USING BUSINESS MANAGEMENT GAMES AS RESEARCH TOOLS IN FOOD RETAILING — A CASE STUDY

Larry D. Jones

Performance in the food retailing industry varies over time, among competitive markets, and among different organizational affiliations. This paper reports the results of a recent study which examined variation in firm behavior and performance which could be attributed to three phenomena[1]: differences in organizational affiliation, differences among managers within an organizational affiliation, and differences in the competitive environment under which retailers operate. This study differed from some previous behavioral studies in that an experimental business management game was used as the data generator. A central thrust of this study was to evaluate business gaming as a tool which allowed testing of hypotheses concerning economic behavior.

Neoclassical economic theory prescribes the behavior of purely competitive and monopolistic structures. Shubik [11] explains that behavioral prescriptions are less definite in the case of oligopoly, which economists frequently use to characterize the food retailing industry. Neoclassical oligopoly theory has been attacked by revisionists for operating under unrealistic assumptions [5, 12]. Criticisms included the assumptions of perfect information, profit maximization, and the static nature of these theories.

Cohen [6], Weick [13], and Cyert and Hedrick [8] have suggested simulation models and laboratory studies as one means for extending and testing oligopolistic theories. Friedman [9] indicated that the laboratory experiment provides an opportunity to test oligopolistic theory under conditions where assumptions are clearly specified and met, and extraneous forces controlled. In the real world, one knows little about the circumstances under which data are generated. As such, data are ambiguous and represent changes in many variables. As a practical matter, Babb, Leslie and Van Slyke [4] explained that much information which may be obtained through experiments would not be available from firm records. Exploratory work by Babb and Bohl [3] utilized business management games in a research capacity to examine the influence of economic and non-economic factors on firm behavior and performance.

METHODOLOGY

A business management game was designed to be used by supermarket personnel [2]. This game portrayed the internal functioning of a supermarket operating in a controlled competitive environment. The game's purpose was to measure behavior in such an environment and simulate firm and market performance.

Twenty Indiana food retailing managers were selected from three pre-determined organizational affiliations (fixed) including chains, voluntaries and independents.[2] The hypothesis tested was that economic behavior and performance would not vary among the three organizational affiliations. Because participants were classified according to

1 Behavior referred to those price and non-price operating strategies employed by firms as they conducted business. Performance was measured in terms of sales, profits, net worth and returns on net worth and returns on assets. Performance was functionally related to behavior in that there was a unique set of performance criteria associated with each combination of behavioral decisions.

2 The chain affiliation referred to a corporation of 11 or more supermarkets where decision-making was consolidated at a central headquarters. Voluntary affiliation referred to supermarket owner-operators who utilized a wholesaler as a source of supply and closely followed the wholesaler's advice on price and non-price strategies. The independent affiliation referred to owner-operators who used wholesalers as a source of supply but did not depend on them as a source of market strategy advice.

their organizational affiliation, they were nested or restricted to that affiliation. The second hypothesis tested was that there would be no difference in behavior and performance among managers nested within an organizational group.

Each participant made 24 operating and financial management behavioral decisions in the game. Operating decisions included price and non-price behavioral decisions and pricing decisions included setting gross margins in four operational departments (grocery, meat, produce and dairy). Non-price decisions included procurement of goods, promotion, and store hours. Financial management decisions included opening and remodeling stores, borrowing and repaying money, and making and calling investments. Participants competed against four "hypothetical" supermarkets which were controlled by the researchers. Participants were provided with complete information on their competitor's price and non-price strategies.

Following each decision, participant managers were provided feedback information regarding their store's performance. Performance was divided into "internal efficiency" variables and "firm performance" variables. Internal efficiency measures included labor as a percent of sales, inventory levels, cash balance, percent operating expenses, financial leverage and asset turnover.[3] Firm performance measures included sales, profit margin, net worth, returns on assets, and returns on net worth.

Participants made seven sets of decisions. Following a practice, participants made two sets of decisions in each of three pre-determined competitive environments (controlled directly by the researchers).[4] Each environment represented a distinct market strategy to which participants reacted as they made decisions. Subjects were given complete information about price and non-price strategies of their competitors (the four researcher controlled supermarkets). As a result, the assumption of perfect information was nearly met. Participants were, however, free to employ strategies of their choice at all times. The hypothesis tested was that economic behavior and performance would not vary with the competitive environment imposed.

Subjects were given a profit-maximizing goal, and this goal was measurable in the sense that a profit-maximizing price strategy existed in the game. If subjects maximized profits as assumed, there would be no variation in decisions among managers from different organizational groups, and relative prices would not change among different imposed competitive environments.

THE STATISTICAL MODEL

Analysis of variance was used to determine differences in behavior and performance which could be attributed to each main treatment effect.

The basic model for the nested factorial design was:

$$Y_{ijkn} = \mu + O_i + M_{(i)j} + C_k + OC_{ik} + MC_{(i)jk} + \varepsilon_{(ijk)n}$$

where:

Y_{ijkn} = measured behavior or performance variable,

μ = grand mean,

O_i = i^{th} organizational affiliation, $i = 1, 2, 3$,

$M_{(i)j}$ = effect of jth manager in the ith organizational form, $j = 1, \ldots, 20$,

C_k = effect of kth competitive environment, $k = 1, 2, 3$,

OC_{ik} = interaction of competitive environment and organization affiliation

$MC_{(i)jk}$ = interaction of competitive environment and managers fixed within organizational affiliation

$\varepsilon_{(ijk)n}$ = random error assumed to be $NID(O, \sigma)n = 2$ replications.

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[3] Returns on assets = Net profit margin x asset turnover where:

$$\text{Net Profit Margin} = \frac{\$ \text{ Profit}}{\$ \text{ Sales}}$$

$$\text{Asset Turnover} = \frac{\$ \text{ Sales}}{\$ \text{ Assets}}$$

Returns on Net Worth = Return on assets x financial leverage where:

$$\text{Financial Leverage} = \frac{\text{Net Worth} + \text{Liabilities}}{\text{Liabilities}}$$

[4] The three competitive environments imposed by the researchers were a "discount" environment characterized by low gross margins, a "high service" environment characterized by high gross margins, and a traditional or "me-too" environment with margins between the two extremes. Information was given to subjects concerning the non-price strategies associated with each competitive environment such as specials offered, use of trading stamps, advertising levels and store hour policies.

Nesting occurred as managers from each organizational structure were restricted to that organization. A diagrammatic representation is shown in Figure 1. Expected mean squares were calculated to indicate how hypotheses should be appropriately tested (Table 1). Because the model was fixed, the results of this study cannot be extended to other organizations, managers, or competitive situations.

THE RESULTS

Price Behavior. Organizational structure had a significant effect on four out of five measures of price behavior (Table 2). The hypothesis that

Figure 1. DIAGRAMMATIC REPRESENTATION OF THE ANALYSIS OF VARIANCE

Competitive Environment	ORGANIZATIONAL AFFILIATION		
	1	2	3
	Individuals within organization		
	1 ... 20	21 ... 40	41 ... 60
1			
2			
3			

Table 1. DEGREES OF FREEDOM AND EXPECTED MEAN SQUARES OF ANALYSIS OF VARIANCE

Source of Variation	Symbol	Degrees of Freedom	Expected Mean Squares
Organizational Structure	O_i	$(O-1) = 2$	$\sigma^2_\epsilon + 6\sigma^2_M + 120\sigma^2_O$
Managers within organizational structure for all structures	$M_{(i)j}$	$(M-1)O = 57$	$\sigma^2_\epsilon + 6\sigma^2_M$
Competitive Environment	C_k	$(C-1) = 2$	$\sigma^2_\epsilon + 2\sigma^2_{MC} + 120\sigma^2_C$
Organizational Structure x competitive environment	OC_{ik}	$(O-1)(C-1) = 4$	$\sigma^2_\epsilon + 2\sigma^2_{MC} + 40\sigma^2_{OC}$
Managers within each organizational structure x competitive environment	$MC_{(ij)k}$	$[(M-1)O](C-1) = 114$	$\sigma^2_\epsilon + 2\sigma^2_{MC}$
Error term	$\epsilon_{(ijk)n}$	$OMC(N-1) = 180$	σ^2_ϵ
Total		$OMCN-1 = 359$	

prices would not vary among managers from different organizational affiliations was thus rejected. Furthermore, price responses among managers nested within an organizational grouping were significant, indicating that managers do not behave in an uniform manner just because they belong to an organizational structure. Hence, the hypothesis is that there would be no difference in pricing among nested managers was rejected.

Competitive environment had a significant impact on pricing behavior. While manager pricing decisions suggested that managers behaved as price followers, they were not willing to change prices as much as the changes established by the researchers.

Interaction between organizational structure and competitive environment was generally not significant, suggesting that manager behavior in response to changing competitive environments was generally the same for all organizational structures. Inter-

action between nested managers and competitive environment was significant, again demonstrating that managers within an organizational structure did not behave uniformly.

There was a profit-maximizing price strategy in the game which involved equating net marginal revenues for various departments in a store. Observed variation in gross margin decisions among managers from different organizational affiliations and in different competitive environments were not consistent with profit maximization. Thus, the hypothesis that participants would maximize profits was rejected.

Non-Price Behavior. Organizational structure had a significant effect on all non-price behavioral measures except advertising and store hours policy (Table 2). Competitive environment had a significant effect on all non-price decisions except stamps and store-hours policy. Again, managers nested

Table 2. THE EFFECT OF ORGANIZATIONAL STRUCTURE AND COMPETITIVE ENVIRONMENT ON BEHAVIORAL AND PERFORMANCE MEASURES OF FIRM MANAGERS

	F-Values				
	O_i	$M_{(i)j}$	C_k	OC_{ik}	$MC_{(i)jk}$
Price Response Variables					
Grocery Gross Margin	3.06*	10.08**	59.69**	1.27	2.80**
Meat Gross Margin	4.19*	20.43**	22.78**	1.10	2.86**
Produce Gross Margin	2.77+	19.51**	77.41**	6.73**	4.05**
Dairy Gross Margin	0.03	22.96**	14.74**	1.85	· 6.31**
Total Gross Margin	4.31*	3.97*	48.05**	1.57	2.15**
Non-Price Response Variables					
Advertising	0.29	9.47**	4.71**	2.93*	1.10
Stamps	6.45**	11.90**	0.36	2.67*	1.93*
Total Specials	7.67**	14.17**	35.13**	1.90	2.05**
Store Hour Policy	2.21	19.41**	1.38	1.13	7.18**
Internal Firm Efficiency					
Labor as % Sales	2.57+	8.97**	17.75**	5.70**	1.65**
Inventory	0.71	16.75**	0.76	3.30*	4.14**
Cash Level	7.24**	6.05**	3.95*	1.30	1.60**
% Operating Expenses	5.89*	11.85**	44.99**	1.14	1.83**
Financial Leverage	1.87	3.91**	1.16	2.44	0.97
Asset Turnover	1.73	7.42**	48.67**	0.93	1.82**
Overall Firm Performance					
Total Weekly Sales	0.02	15.01**	182.98**	3.90**	2.25**
Net Profit Margin	7.61**	6.75**	3.37*	1.57	1.66**
Net Worth	12.10**	7.34**	3.86**	4.23**	6.02**
Return on Assets	6.56**	12.12**	7.04**	2.50**	2.56**
Return on Net Worth	7.81**	8.73**	4.88**	2.20+	2.37**

+ significant beyond .01 level.
* significant beyond .05 level.
** significant beyond .01 level.

within an organizational structure did not behave uniformly.

Hypotheses concerning uniform behavior among managers from different organizational structures, among different competitive environments, and among managers nested within organizational affiliation were rejected. These findings reinforced the importance of non-economic factors in business behavior and indicated that unique non-price promotional mixes existed among the organizational affiliations.

Internal Firm Efficiency. Six variables were selected to measure internal firm operation including labor as a percent of sales, inventory, cash level, percent operating expenses, financial leverage, and asset turnover.

Organizational structure had a significant effect on labor utilization, cash levels, and on operating expenses as a percent of sales (Table 2). Managers nested within an organizational affiliation had a significant impact on internal efficiency, implying a great deal of variation in internal firm operation. Competitive environment had a significant influence on two of six measures of internal efficiency.

Overall Firm Performance. Five variables were used to measure firm performance. These included sales, net profit, net worth, returns on assets, and returns on net worth.

Organizational affiliation had a significant impact on all performance measures except total weekly sales (Table 2). Independent firms were

found to be the most profitable, voluntaries being the least profitable.[5] Greater control of internal expenses would have enhanced voluntarie's profitability. There were great differences in the financial impact of these variables. While sales were not statistically different, net profit margins varied 40 percent among organizational affiliations, net worth varied 22 percent, and returns on net worth varied more than 46 percent. Overall performance results were not uniform for firms within organizational affiliations. These results would suggest that some firms from all organizational structures would survive. Competitive environment had a significant effect on all measures of overall performance. Firm profitability was highest in the competitive environment characterized by higher gross margins and lower levels of non-price variables.

EFFICACY OF RESEARCH METHOD

For business games to be useful in studying firm behavior, they must be able to create a realistic environment for decision making. Aronson and Carlsmith [1] classified realism as being either mundane or experimental. Mundane realism is defined as the extent to which events in a laboratory are likely to occur in the real world. Experimental realism refers to how realistic the experimental situation is to the subject, i.e., how much impact the experiment has on him or how seriously he takes the experiment. Campbell [7] explained that both types of realism are important in validating experiments.

Studies by Babb, Leslie and Van Slyke [4] and Roland and Gardner [10] reported a high degree of experimental realism, but limited information has been available on mundane realism.

Utilization of the supermarket game appeared to meet the criteria of experimental realism. Each participant raised relevant questions, stayed long hours and made spontaneous statements to the researchers. In a post-game questionnaire, 99 percent of the participants stated that they felt the experiments had training value. They would recommend the sessions to other managers. It was concluded that a high degree of experimental realism had been attained.

This research attempted to qualify mundane realism by comparing real world behavior with similar measures in the game. Information on actual price policies relative to competitors, pro-

motional activities and store hour policies were obtained in a pre-game questionnaire. These data were compared with similar measures in the game.

In the experiment, managers priced consistently with their real-world behavior about one-half the time. Several reasons may be advanced to explain this lack of price correspondence: First, managers are frequently unable to recognize competitive price levels in the real world. Secondly, managers may have been experimenting in the game as they sought to discover what would happen as decisions were changed. Manager non-price behavior in the real world was nearly identical to that used in the experiments. In a post-game questionnaire, 74 percent of the participants stated that they employed the same price and non-price strategies in the experiments as they did in real life. These results suggested that the game was a useful research tool. This approach was judged superior to alternative means of data generation because of the experimental control afforded, the availability of this type of confidential data, and the low cost of data collection.

CONCLUSIONS

Changes in competitive environment did cause participating food retailers to alter their price and non-price behavior; hence, performance also changed. While pricing decisions suggested that managers behaved as price followers, they were not willing to change prices as much as those established by researchers.

Behavior and performance variation was wider within an organizational affiliation than among affiliations. This suggested that some firms from all organizational affiliations will survive.

Organizational affiliation did have an impact on behavior and performance of firms in the business management game. Hence, factors usually not considered in this static theory of the firm such as organizational affiliation do have an impact on firm behavior and the resultant performance.

The business management gaming approach for studying firm behavior and performance provided the advantages of (a) low cost data collection, (b) controlled conditions for data generation, thus removing uncertainty as to "cause and effect," (c) high degree of experimental realism. Quantifying mundane realism resulted in consistent price

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5 It is recognized that chains may have advantages over independents or voluntaries because of their buying power, efficiencies of distribution, access to capital and the like. They did not enjoy such advantages in the experiments.

behavior between the game and the real world about half the time.

The gaming approach also afforded the advantage of providing relevant behavior and performance data. In fact, it is doubtful that relevant data would have been obtained from field studies.

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