Information and Consumer Behavior

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Consumers are continually making choices among products, the consequences of which they are but dimly aware. Not only do consumers lack full information about the prices of goods, but their information is probably even poorer about the quality variation of products simply because the latter information is more difficult to obtain. One can, for example, readily determine the price of a television set; it is more difficult to determine its performance characteristics under various conditions or its expected need for repairs.

This article contends that limitations of consumer information about quality have profound effects upon the market structure of consumer goods. In particular, monopoly power for a consumer good will be greater if consumers know about the quality of only a few brands of that good. This is a significant departure from the literature. Economists have long been interested in the determinants of monopoly power, but studies have always concentrated on the production function or market-size variables. I try to show that consumer behavior is also relevant to the determination of monopoly power in consumer industries.

Location theory has also ignored the consumer's lack of information. Since many trips to a store are, in part, quests for information, the location of retail stores can be profoundly affected by consumer efforts to acquire information.

I shall also try to show that advertising and inventory policy are affected by consumer ignorance about quality differences among brands. All of these impacts of consumer ignorance have remained unexplored because economists have not developed a systematic analysis of consumer quests for information about quality differences.

Information about quality differs from information about price because the former is usually more expensive to buy than the latter. Indeed this is one reason we expect the variance in the utility of quality facing a consumer to be greater than the variance in the utility of price.

This difference in the price of information can lead to fundamentally different kinds of consumer behavior. Information abort quality can be purchased by the same procedures as those used in acquiring price information. But, if the cost of these procedures rises sufficiently high, the consumer will try to get that information in other ways.

The most obvious procedure available to the consumer in obtaining information about price or quality is search. We define search somewhat more narrowly than Stigler's use of the same concept (Stigler 1961, 1962). We assume that consumers already know where they can obtain each of the options open to them. Their information problem is to evaluate the utility of each option. We define search to include any way of evaluating these options subject to two restrictions: (1) The consumer must inspect the option, and (2) that inspection must occur prior to purchasing the brand.

A consumer can search for quality as well as price. A consumer trying on a dress differs from a consumer determining the price of a dress only because the time required to try on a dress is longer.

But there will be goods for which this search procedure is inappropriate —goods it will pay the consumer to evaluate by purchase rather than by search. If the purchase price is low enough, any even moderately expensive search procedure would be ruled out.

To evaluate brands of canned tuna fish, for example, the consumer would almost certainly purchase brands of tuna fish for consumption. He could, then, determine from several purchases which brand he preferred. We will call this information process "experience."

For tuna fish there is no effective search alternative open. At the low price of experience, there is insufficient demand for specialized establishments selling tastes of various brands of tuna fish.

Consumers can prefer information by way of experience rather than by way of search even when experience is expensive. Search can be even more expensive. In purchasing most appliances, consumers are confronted with this problem. Determining by inspection the time stream of services from alternative brands of an appliance is an exceedingly difficult job. Hence, experience might well be employed as the cheaper information procedure.

Neither search nor experience need be conducted at random. Prior to sampling, a consumer can obtain information from relatives and friends, consumer magazines, or even from advertising. The consumer has to decide whether he will use this prior information as a guide to his sampling for any particular good.

This article examines all these means of information acquisition. The purpose of this examination is to discover the impact of the consumer's information purchases on the market behavior of consumer goods.

Search and Experience: Theory

What predictions can we make about the market behavior of search and experience goods? To answer this question we need a theory of search and experience. Stigler has already developed a theory of search (Stigler 1916, 1962).[1] His model is appropriate for the following conditions: Suppose that a consumer has to decide on the number of searches he will undertake prior to searching. After he has searched, he can, then, choose the best of the set of alternatives he has examined. Assume further that he must search by random sampling and that he knows the form of the probability distribution of his options.

Given these assumptions, the appropriate model to determine the optimum number of searches is easily constructed. To maximize expected utility, a person will search until the marginal expected cost of search becomes greater than its marginal expected return. Marginal cost is derived from a cost function—the cost of searches in utility terms as related to the number of searches. Marginal expected return for the *i*th search is the difference between the expected present value of the utility of the best option in i searches minus this expected value for $i - 1$ searches, or

$$MR_i = E_p(B_i) - E_p(B_{i-1}), \tag{1}$$

where $E_p(B_i)$ = the expected value in utility terms of the present value of the best of i options.

To make equation (1) determinate, it is necessary to specify the probability distribution of the utility of options. (Henceforth we will call this probability distribution simply the utility distribution.) The simplest distributions to work with are the rectangular and normal distributions. All of our work will be with these distributions.

Information by way of experience requires a somewhat different analysis. After using a brand, its price and quality can be combined to give us posterior estimates of the utility of its purchase. Prior to using the brand, all the consumer knows is its price. But this knowledge provides only the roughest sort of guide to choice, for the consumer must assume a generally positive relationship between price and quality. In the absence of any other information, the consumer would not know if he were better off experimenting with low- or high-priced brands.

To simplify our analysis of the experience case, we assume that consumers either sample at random from among all brands or from among those brands in the price range the consumer deems appropriate for himself. In the latter case, one simply translates all references to the probability distribution of utility by brands into references to the appropriate subset of that distribution.

[1] Stigler's theory is a prior theory of search, rather than the more appropriate sequential decision analysis. That is, in Stigler's model the consumer must decide prior to searching how many searches he will undertake. A consumer can do better by searching until he finds a good that is better than some minimum level of utility. To keep the discussion simple, we also confine our analysis to prior decision models. However, I have developed an analysis of the sequential decision case. The results of that analysis are tabulated along with the results of the prior decision model.

To analyze the experience case, more assumptions are required. We assume that having experienced n brands of the same product, the consumer is able to determine with certainty his most preferred brand among the n. Further, this most preferred brand among the n will remain so over time. We assume further that the only way to experience a brand is to purchase it.

Just as in the case of search, the consumer should purchase information by way of experience until the marginal cost of information becomes greater than its marginal return. In our experience case, information can be acquired only by purchasing a different brand and thereby learning which brand is best for a larger set of brands. This best of a larger set will tend to have a higher utility in future consumption. The marginal return to information remains as it was in equation (1). The marginal expected return for the ith experiment is the difference between the expected present value of the utility of the best of i brands minus this expected value for $i - 1$ experiments.

Marginal cost will be different in the experience case from that in the case of search. In contrast to search, the expected cost of information in the experience case depends on the utility distribution. The marginal cost of an experiment is the loss in utility from consuming a brand at random rather than using the best brand that one has already discovered. The expected value of this marginal cost for the ith experiment (evaluated at that time period) is

$$MC_i = E(B_{i-1}) - u, \tag{2}$$

where $E(B_{i-1})$ = the expected value of the utility of the best brand in $i - 1$ random choices, u = the mean of the utility distribution, and $i > 1$. The utility the consumer expects if he uses the best brand already available is $E(B_{i-1})$; u is the utility he expects if he continues to sample at random.

The marginal cost of experience can now be compared with its marginal return, if the latter is converted from present value terms. That is, the marginal cost of equation (2) is a once-for-all cost, while the marginal return of equation (1) is a return reaped in continued purchase of the commodity. We can easily convert the $E_p(B_i)$ of equation (1) to $E(B_i)$. The expected present value of the marginal revenue at the time of the ith purchase of information becomes:

$$MR_i = [E(B_i) - E(B_{i-1})] \sum_{y=1}^{ft-i+1} \frac{1}{(1+s)^y}, \tag{3}$$

where f = number of times per year the product is purchased; t = number of years over which purchases will occur; s = interest rate over the period of one purchase = $(1 + a)^{1/f} - 1$; and, a = annual interest rate.

We can simplify the expression for the sum in equation (3). Then the equilibrium number of experiments is given by the maximum i, such that the marginal cost is less than or equal to the marginal return, or

$$E(B_{i-1}) - u \leq [E(B_i) - E(B_{i-1})]\frac{1}{s}\left(1 - \frac{(1+s)^i}{(1+s)^{ft+1}}\right). \tag{4}$$

Solutions[2] to equation (4) for both the normal and rectangular distributions for a variety of values of f are given in table 1. Assumed is an annual interest rate of 10 percent and $t \rightarrow \infty$. Table 1 delivers a fairly clear message. The number of experiments with brands of a product is closely related to the frequency of purchase of that product. This conclusion holds whatever the probability distribution might be. In equation (4), the derivative of the marginal revenue with respect to frequency of purchase is positive. Hence, increasing the frequency of purchase shifts the marginal revenue curve to the right. This, of course, produces a greater equilibrium value of i with increasing frequency of purchase.

This variation in the number of experiments can have profound effects upon variation in market structure. If a consumer chooses his experiments at random, then only those brands with which a consumer experiments compete with each other for that consumer's favor after he has finished experimenting. Since the elasticity of demand facing a brand is a function

TABLE 1

Sample Size by Frequency of Purchase for $t \rightarrow \infty$*

	Sequential Decision		Prior Decision			
	Experience (Expected Sample Size)		Experience (Sample Size)		Search (Minimum Sample Size)	
Frequency per Year	Normal	Rectangular	Normal	Rectangular	Normal	Rectangular
0.2	2.87	2.6	2	2	4	4
0.5	4.08	3.4	4	3	5	4
1.0	5.76	4.3	5	5	7	6
2.0	8.40	5.6	8	7	10	8
12.0	26.6	12.2	26	16	31	17
52.0	79.7	26.0	80–75†	32	...	...
365.0	391.0	58.8	400–350†	84	...	...

* An annual interest rate of 10% is assumed.
† The answer falls within this range.

[2] The solution for i in equation (4) depends upon the utility distribution. If this distribution were rectangular and we assume $t \rightarrow \infty$, then i = maximum i such that

$$i \leq .5 + \sqrt{\frac{2}{s} + 2.25}.$$

of the number of close substitutes which a consumer can compare, the number of these experiments will control the brand's elasticity of demand for those who have finished experimenting.

What about the elasticity of demand for those who have not finished experimenting? If the consumer samples at random, that elasticity of demand must be zero. The overall elasticity of demand is a weighted average of the experimental and the postexperimental elasticities. The weights are the present value of the quantities purchased during the two periods. In our special case—where the life-span of the consumer is indefinitely long ($t \to \infty$)—the weight to the experimental elasticity is:

$$W_E = 1 - \frac{1}{(1+s)^n} = 1 - \frac{1}{(1+a)^{n/f}}, \tag{5}$$

where a = the annual interest rate, and n = sample size.[3]

As table 1 indicates, n/f is a decreasing function (at least for the rectangular and normal distributions) of the frequency of purchase. In consequence, the impact of the elasticity of demand for the experimental period will be greater for low-frequency goods. What is more, this effect can be quite important, since the weight given to the experimental period will not be negligible for low-frequency goods.

The elasticity of demand facing the firm is a true measure of monopoly power; the empirical measure of monopoly power usually used is the concentration ratio. If consumers sampled at random, the forces we have examined would have no impact on the concentration ratio in spite of their profound impact on elasticity of demand. But different consumers will tend to experiment with the same brand. As we shall see in the later sections of this paper, much of their experimenting will be based on prior information from either friends or from advertising. Both information systems will produce a relationship between the brands used in the experiments by one consumer and those used by another.

If there is some tendency for consumers to choose the same brands for their experiments, there will be a positive relationship between the number of experiments each consumer makes and the number of brands a market can support. In the extreme case, where all consumers experiment with exactly the same brands, the optimum number of experiments sets an

[3] The present value of purchases during the experimental period is

$$\sum_{j=1}^{n} \frac{1}{(1+s)} j.$$

The present value of purchases overall is

$$\sum_{j=1}^{\infty} = \frac{1}{(1+s)} j.$$

Equation (5) is the ratio of the former to the latter.

upper limit to the possible number of brands on the market. But such perfect correlation of consumer experiments is not required for our results. With any positive correlation, the ratio of consumers experimenting with the nth most likely brand to those experimenting with the $(n + m)$th most likely brand will decline as the number of experiments increases. In consequence, customers will be concentrated among fewer brands, the fewer the number of experiments they make.

Prior information will tend to blur the relationship between elasticity of demand and the number of experiments, because this prior information directly or indirectly involves some comparison of the experimental brands with some brands the consumer does not choose for his experiments. At the same time, this prior information tends to produce a relationship between measured monopoly power and the number of experiments a consumer makes.

This relationship between market structure and the sample size of consumers need not confine itself to experience goods. In particular, we expect a systematic difference in the sample size when information is acquired by search rather than experience. By the previous argument, this should produce a systematic difference in market structure for goods utilizing the two information systems.

For any good, the consumer has a choice between searching or experimenting to obtain information about the good's qualities. The cost of experimenting sets an upper limit to the cost of search that a person is willing to undergo. For the same good, the marginal revenue curve of sampling will be substantially the same for both search and experience.[4] Hence we would expect the decision to search for a good to lead to a greater sample size than the decision to experience for that good.[5]

Now let us vary goods. In so doing we will vary the mean and the standard deviation of the utility distribution of the goods, but we will hold both the frequency of purchase and the form of the utility distribution constant. The sample size appropriate for experimentation remains invariant.[6] Hence one would decide to search for any good in this class only if this led to a larger sample size than the sample size appropriate for experience for *all* goods in this class. While we cannot control for shape of the utility distribution, we can control for frequency of purchase. Treating the former as a random variable, we predict a larger sample size for

[4] There is a slight difference in marginal revenue curves because there is some difference in appropriate discounting procedures in the two cases. Our tabulated results take account of this quite negligible difference.

[5] If the marginal cost curves of the two were the same shape, the argument in terms of overall costs would be sufficient. In fact, the marginal cost curve for experience rises. If the marginal cost of search were constant, the differences in the shape of the marginal cost curve would further fortify the above result.

[6] Both the marginal revenue and marginal cost of experience are directly proportional to the standard deviation of the utility distribution. Hence if the two were equal for one standard deviation, they would be equal for another.

search than for experience, holding frequency of purchase constant. Table 1 records the minimum number of searches for various frequencies of purchase.

This result has important consequences for the expected monopoly power of products for which consumers search rather than experiment. As we argued earlier, the larger the number of brands a consumer samples, the lower the monopoly power for that good. The greater number of searches, holding frequency of purchase constant, will tend, therefore, to produce lower monopoly power for search products.

There is an additional characteristic of search that reinforces this conclusion. Search does not require purchasing the good, while experiencing a good usually does. Hence the zero elasticity of demand during the experimental period will not lower the elasticity of demand for search goods as it lowers the elasticity of demand for experience goods.

There is one more implication of our model. The minimum number of searches that it pays to use for high frequency of purchase goods is far higher than the minimum number of searches it pays to use for low frequency of purchase goods. The experience option rules out anything but the cheapest search procedures (relative to the standard deviation of the utility distribution) in the former case. We would, therefore, predict larger sample sizes for search for nondurable goods than for search for durable goods.

Search and Experience: Classification and Test

In order to test our hypotheses, we must be able to make better than random guesses about which goods belong in the search category and which belong in the experience category.

Experience will be used when search becomes too expensive. One of the qualities most difficult to determine prior to purchase is the repair expenditures a durable good will require. Hence, for durable goods we have an obvious criterion for experience goods: those in which the ratio of repair expenditures to sales is high. (It seems reasonable to assume that the variance in repair expenditures will be a function of the level of repair expenditures.) This measure will also catch another feature of experience goods. Those goods with high repair expenditures probably also have a high incidence of performance defects not serious enough to justify repairs at the given level of repair costs. In consequence, we expect the variance in qualities requiring experience to ascertain to increase as the level of repair expenditures increases.

With extant data there is only one easily applicable measure of repair expenditures: the nonmerchandise receipts of stores specializing in selling a given kind of merchandise. A classification based on this information is contained in table 2. Obviously, repairs are only one source of nonmerchandise receipts; but it is a sufficiently important component that

TABLE 2

ESTIMATES OF THE RATIO OF REPAIR EXPENDITURES TO SALES BY GOOD, 1963

Goods	Nonmerchandise Receipts*	Total Repair†
Experience goods:		
Jewelry	12.6	17.3
Typewriters	8.8	...
Radio, television	8.1	24.3‡
Tire, battery	7.5	...
Aircraft, boats, motorcycles	7.0	...
Heating and plumbing	6.4	...
Bicycles	6.0	...
Automobiles	5.7	30.0§
Music instruments	4.9	10.7
Appliances	4.4	14.0
Search goods:		
Floor covering	3.8	...
Garden implements	3.5	...
Sporting goods	2.8	...
Household trailers	2.5	...
Cameras	2.4	...
Furniture	2.1‖	7.6
Paint and mirrors	1.9	...
China, glassware	1.9	...
Hardware	1.6	...
Hobbies, games	0.8	...

* The percentage of nonmerchandise receipts to sales of stores specializing in the sale of the specified good.

† To the percentage of nonmerchandise receipts, we add the ratio of the receipts of service specialists to the sales of the good for those goods whose service specialists are specified in the U.S. Bureau of the Census (1966*b*).

‡ The U.S. Commerce Department estimates this percentage as roughly 29% (U.S. Department of Commerce 1964).

§ Commerce estimates for this percentage is roughly 23%.

‖ Furniture stores have a percentage of nonmerchandise receipts of 2.7. But they also sell television and appliances. The tabulated figure adjusts for the proportion of sales in the three categories.

there should be some correspondence between our measure and what we are trying to measure.

For certain goods, we can also make estimates of total repair expenditures by adding to the percentage of nonmerchandise receipts the ratio of services of repair specialists to total sales. This procedure is limited by the availability of data on repair-service firms. Table 2 shows some differences in ranking of goods by these two measures. However, we can devise a single classification procedure appropriate for either measure. The advantage of this classification procedure is its objective nature. Half the durable goods are placed in the experience category; half in the search category.

There are two obvious mistakes in classification contained in table 2: (1) The high level of repair expenditures for jewelry stores must be almost wholly produced by watch repairs. It makes sense to classify the rest of jewelry as a search good. (2) In spite of its low repair expenditures, paint is not a good whose quality variation can be determined by search. The properties of paint can be determined prior to use only with the greatest difficulty. Hence it makes sense to classify paint as an experience good. We shall use both the original and revised classifications.[7] The latter makes more sense, but the former is based on more objective information.

Admittedly both our classification procedures are exceedingly crude. This will have an impact, since random errors in classification tend to bias results toward zero. The relationships examined in this article will have to be powerful indeed to overcome the effect of such bias.

For nondurable goods, there is no similar data to back a classification procedure, but there is a simple principle that leads to very little ambiguity in classification. A nondurable good is classed as an experience good where sampling is destructive. Strict application of this principle leads to a classification with only clothing and clothing-related products in the search category and all other nondurables in the experience category.[8]

With these classifications, we can test our theory about the relationship between monopoly power and the sample size of consumers. We predict the following relationships: (1) higher concentration ratios for low-frequency goods than for high-frequency goods for both experience and search goods; (2) higher concentration ratios for experience goods than for search goods, holding frequency of purchase constant.

To test our hypotheses we use concentration ratios for U.S. manufacturing in 1958. We classify durable goods into search and experience categories by both classification procedures discussed in the previous section. Table 3 records the results—two tests of each of our two hypotheses. All differences are in the directions predicted and are significant at the 5 percent or lower levels.

These results provide considerable support for our hypotheses. But caution, of course, is required. As in virtually all tests of economic propositions, we are confronted with the possibility of biases of unknown direction and magnitude. The traditional statistical tests are of no help in handling the bias problem.

More tests of our theory are required, and in subsequent sections I provide additional tests. Each of these sections, then, has a dual function. The behavior examined, I believe, is interesting in itself, and it provides

[7] To maximize the "objective" quality of the revisions, I have limited them to revisions that virtually no one can question. My own experiences as a consumer would cause me to make other changes—in particular, classifying cameras as an experience good rather than a search good. Indeed, if one were to make this change, virtually all our results would be more favorable to the hypotheses tested in this article.

[8] Even if sampling is destructive, search could be undertaken as long as the consumer did not have to purchase the sample. Free samples are offered occasionally for a myriad of goods which would otherwise be in the experience category. But I do not believe this practice is sufficiently widespread to cause any problem in classification. Again, the proof for this belief must be in the ensuing pudding.

TABLE 3

1958 CONCENTRATION RATIOS BY INFORMATION CATEGORY[a]

	DURABLE				
	Classification 1[c]	Classification 2[d]	NONDURABLE	DIFFERENCE[b]	t[b]
Experience	69.6	70.9	61.7	7.9; 9.2	1.84*; 2.13*
Search	48.8	49.3	35.6	13.2; 16.0	3.24**; 3.43**
Difference	20.9	21.6	26.2	...	...
t	4.07**	4.3**	8.81**	...	...

[a] Averages by industry for the ratio of value added of the eight largest firms to total value added. Concentration ratios from U.S. Bureau of the Census (1962).
[b] First number refers to classification 1; second number to classification 2.
[c] Classification 1: based on table 2.
[d] Classification 2: revised classification, jewelry in search category and paint in experience category.
* Significant at the 5% level.
** Significant at the 1% level.

varying degrees of evidential support for the information theory underlying all sections.

Guided Sampling

Thus far, in the bulk of our analysis we have assumed that consumers sample at random. Often the consumer can use a more effective procedure—sampling guided by the recommendation of friends or consumer magazines. The preferences of consumers tend to be positively correlated. In consequence, the expected utility of a sample suggested by a friend will be greater than the expected utility of a random sample.

But guided sampling is not available for all goods. Friends are more than happy to advise occasionally; most would find continual guidance about all the details of purchasing somewhat unpleasant. The consumer will, then, try to use the limited amount of guidance where it will do him the most good. Where unguided sampling is cheap, guided sampling will not be used. Unguided sampling tends to be cheaper for search goods than experience goods; unguided sampling is also cheaper for goods which are purchased frequently than for goods which are purchased infrequently. Therefore, we would predict that (1) holding frequency of purchase constant, there should be more guidance for experience goods than for search goods; and (2) among experience and search goods, there should be more guidance, the lower the frequency of purchase.[9]

We can test these hypotheses by looking at the distribution of articles in *Consumer Reports* for 1963 and 1964. We used two principles of classification: durable versus nondurable; search versus experience. Table 4

[9] This heuristic argument is confirmed by a detailed theory of guidance which could not be included here because of space limitations.

TABLE 4

ARTICLES IN "CONSUMER REPORTS" IN 1963 AND 1964 BY INFORMATION CATEGORY

	Durables				Nondurables	
	Classification 1*		Classification 2†			
Information Category	Number of Articles	Consumer Expenditures‡	Number of Articles	Consumer Expenditures‡	Number of Articles	Consumer Expenditures‡
Experience.	76	35.0	81	33.5	45	60.0
Search . .	30	16.0	25	17.5	8	35.2

* Based on table 2.
† Based on text revisions of table 2.
‡ Relevant consumer expenditures in billions of dollars (products of local industry excluded; fresh produce excluded). Basic data from U.S. Department of Commerce (1964); local industry exclusions based on data from U.S. Bureau of the Census (1966*c*); fresh produce exclusions based on data from U.S. Bureau of Labor Statistics (1956–57).

records our data. We performed four separate tests: two tests varying the information category, holding frequency of purchase constant at two different levels; two tests varying the frequency of purchase, holding the information category constant at two different levels.

For any given test we have two categories. It is reasonable to assume that the probability of obtaining an article in either of these two categories is stable and independent of the previous articles selected. In the case of the null hypothesis, probability will be given by the ratio of relevant[10] consumer expenditures in one category to relevant consumer expenditures in both categories. The null hypothesis, then, generates a binomial distribution with p, defined above.

For both search and experience, there are far more articles about durable goods than we can reasonably ascribe to chance. In both cases the null hypothesis is rejected at the .001 level of significance.

We can also reject the null hypothesis in our comparison of search and experience goods for nondurable goods. Again our results are in the direction predicted by our theory and are significant at the .001 level.

[10] Irrelevant consumer expenditures are those expenditures which a priori are exceedingly unlikely to generate articles in *Consumer Reports*. Consumer expenditures for products of local industries form one such group: housing, bread, dairy products, and beer. Since *Consumer Reports* is a national magazine, it will give little attention to local markets. In 1963–64, there was only one article on a local industry: cottage cheese in Philadelphia. Since we eliminated the category to which this article belonged, we did not count this article.

We also regarded as irrelevant consumer expenditures on fresh produce: fresh fruits and vegetables and nonprocessed meat. Even when these goods are in a national market, quality variability of the product of any one producer of a good in this category is enormous. Hence, preference ratings by national brands—if they exist—lose virtually all meaning. During 1963–64, there were no articles in *Consumer Reports* in this category.

The results of a comparison of search and experience goods for durable goods are not quite so convincing. Using our first classification procedure for search and experience goods, the results are in the right direction but not statistically significant. Using our second classification procedure, our results are in the right direction and significant at the .013 level.

Newspapers and magazines in general also provide preference ratings of consumer products. Virtually all of these ratings are focused on goods with a low frequency of purchase. Usually people go to any given movie or read any given novel only once. It is certainly consistent with our hypothesis that newspapers provide more ratings of particular books, movies, and kindred activities than of any other consumer product.

Location

Another implication of the experience-search distinction has been explored by Robert Van Handel (1969). Location theory in the past has examined the pattern of store location resulting from minimizing the distance traveled by customers. The assumption this theory always used, however, was that consumers only want to look at one item before purchasing. This will tend to produce a uniform distribution of stores through space. The pattern of store location resulting from multiple searches will be quite different, however, because the travel time between stores becomes important. It will pay stores to cluster.

For experience goods, the consumer usually experiences the good at home. In consequence, the distance between stores plays a much less significant role in determining the distribution of stores.

One would, therefore, predict more clustering for stores that sell search goods than for the stores that sell experience goods. Using as his measure of clustering the average percentage of a city's total sales that take place in the central business district, Van Handel found that there was indeed more clustering of firms in our two search categories than in any of the experience categories (see table 5). The probability of this perfect arrangement of search and experience goods occurring by chance is less than 5 percent.

What determines the good-to-good variation in the ratio of retail advertising to national-brand advertising? There is one return to national-brand advertising that cannot be recouped by a retailer advertising the same brand. Usually the advertising media has a circulation area larger than the market area of the store. Since the brand's market area is larger than the store's, there are more potential customers for the brand than for the brand in a particular store.

For media with a national distribution, this disparity in market size is so overwhelming that virtually no retail advertising appears. For local advertising, the two do not diverge so drastically, but this difference in

TABLE 5

AVERAGE PERCENTAGES OF CITIES' TOTAL SALES IN THE CENTRAL BUSINESS DISTRICTS

Type of Good	Percentage
Apparel	61.27
Furniture	48.33
Autos	24.04
Eating places	23.36
Appliances	35.85
Drugs	22.97
Liquor	15.80
Food	4.88

SOURCE.—Work of Robert Van Handel (1969).

market size can still play a significant role. The newspaper-circulation area for a large city can be larger than the market size for certain goods.

But the market areas of stores will differ systematically by type of good sold. In the last section we saw that the stores that sell search goods cluster more than the stores that sell experience goods. This differential clustering is only possible if the market area for search goods is wider than the market area for experience goods. Hence, the advantage of national-brand-advertising is less for search goods than for experience goods.

But retail advertising has advantages also. Retail advertising can attract customers to the store who would not have been customers for a national brand if it had advertised. A response to an advertisement need not involve the purchase of the good advertised. If the consumer likes what he sees in an advertisement for a search good, he will make sure that he searches that brand; but nearby brands, whether they were advertised or not, will usually be searched too. The consumer will then buy the best of the set he has examined. This best is likely to be in the store the consumer initially visited, even if it is not the advertised brand. Since the consumer wants to minimize the cost of search, his first searches beyond searching the advertised brand will be in the store to which he initially went in response to the advertisement. By definition, this kind of additional search cannot be undertaken for experience goods.[11] Hence this source of greater returns to retail advertising than national-brand advertising will be greater for search goods than for experience goods. We, therefore, predict that the ratio of retail advertising to national-brand advertising will be greater for search than for experience goods.

To test this proposition, I looked at seven scattered days' advertisements for the *New York Times* during 1966–67. Every day of the week was

[11] The only related phenomenon for experience goods is multiple purchase in the same store, and multiple purchases can occur for search goods as well.

represented as was every section, including the Sunday magazine section. I then looked at the ratio of the number of retail advertisements to the number of national-brand advertisments by type of good. Table 6 records the results, which show a far higher ratio for search goods than experience goods. By one of our classification procedures, eleven of thirteen search goods were in the class of the higher thirteen ratios, while only two of ten experience goods were in this class. By another of our classification procedures, ten out of twelve search goods were in the higher twelve ratios, while only two of eleven experience goods were in this class. From the hypergeometric distribution, the probabilities of getting these or greater values by chance are .0028 and .0032, respectively.

Inventories

What determines the variation in inventory/sales ratios among retail store types? O e of the well-known results of inventory theory is the proposition that the inventory/sales ratio of a brand should be smaller

TABLE 6

RETAIL AND NATIONAL-BRAND ADVERTISEMENTS IN THE "NEW YORK TIMES," 1966–67

Goods	Retail	National	Ratio
Experience goods:			
Liquor	1	53	0.02
Food	5	13	0.08
Drugs	3	3	1.00
Tobacco	3	8	0.38
Toiletries	18	11	1.64
Television, phonographs, music instruments	37	5	7.40
Household appliances	26	4	6.50
Bicycles, motor boats	9	2	4.50
Automobiles	59	13	4.54
Watches	10	14	0.71
Ambiguous:			
Jewelry, silverware	46	0	∞
Search:			
Men's clothing	113	10	11.3
Women's clothing	188	23	8.2
Miscellaneous apparel and accessories	40	4	10.0
Furs	16	0	∞
Footware	79	1	79.0
China, glass, cookware	14	1	14.0
House furnishings	48	4	12.0
Furniture	103	5	20.6
Sporting equipment	4	0	∞
Cameras	7	0	∞
Garden supplies	0	10	0
Hardware, power tools	0	2	0

when the sales for the brand is larger.[12] Holding total store sales constant, the sales for a brand will decline as the number of brands the store is required to stock increases. Hence, the inventory/sales ratio of the store should increase as the store increases the number of brands it stocks.

We expect a given store to carry more brands for search goods than for experience goods. This results from two considerations: First, we expect the market to support more brands for search goods than for experience goods. This proposition was developed in the second section. Second, stores will find it more difficult to specialize in a small subset of these brands for search than for experience goods. A consumer wants to shop for several search goods prior to purchase. To minimize distance the consumer has to travel, a given store has an incentive to stock many different search brands. We, therefore, expect higher inventory/sales ratios for search goods than for experience goods.[13]

We test this proposition with data from the 1929 *Census of Retailing* (the only year for which inventory data are available). The results are reported in table 7. For nondurable goods there was a significant difference in the mean of the inventory/sales ratio.[14]

For durable goods also, search goods have a higher inventory/sales ratio. However, for the original classification of search and experience goods for durables, the difference is not significant. The problem is the behavior of jewelry stores, whose inventory/sales ratio is far higher than any other store type. But, as we maintained earlier, jewelry stores suffer from a serious split personality. They sell both watches—an experience good—and the rest of jewelry—a search good. If we follow the revised classification of search and experience goods developed in the first section, the difference between search and experience goods is highly significant. All told, our results support our hypothesis.

[12] Take the costs of not stocking an item when it is demanded for any given level of inventory by forming this expectation over the entire range of demands. The expected cost is a linear function of the standard deviation of demand. The standard deviation of demand will not increase proportionately to total sales. Hence, we do not expect inventories to increase proportionately to total sales.

[13] Variation in the number of brands on the market would also tend to produce higher inventory/sales ratios for nondurable goods than for durable goods. But there is an important force operating in the opposite direction. A single purchase of a durable good tends to cost more than a single purchase of a nondurable good. This tends to make demand "lumpier" for durable than for nondurable goods. This will increase the standard deviation of demand for durable goods and hence tend to increase the required inventories.

[14] One obvious explanation of the low inventories for the food category is the cost of spoilage. We eliminated this problem by eliminating all food categories in which spoilage was a serious problem. The dominant bias in the remaining goods is the pressure for low inventories produced by style changes. But among nondurables, this is a bias tending to lower inventories for the search goods. Our results emerge in spite of this bias.

TABLE 7

Mean Ratios of Inventory to Sales, Retail Stores, 1929

			Durable			
			Classification 1†		Classification 2‡	
	Mean	N*	Mean	N*	Mean	N*
Experience	10.3	5	20.4	13	17.3	12
Search	24.5	19	26.3	12	26.5	11
Difference	14.2	...	5.9	...	9.2	...
t	4.19	...	1.33	...	2.48	...

Source.—U.S. Bureau of the Census (1933).
* Number of store types.
† Based on table 2.
‡ Based on text revisions of table 2.

Summary and Conclusion

We have developed a highly simplified theory of the consumer's quest for information about the quality of goods. The consumer has a simple alternative to search; he can use experience, that is, he can determine the quality of brands by purchasing brands and then using them. This paper has explored the implications for market behavior of search and experience.

We were able to make the following predictions: (1) There will be more monopoly for experience goods than search goods, and more monopoly for durable than nondurable goods. (2) The recommendations of others will be used more for purchases of experience goods than search goods; advice will also be used more for durable than nondurable goods. (3) Stores that sell search goods will cluster more than stores that sell experience goods. (4) The ratio of retail advertising to national advertising will be greater for search goods than for experience goods. (5) Inventory/sales ratio will be higher for stores selling search goods than for stores selling experience goods.

In developing our theory, we have blithely ignored a great many complicating considerations. Only by keeping the theory simple can we get implications. We are rewarded by a fairly rich set of testable implications, and the theory passes these tests in a quite satisfactory manner (table 8 summarizes the record).

The wide variety of tests to which our theory has been subjected allows a more rigorous test procedure than is often the case. The problem with the testing of economic hypotheses is that we are almost always confronted with a bias of unknown direction and magnitude. The usual tests of significance are appropriate only with a zero bias.

TABLE 8
SUMMARY OF RESULTS[a]

	Monopoly	Guidance	Location	Advertising	Inventory
Search versus experience:					
Test 1[b]	**	**	*	**	**
Test 2[b]	**	+[c]*	...	...	+**
Durable versus nondurable:					
Test 1[b]		**	...	...	...
Test 2[b]	**	**	...	...	...

[a] Results in the right direction, but not significant.
[b] Results are available for two tests for the same subject when we ran two tests keeping either information category or frequency of purchase constant at two different levels.
[c] When the results of our alternative classification procedures belong in the same category, they are reported once, otherwise they are reported separately.
* Results significant at the 5% level.
** Results significant at the 1% level.

In our case, we can test our theory under more general conditions. We can assume a bias of unknown dimension and magnitude for each test, but a bias whose expected value over all tests is zero. Under these circumstances, the probability of getting a test result in a specified direction would be one-half if the null hypothesis were true. The probability of getting five independent test results—independent in the sense that the bias is independently distributed—in the specified direction would be 1/32.

Since there are twelve tests in table 8 in five different areas, it is likely that we have the equivalent of at least five independent tests. All of our test results are in the right direction.

These results are favorable enough to indicate that there is probably something to the ideas which predicted these results. An examination of previously unexplored areas in economics can say no more.

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