ECONOMIES OF SCALE IN FOOD RETAILING

by:

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Independent grocery store operators are continuing to be displaced by integrated chains. According to the Bureau of the Census, chain's share of total grocery store sales in the United States rose from 51 percent to 59 percent between 1967 and 1977. Such a dramatic shift in a 10-year period, after most independents had already affiliated with wholesalers, raises questions about the independents' competitive viability in future. Economies of scale may be a relevant causal factor.

Few efforts have been made to estimate the magnitude of scale economies in food retailing. In large part, this is due to a lack of relevant data. In this paper, I will look at scale economies in three ways. First, publicly available information that pertain to scale economies will be discussed. Second, using this information and personal observations of the industry, I will make estimates of potential scale economies. Finally, these estimates will be contrasted with actual performance for the 1971-78 period based upon data from Cornell (1), NARGUS (8), Progressive Grocer (12), and Oesterle (10) which are summarized in a forthcoming report (6). The reconciliation process provides a check on the accuracy of the estimated scale economies.

Data on Scale Economies

Economies of scale in food retailing may be examined at the store, warehouse, and multiwarehouse levels.

Store Level

Progressive Grocer (12) reported that large supermarkets had higher sales per square foot of selling area, more sales per full-time equivalent employee, greater sales per customer transaction, and higher sales per checkout in 1979. Oesterle, using sample data for independents during the 1972-75 period, found that large stores had substantially higher (usually more than four times higher) sales per square foot and sales per customer transaction than did smaller stores (10). Unpublished data obtained from a special tabulation of the 1972 census of retail trade also indicate that larger supermarkets (measured by sales) have higher sales per square foot of selling area. Other things equal, these measures suggest that larger supermarkets have lower per unit labor costs, lower per unit occupancy costs, or both.

Published Census data suggest that larger supermarkets have higher unit payroll expenses (13).[1] However, the data do not give any indication about whether the cost differences are due to differences in productivity or wage rates. Oesterle, in his study of independents found that, after adjusting for unpaid family labor, larger supermarkets had higher sales per man-hour but that most of these economies were passed on to workers in higher wage rates (10).

The National Commission on Food Marketing, in 1966, concluded that economies of store size exist at least until store size exceeded 10,000-12,000

square feet (9, p. 149). The Food Com-
mission also reported that store utili-
zation (sales per square foot of selling
area) had a very significant effect on
per unit costs. Through most of the
relevant range of the cost curve, a 20
percent increase in volume lowered costs
by one percent of sales.

Holdren reported in 1960 that large
stores have higher sales per square foot
of selling area and, therefore, that real
capital-output ratios decline as store
size increases (7, pp. 46 and 57).

Feaster, et. al., reported that
supermarkets designed to handle four
times the volume of a typical supermar-
ket could reduce per unit direct opera-
ting expenses in the dry grocery depart-
ment by 11 percent (2). A store designed
to handle 13 times the volume of a typi-
cal supermarket could reduce its per
unit direct costs by 16 percent.[2] Grin-
nel and Crawford reported that large
supermarkets operated by large chains
had 41 percent lower per unit overhead
expenses at the store level than did
small stores operated by small chains
(4). If the savings found in direct
expenses in the dry grocery department
also apply to the other departments,
potential economies at the store level
would equal about 2 percent of sales.[3]
Greater economies in overhead expenses
could increase the extimate slightly.

Warehouse Level

The National Commission of Food
Marketing found that there are economies
of warehouse size up to annual retail
sales volumes of $75 to $100 million
(about $190 to $250 million in 1979 dol-
lars) (9, p. 151). Economies beyond
that size were thought to be insignifi-
cant. Pierson, using synthetic cost-
estimating procedures, reported that
economies of size occur until warehouse
output equals 320,000 cases per week
(this represents retail sales of about
$750 million per year in 1979 dollars[4]

(11). Per unit total expenses for ware-
houses of this size were one-third lower
than those of warehouses that handled
80,000 cases per week. Per unit expen-
ses did not change when output exceeded
320,000 cases per week.

Grinnell and Crawford reported that
per unit direct operating expenses in
grocery warehouses (excluding transpor-
tation functions) decline when weekly
throughput increases from 100,000 cases
(about $75 million per year at wholesale
value) to 500,000 cases (about $400
million per year) (3). The decrease in
costs was about 7 percent for conventional
warehouses, 17 percent for mechanized
warehouses, and 21 percent for automated
warehouses. A large automated warehouse
could save 24 percent compared with a
small conventional warehouse. The report
also concluded that a conventional ware-
house with better-than-average management
could be quite efficient compared to the
more mechanized operations.

Grinnell and Crawford also reported
that in the dry grocery, dairy, and fro-
zen food departments, warehouses operated
by large chains with large stores enjoyed
50 percent lower per unit overhead costs
than did warehouses operated by small
chains with small stores (4). These
studies suggest that economies of ware-
house size equal 1 to 2 percent of super-
market sales.[5]

Multistore Operations and
Operation of a Warehouse

There are a number of economies and
other benefits (primarily associated with
market power) that accrue to retailers who
operate many stores in a single metropoli-
tan area and to independents who are
affiliated with general line wholesalers.
Multistore firms are able to operate
their own buying offices and employ
specialized managerial and professional
talent, for example, buyers, merchandisers,
personnel specialists, accountants and
real estate specialists. Volume purchases

them to take advantage of a larger number of deals, discounts, and allowances regularly offered by vendors.[6] Multistore operation reduces a retailer's advertising costs per dollar of sales. A multistore retailer may be large enough to establish its own line of private label products that have higher margins and can be used to develop a consumer franchise (9, p. 133). Multistore retailers enjoy greater familiarity by both consumers and the business community and may be able to obtain credit at more favorable terms. Larger firms also have a better chance to secure the most desirable locations for new stores. Finally, operation of multiple stores means that a firm's survival is less dependent upon the success of any one store.

If a firm's retail operation in a city is large enough, it may be able to integrate into the wholesaling function by operating its own general line warehouse. Other things equal, since wholesalers concentrate almost exclusively on wholesaling while retailers devote primary attention to retailing functions, it is unlikely that a retailer in a single city would operate a warehouse as efficiently as does a general line wholesaler. However, a wholesaler must serve many retail customers and, therefore, cannot cater to all of the special needs of any one. If, as often occurs, a wholesaler's price structure causes large retail accounts to subsidize small ones or if the wholesaler does not provide all the products and services that a retailer needs, it may be feasible for the retailer to operate his own warehouse. Integration increases the opportunity to take advantage of vendor deals, discounts, and allowances. Economies also may be gained through control of the store delivery operation, which can be specialized to the firm's particular needs. No data are available to help quantify economies available to multistore firms that do or do not operate their own warehouse.

Multiwarehouse Operations

Very limited information is available about economies of multiwarehouse firm size. The National Commission on Food Marketing reported that economies accrue from manufacturing operations, private label programs, and other procurement activities (9, pp. 151-152). It reported that, although bread baking and fluid milk packaging may be operated with reasonably low volume, most manufacturing operations require substantial volume to achieve maximum economies. Annual retail sales of up to $500 million (over $1.3 billion in 1979 dollars) may be needed to reach minimum efficient size for slower moving items like jams, jellies, mayonnaise, peanut butter, and spices.

Large retailers can enjoy size economies in the procurement of private label products. A specialized staff is needed to identify product categories in which private label entry is feasible, to write product specifications, design product labels, select packers, enforce quality control, and maintain proper product logistics. Since many of these costs do not vary greatly with total sales, per unit costs decline as sales increase. Larger firms would be expected to offer a wider selection of private label products and possibly offer consumers a more favorable price-quality relationship because they have more private label specialists and more buying power. If economies in procurement are greater than those available through integration into manufacturing, this might partially explain why retailers have reduced their emphasis on integration into manufacturing (6).

Larger retailers may be able to receive and ship more of their merchandise in carload and truckload lots and they may be better able to take advantage of backhaul opportunities. These benefits would apply to firms with large ware-

houses as well as those with multiple warehouses.

The Food Commission reported that only large firms can support field buying of perishables. It stated that this activity is expensive but provides economies when the retail volume is substantial (9, p. 152). Field buying may also enable firms to purchase within-grade quality differences with little or no price differential. It also is argued that the presence of field buyers assists retailers anticipate market changes and to buy accordingly.

There are other advantages of firm size that do not necessarily translate into lower per unit operating costs. These advantages include greater access (perhaps at lower cost) to capital markets, more specialized management staffs (real estate, warehousing, transportation, procurement, public relations, research, etc.), more immunity to adverse effects of strong competition in any one market area, and a degree of consumer recognition that promotes sales among consumers who move to a new city.

Larger firms also have some disadvantages--they are more likely to be scrutinized for antitrust violations, to be the target of labor union organizing drives, and to be questioned when food prices rise. In addition, financial problems and obsolete stores have plagued some large chains in recent years, suggesting that very large firms can encounter substantial managerial diseconomies of size or age. Specific data needed to quantify multiwarehouse economies of scale are not available.

Estimated Economies of Scale

Although the data needed for precise measurement are not available, I have estimated the approximate magnitude of scale economies at each level of retail firms' operations (Table 1). Differences in store features, customer services,

Table I. Estimated economies of scale in grocery retailing

Source of Economy	Economies as a Percentage of Retail Sales
Store Size	2
Multistore operations	
Without warehouse	2
With warehouse	4
Warehouse size	1
Multiple warehouses	2

wage rates, and other factors, except size, that may affect cost comparisons between different firms were assumed to be constant.

At this point, the objective was to estimate the magnitude of size economies that are potentially available to grocery retailers. In a moment, these estimates will be compared with actual costs. The numbers in Table 1 are intended to represent those economies that are feasible using good management. A particular well managed firm might do better while a poorly managed firm probably would not realize these size economies. In practice few, if any, large firms are likely to be successful enough in all their operations that, overall, they would achieve all the estimated gains.

Large supermarkets can realize 2 percent lower operating expenses per dollar of sales than can comparable small supermarkets. Large, limited-assortment, no-frills supermarkets would be expected to achieve much larger gains compared to small, full service supermarkets. Store size economies are available to both independents and chains.

Multistore operators without warehouses include independents with 2-10 stores as well as chains. Large operators in a single market area may realize multistore economies equal to 2 percent of sales. An additional 2 percentage

points may be gained with the addition of a warehouse. A large warehouse could save another 1 percent of retail sales. Thus, a chain with operations in only one local geographic area may gain economies of up to 5 percent of sales over a single store independent, assuming equal size and type of stores.

Multiwarehouse operations enable a chain to save an additional 2 percent of sales for a possible gain of 7 percent of sales compared with independents in its market areas. Adding store size economies brings the total to 9 percent of sales.

In addition to economies of scale in warehousing and store operations, larger chains may pay lower prices for the merchandise they sell. Data are not available to analyze retailers' cost of goods sold and, therefore, conclusions must be considered speculative. Based upon findings of the National Commission on Food Marketing, and knowledge about the nature of the grocery trade, it seems possible that large chains may pay one to two percent less for merchandise because of their buying power.[7] Cost differences due to volume purchases, reduced transportation requirements, and so forth, probably justify much of the price difference. Market power may also be a factor.

Reconciliation of Potential and Actual Economies of Scale

Now let's compare these potential economies with actual firm performance during the 1971-78 period shown in Table 2.[8] First, the data on actual performance of independents is for firms that are usually affiliated with wholesalers while the small independents included in the analysis of potential economies of scale are assumed to be unaffiliated. I estimate that the benefits associated with affiliation probably equal about 2.5 percent of retail sales which would reduce the potential large chain advantage to 6.5 percent of sales. In addition, af-

filiated independents generally operate larger stores than do unaffiliated independents. I estimate that this factor reduces the store size advantage of chains over affiliated independents to 1.5 percent of sales, rather than 2 percent. The large chains' total potential cost advantage over affiliated independents is thus 6 percent of sales (Table 3). This compares with a realized cost advantage of only one percent of sales for the 1971-78 period (6).[9] What happens to the remaining 5 point potential?

Higher wage rates paid by large chains accounted for half of the 5 percentage points (6). Information is not available to allocate the remaining 2.5 percent of sales to individual explanatory factors. However, factors that appear to be significant will be identified. Part of the benefits of economies of scale may be passed on to consumers in the form of better quality and a larger selection of products and services. Second, chains may build comfortable offices and pay higher managerial salaries.[10] Third, the savings may be used to adopt innovations (such as automated warehouses or UPC scanners) and pay for home economists, nutrition information and consumer features. Fourth, chains may use the savings to integrate into food manufacturing or diversify into other food and nonfood retailing (for example, combination stores, restaurants, and clothing stores).[11]

Fifth, large chains may remodel and refurnish their existing stores and expand geographically by building or acquiring stores in other areas. Profits earned in one geographic area could subsidize new stores until they become profitable. Related to this, firms may engage in price wars or other competitive battles to gain or regain market share in new or existing market areas.

Sixth, it seems likely that large chains may be unable to capture all of

Table 2. Gross margins, operating expenses, and profits of independents and food chains, by size of chain, 1971-78 averages

Type of firm, level of operation	Gross Margin	Operating Expenses			Pre-tax profit
		Payroll	Nonpayroll	Total	
		Percent of retail sales			
Independent					
Store level	19.2	8.4	8.8	17.2	2.0
Warehouse level	6.1	3.0	2.1	5.1	1.0
Total	25.3	11.4	10.9	22.3	3.0
All Chain					
Store level	17.8	10.5	6.1	16.6	1.2
Warehouse level[1]	4.5	2.9	1.6	4.5	[2]
Total	22.3	13.4	7.7	21.1	1.2
Small chains					
Store level	18.0	9.9	6.6	16.5	1.8
Warehouse level[1]	5.1[3]	2.9	1.9	4.8	.3[3]
Total	23.1	12.8	8.5	21.3	2.1
Medium chain					
Store level	17.7	10.0	6.2	16.2	1.4
Warehouse level[1]	4.4	2.8	1.6	4.4	0
Total	22.1	12.8	7.8	20.6	1.4
Large chain					
Store level	17.9	10.8	6.0	16.8	1.1
Warehouse level[1]	4.5	3.0	1.5	4.5	0
Total	22.4	13.8	7.5	21.3	1.1

[1] Includes chains manufacturing activities.
[2] Negligible.
[3] Includes 0.3 percent of sales due to small chains' use of general line wholesalers for part of their merchandise.

Source: 6.

the potential economies of scale. Bureaucratic inefficiencies and a mix of various age facilities virtually assure some inefficiency. It is likely that competitive pressures seldom force large chains to approach their optimum efficiency in most markets. In addition, some market areas are not large enough to support an optimum size, spatially efficient distribution network. It is likely that small firms also do not reach their optimum efficiency levels, in part, because entrepreneurs in such a complex industry, subject to rapid day-to-day changes and the problems of managing many people, cannot excell in all areas of operation.[1,2]

In summary, during the 1971-78 period, it appears that approximately 2.5 of the 6-point economies of scale

Table 3. Reconciliation of potential and actual economies of scale in grocery retailing

Item	Percentage of Retail Sales
Potential economies of scale	9
Adjustment for affiliation with wholesaler and store size differences	3
Realized economies	1
Passed on to employees	2.5
Unaccounted for, i.e., used for other purposes or lost to diseconomies	2.5

available to large chains was used to further the firms' growth and other objectives or was lost to various types of diseconomies of size and age. Another 2.5 points went to their employees. This left a net gain of 1-point which could potentially have been applied to profits (Table 2). However, large chains' profits averaged about 2 percent of sales less than those of independents and their affiliated wholesalers. The 1-point realized cost saving and the 2-point profit reduction were passed on to consumers as 3 percent lower prices.[1][3]

FOOTNOTES

[1]Excluding fringe benefits, payroll per dollar of sales equaled 9.0 cents, 9.4 cents and 9.3 cents, respectively, for stores with annual sales of $1-$2 million, $2-$5 million, and $5 million and over. Inclusion of fringe benefits would likely increase the differential.

[2]If the very large store also adopted available cost-saving labor scheduling techniques and product-handling methods,

its per unit total direct costs in the grocery department could be 60 percent lower than those of conventional average-size supermarkets (5).

[3]Assumes 12 percent saving times operating expenses of 17 percent of sales.

[4]This conversion assumes that the 1979 average case value is $15 at wholesale and that retail sales equal three times wholesale sales after allowing for direct delivery of some products and an adjustment for retail gross margin.

[5]Assume direct expenses equal 3 percent and indirect expenses equal 1.5 percent of retail sales and that savings equal 20 percent and 50 percent respectively.

[6]Many allowances for advertising or other promotional activities are more feasible for large firms. Other deals and discounts require storage of merchandise and specialized buyers are needed who know when and how much to buy.

[7]Price discrimination cases revealed that favored firms obtained 5 to 10 percent lower prices in their purchases of dairy products. This represents a saving of 0.5 to 1 percent of total store sales (9, p. 483). The Food Commission reported that price discrimination is most prevalent in commodity type products that are primarily manufactured locally, such as dairy and bakery products.

[8]These data assume the cost of goods sold is the same for independents and large chains. It is likely that chains actually have lower cost of goods sold; this would have the effect of raising their ratios relative to those for independents in Table 2. It also would increase their retail price differential, discussed below.

[9]This does not include any benefits that large chains may derive from lower merchandise costs due to their buying power.

[10]In general, this industry is not noted for plush managerial offices, however, and the bulk of managerial salaries is included in payroll expenses (which have already been taken into account).

[11]Economies and other benefits of integration and diversification would appear as larger profits at some point in time, unless revenues continue to be plowed back into the operations.

[12]Preliminary analysis of a recent study conducted for USDA indicates that in dry grocery warehouses, substantial differences occur between actual and potential productivity, and the difference is not influenced by the size of an operation. Although this study included only 9 observations and was restricted to a small portion of integrated operations, the findings were so consistent among the 9 warehouses that it is reasonable to hypothesize that significant inefficiencies probably would be found in the rest of their operations and the operations of comparable independents.

[13]The 3 percent price differential is based upon differences in average gross margins during the 1971-78 period (6).

REFERENCES

1. Earle, Wendell, and Willard Hunt, Operating Results of Food Chains, Cornell University (various issues).

2. Feaster, Gerald, Gerald Grinnel, and Terry Crawford, "Cost Comparisons of Grocery Departments in Conventional Supermarkets and Super Stores with Implications for Training," presented at annual meetings, Food Distribution Research Society, San Antonio, Tex. November 15, 1976.

3. Grinnell, Gerald E., and Terry L. Crawford, "Mechanization Alternatives for Grocery Distribution Centers," presented at Computer Based Technology in Food Distribution Conference, Troy, Mich., April 5-7, 1977.

4. Grinnell, Gerald, and Terry Crawford, "An Analysis of Overhead Expenses of Food Retailers at Headquarters, Warehouse, and Store Levels," presented at annual meetings, Food Distribution Research Society, Montreal, Canada, October 5-7, 1977

5. Grinnell, Gerald, "Trends in Grocery Retailing," National Food Review, January 1978, pp. 19-20.

6. _____, Grocery Retailing: Structure, Performance, Public Policy, USDA-ESCS (forthcoming).

7. Holdren, Bob R., The Structure of a Retail Market and the Market Behavior of Retail Units. Prentice-Hall, Englewood Clifs, NJ, 1960.

8. National Association of Retail Grocers of the United States, 1976 Financial Analysis.

9. National Commission on Food Marketing, Organization and Competition in Food Retailing, Technical Study No. 7, June 1966.

10. Oesterle, Eric C., Financial Performance of Selected Independent Supermarkets in Five Regions of the United States, 1972-1975, Station Bulletin No. 166, Department of Agricultural Economics, Purdue University, July 1977.

11. Pierson, Thomas R., Economies of Size in Grocery Distribution Centers, Department of Agricultural Economics, Cornell University, 1973.

12. Progressive Grocer, April 1979, April 1980.

13. U.S. Bureau of the Census, Census of Retail Trade, 1977, Subject Series--Establishment and Firm Size, RC77-S-1, 1980

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COST AND REVENUE ANALYSIS FOR THE
SMALL/MEDIUM FOOD DISTRIBUTOR

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Statement of Problem

The problem dealt with in this paper is whether applicability of Cost and Revenue analysis to small and medium sized food distributors may be cost effective through the use of grouping techniques and the mini-computer.

Objectives

The objectives of the study were to test the applicability of techniques suggested by Seven and Johnson to determine their feasibility in use. A secondary objective of the study was to assess the value of a mini-computer for aggregating cost, volume, aggregate throughput and other data that would be useful in a managerial decision making study.

Profitability analysis has been an important technique to the businessman for years. Methods have been developed to aid in this analysis, such as the Rule of Thumb method, Contribution Method, Full Cost Method, as well as Cost and Revenue Analysis. Management may use one or all of these techniques to evaluate the profitability of operations. Only Cost and Revenue Analysis has the potential to give the manager profitability information on each product, customer,

territory or salesman the firm deals with.[1] Recent developments have highlighted the value of C&R analysis to the smaller business operator who has traditionally avoided techniques with the sophistication of C&R.

It has been said that "necessity is the mother of invention," and this may be the reason for the increased interest in C&R techniques. As energy, credit and operating costs have increased drastically, distribution managers in particular have turned to C&R analysis as a method of understanding the impact of such increases on profits. The increases have been so significant in some cases that quarterly analysis may not begin to be enough. Sound business practices dictate that now, more than ever, the firm should establish a cost and revenue analysis system to enable identification of the costs which are incurred by product line or in dealing with the firm's customers.

Additional value accrues to C&R techniques because they force the firm to group costs and revenues according to the way they are incurred, as opposed to conventional methods offered by the accounting profession.[2] Determination of delivery costs requires the addition