-theoretic approach suggests that this can be found by first looking at those designs that are best for both parties.

A game-theoretic approach is important if the buyer is an active and rational participant in the market. The difference will be seen most acutely in the information acquisition part of the trading process. By worrying about the buyer's costs of acquiring information and the seller's costs of making this information credible and reliable, we may see many marketing phenomena in a new and perhaps sharper light. For example, efforts to decrease the buyer's cost of acquiring information takes many forms. Advertising on television is accessible to the buyer with no incremental effort, and advertising in the mail is almost as cheap to access. Retail showrooms are generally located close to homes and other destinations of buyers (e.g., malls). This serves the function of allocating transportation costs for completed trades, but it also reduces the buyer's costs of evaluating the product. Continuing with the examples, salesmen are used to help the buyer map his or her preferences to the characteristics of product assortments (Wernerfelt 1994a), and various matching specialists, such as real estate or travel agents, are used when the product space is very large.

One can question the assumptions about consumer rationality, which underlie the efficiency criterion. In contrast to firms, consumers are trading in many markets and could

<sup>19</sup>Almost all "unconditional guarantees" involve some return costs for the buyer. However, these are generally lower than if no explicit guarantee is offered.

thus be expected to be less sophisticated players. Furthermore, consumers are not disciplined by competition in the same (short-term) way firms are. So one could argue that it is unreasonable to assume that those buyers who are consumers are just as rational as firms. I do not dispute this point, but given the difficulties of specifying bounded rationality, it may be useful to start with the extreme case of full rationality.

Another main conceptual restriction on the criterion is that the definition of efficiency requires that customer preferences be exogenous. In fact, the concept of relative efficiency is not defined unless preferences are fixed.<sup>20</sup> On the other hand, joint payoffs are defined for endogenous preferences, and to the extent that efficiency reduces to maximization of joint payoffs, our criterion applies.

In summary, I have proposed a weak normative criterion, which can be applied by posing two easy questions:

1. Does one alternative make all parties better off?
2. Is it possible that some players can, and will, pay others such that they agree to a change?

The strength of the criterion is that it allows normative comparisons of a very large set of practices. It should be especially useful for choices among alternative designs of products, channels, and trading processes.

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