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1.) The Market

The primary competition between the manufacturers of nationally advertised brand named grocery items, such as canned fruits and vegetables, cookies, crackers, toothpaste, mouthwash, and household paper products, to name but a few, is for shelf-space in the stores. The nature and significance of that competition are not widely understood.

The decision as to what products go on what shelves is made either on a store-to-store basis by the store managers, or at chain headquarters by those to whom they report. The decision is not taken in isolation, however, but in consultation with various manufacturers' representatives. The dialogue which passes between these protagonists records a bargaining process between relative equals, each of whom has need of the other. The manufacturers must strive to please the retailers because, without them, access to the market is denied. And the retailers must keep the manufacturing giants happy because, as a result of years of advertising, to be without their products is to drive customers from the store.

Large manufacturers typically produce a wide variety of products. The quantity of any one of them to be purchased by a given retailer is seldom an issue; the retailer ordinarily knows about how much he can sell in a week and wants no more than that. Rather the manufacturer's representative is concerned to place in the stores as many of his employer's product lines as he can (or

has been instructed to) do. Shelf plans, quantity discounts, monthly specials package deals, and the like are his aids in this endeavor.

When it is determined how many of a given manufacturer's products (say cookies and crackers) a given retailer will offer, and how many of each he expects to sell, the amount of shelf-space he must devote to that manufacturer's products is also decided. Thus, if manufacturer i offers products $X_{i1},\ldots, X_{in_i}$, if a given retailer wants to display those X_{ij} for which $j\varepsilon J_i$, and if s_{ij} square feet are required to shelve a week's demand for X_{ij}, then that retailer must allocate

$$(1) \quad s_i = \Sigma j\varepsilon J_i \; s_{ij}$$

square feet of shelf-space to i's products. To the extent that the major manufacturers tend to allow retailers a fairly constant markup over wholesale prices (constant across products, that is, not necessarily across manufacturers), the retailer may expect to earn

$$(2) \quad \$ \; r_i s_i$$

from the sale of i's products during the week in question. In effect, the retailer is renting shelf-space to the manufacturer at a rate of r_i dollars per square foot.

2.) A Hypothetical Question

Let us now ask how much shelf-space a typical manufacturer i of cookies and crackers would want, given that he had to pay r_i dollars a square foot

for it each week. Although this represents only a part of the issue real store managers and manufacturers' representatives have somehow to settle each time they meet, it illuminates at least the representatives' view of that issue.

Let D be the total weekly demand (assumed known and constant), on the store in question for cookies and crackers and let $1, 2, \ldots, N$ be all the manufacturers thereof whose wares the store may choose to carry. Then i's share of the total demand may be assumed to be

$$(3) \quad \frac{s_i}{s_1+\ldots+s_N} D \quad ,$$

and its profit for the week is accordingly

$$(4) \quad \frac{(P_i-C_i)D \; s_i}{s_1+\ldots+s_N} - r_i s_i \quad ,$$

where P_i is the (retail) price consumers actually pay for i's products and C_i is their (delivered) cost. Thus $1, 2, \ldots, N$ are players in a game wherein each manufacturer i chooses a "strategy" s_i in an effort to maximize his own "reward"

$$(5) \quad \pi_i = \frac{s_i}{s_1+\ldots+s_N} - c_i s_i \quad .$$

Here $c_i = r_i/(P_i-C_i)D$, so that (5) is a constant multiple of (4).

The game wherein each player i seeks to maximize the function π_i defined by equation (5) thru his or her individual choice of s_i arises in other contexts , and has been studied in some detail; see [1] , Chapter IV. There it is argued that, because opponents' strategic decisions can never

be predicted with precision, no single strategy can properly be called optimal for player i. However, those in the range $1/8c_i \leq s_i \leq 1/4c_i$ are very often good ones for i, while those for which $0 \leq s_i \leq 1/16c_i$ seem doomed to almost certain failure.

It is a consequence of the restriction $s_i \geq 1/16c_i$ that the present game can be played by only a few contestants at a time. This is most obvious in the symmetric case $c_1=c_2=\ldots c_N=c$, for then the stated bound on s_i implies

$$(6) \quad w_i = \Sigma_{j\neq i} s_j \geq (N-1)/16c \geq 1/c$$

if $N \geq 17$. Consequently, $\pi_i < 0$ for all $s_i > 0$ whenever the players are more than 17 in number and avoid the use of virtually hopeless strategies.

In fact, 17 is an extremely conservative upper bound on N. As demonstrated in [1], the players' strategic choices become difficult whenever $N > 4$ and are probably prohibitively so when N exceeds five or six. The strategic difficulties alluded to here (and discussed explicitly in [1]) are further compounded by the fact that , in practice , the parameters r_i, P_i, G_i, and D change somewhat with the passage of time and may never be precisely measured. So the paramete $c_1, \ldots, c_N$ relevant to the players' choice of $s_1, \ldots, s_N$ are in effect random variables , to be predicted prior to the moment of decision ; one may inadvertently play $s_i=1/15c_i$ even when $1/16c_i$ is intended.

The obvious conclusion is that instances in which the game (5) is profitably played by more than a half-dozen contestants, or with strategies outside the interval $1/8c_i \leq s_i \leq 1/4c_i$, must be exceedingly rare. When and if the game is played at all, it must almost certainly be by a

relatively few individuals at a time, each one of them occupying a substantial amount of shelf space.

3.) The Role of the Store Manager

The foregoing conclusions apply, at present, only to the hypothetical situation wherein the manufacturers decide how much shelf-space to rent for the display of their own products. It remains to discover how, if at all, these results pertain to the existing (rather different) situation.

In practice a store collects $r_i s_i$ dollars from i's display of size s_i only if the goods in it are actually sold. Thus, it becomes the storekeeper's responsibility to restrict each display to a quantity he may reasonably expect to sell. Manufacturer's representatives, on the other hand, are concerned to persuade storekeepers that this or that additional product line will move quickly enough to pay its shelf-rent. The truth of such claims is ordinarily established experimentally; a part of each manufacturer's display is typically devoted to new products, present on a trial basis only. If they pay their rent they stay and if they don't they go.

Shelf-rent, in short, is the product of a bargaining process between store-managers and manufacturers' representatives. The latter seek always to place additional of their employer's products on the shelf, while the former strive to eliminate those promising less than some target rate of return. Shelf-rent is not a precisely determined figure, because differences in bargaining power and skill do exist, and because customers' purchasing patterns are to some extent unpredictable But it is a useful analytical device, which is discussed implicitly, if not by name, whenever shelf allocations are in dispute.

The relevance of the earlier results concerning the hypothetical situation

in which manufacturers really do pay shelf rent and control display size should now be obvious. In particular, display sizes in the interval $0 \leq s_i \leq 1/8c_i$ should be exceedingly rare and the number of manufacturers represented in a single section of a single store should but seldom exceed a half dozen.

4.) Welfare Considerations

Under conditions of perfect competition $w_i + s_i = 1/c_i$ for each i, since it must be impossible for any i to operate at a profit. Therfore $c_1 = \ldots = c_N = c$ and $1/c$ is the size of the total cookie and cracker display at the store in question. This is to be compared with the result $w_i + s_i = 4/5c$ of competition between four manufacturers using the quite reasonable strategies $s_i = 1/5c$.

The comparison is quite favorable to the oligopolistic market structure; in exchange for a reduction of but 20 percent in variety (display size), the public achieves the economies of scale and benefits of quality control ordinarily associated with mass production. Industry profits, on the other hand, are only about $\pi_i(.25,0, \ldots, 0)/5$ or 20 percent of what they would be to a monopoly.

The above comparisons are necessarily rough, because a variety of phenomena can occur in oligopolistic markets. There is no need, for instance, that in them c_1 shall equal c_2 etc.; a company with market power may very well, for instance, command a lower shelf rent than its competitors. Nor is the number of competitors exactly determined. In cookies and crackers there is a "big three" composed of Nabisco, Keebler, and Sunshine. But the place of a fourth or fifth national brand is occupied on most store shelves by a private-label brand, a locally produced one, or possibly both. In lemon juice, by comparison,

there is a single dominant brand. Most stores carry it and perhaps one other. The market would presumably accomodate more, but the profits to be expected from successful entry just don't seem to inspire potential competitors.

Nonetheless certain conclusions do emerge; the shelf-space game is easy to play with up to four players. But as additional ones are added the choice of a strategy (display size) becomes increasingly difficult; because the smaller ones are so tricky to administer, entry almost has to be undertaken in a big way. Thus it can succeed only at the expense of an established firm. Conversely, in markets with more than four nationally advertised brands, there is a strong tendency for some to drop by the wayside. Despite the limited number of competitors able to survive in the market as currently structured, however, the public seems well served. Both in price and in latitude of choice it receives benefits comparable to those to be expected from perfect competition, in addition to the economies of scale gaint producers ordinarily achieve.

Reference

[1] J. Case, Economics and the Competitive Process, N.Y.U. Press, New York, (1979).