The Use of Computerized Business Games to Simulate Business Behavior Under Different Policies

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ABSTRACT

Computerized business games can be used as a research tool to investigate in a laboratory setting how business firms respond to either governmental policies or to policies established by corporate headquarters. This idea was tested by comparing performance in 2 industries which had constraints placed on certain decision variables to that in 2 industries without constraints on these variables.

INTRODUCTION

Computerized business games have been introduced into business school curricula in a variety of areas. A substantial literature has developed wherein the value of business games as teaching tools has been examined. Amstutz(1), Raia(5) and Wolfe(7) provide both a taste of the controversy and good bibliographies. To a limited extent the business game has been used as a research tool for investigating other issues (Eliason(2), Kennedy(4), Wilsted & Hand(6)). This paper deals with this latter area. It describes a problem that games can be used to investigate and reports on one application in this area.

Econometric models have become an accepted tool for investigating what the outcomes for nations, regions, and cities might be for various governmental policy changes. An assumption which underlies econometric models is that behavioral relationships will not change when policies are changed. While this may be true, it is an assumption that econometric models can only be used to verify ex post rather than ex ante. It is the thesis of this paper that business games can be used to investigate how businessmen will respond to governmental policy changes. If the responses are as would be predicted from theory, then an econometrician can justifiably assume that his model will provide reliable predictions. If on the other hand, the game provides results that are at variance with what theory would suggest, the econometrician is forewarned that his model needs to be revised and he will have some guidance as to what revisions are necessary.

A corollary of the above stated thesis is that business games can also be used by the headquarters of multidivision businesses to investigate how divisions will respond to changes in corporate policies. The top executives of these multidivision firms will have different objectives that they are trying to fulfill than do the government officials who are asking what the results will be of changes in governmental policies. Thus the factors monitored by the researcher will reflect the interest of those whom he is trying to assist.

Before describing one application of a business game for the purpose just discussed, it is necessary to point out that a researcher needs to be careful in choosing the game which he plans to use as his research tool for there are a large number of business games available. Also since business games are abstractions of reality and since the participants will not have to live with the results of their actions beyond the end of the game, a researcher must be cautious in drawing inferences from the experimental situation which he is studying. As with any experimental situation, the more replications one makes, the more confidence one can have that the results are reliable. The validity question is something else. Perhaps the best way of dealing with this issue at the present time is to solicit the opinions of experienced businessmen about the realism of the business game. One cannot expect that the panoply of variables that a real firm might have to deal with will be included in any business game, but it should include those that are of importance for the question being investigated. Thus it can be assumed that any particular business game will only be concordant with a limited number of business sectors. It will be the responsibility of the researcher to make clear to the consumer of his

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work just what business sectors he suggests that his findings are relevant to.

METHOD

The data for this study was developed using 90 business students who were seniors enrolled in the undergraduate core course entitled Business Policies at Temple University. The data was gathered during the fall semester of 1978. The students were enrolled in four different sections of the course. Two instructors taught two sections each. The students were enrolled in four different sections of the course. The students were randomly placed on teams of three. An attempt was made to have each student on a team represent a different functional area. The teams of students represented competing firms in four industries -- one per section.

Model 2 of The Executive Game (Henshaw and Jackson)(3) was the business game used. The authors of the game suggest that the industry represented by their game is an imaginary consumer goods industry. The product of the industry is in demand throughout the year, but it is especially popular at Christmas. Firms can, under Model 2, operate up to three shifts. The game was played for 10 quarters which represents 2½ years of operation. All firms start with identical histories. They make six decisions each quarter. The teams strive to maximize their return on shareholders' equity. The economic, seasonal, and price indexes were the same for each industry.

This experiment grew out of the fact that one instructor wished to simulate a setting wherein the student firms were divisions of multidivision firms which established policies regarding marketing and R & D budgets and prices. They were told by their headquarters (the instructor) that they could not change their marketing budget by more than ± $100,000 over the course of the game; nor could they change their R & D budget by more than ± $100,000; nor could they change their price by more than ± $1.00. The starting budget level for each of these variables was respectively, $200,000, $100,000, and $25.60. The teams were told that if they found it necessary to go beyond these limits, they would have to submit justification for such changes to headquarters and request approval for the changes. None of the teams took this action.

The author allowed the teams in his two industries complete autonomy in making their decisions and only held them responsible for earning the highest possible return on stockholders' equity.

The Executive Game was played by having each team submit a quarterly set of decisions each week. The results for the quarter were returned to the students within two days and thus each team had five days in which to prepare their next set of decisions. A limited amount of class time was made available so that the students could coordinate their individual efforts prior to submitting their next decision. The bulk of the class time and the course was devoted to the discussion of business cases.

RETURN ON EQUITY

The Executive Game was used to determine whether greater profitability might be expected in divisions that were closely controlled by their headquarters or in those that allowed relative autonomy. Table 1 shows that both the highest and lowest profitabilities were earned in the autonomous divisions. The average level of profitability was considerably lower for the autonomous divisions than for the controlled divisions.

In Industry 2 where both the highest and lowest ROEs were earned, the second highest ROE was only 4.70%. The highest ROE firm had a share of the market which was 63% higher than an equal share of the market.

SALES AND SELLING PRICE

Table 2 shows the average firm's sales by type of industry. The firms in the autonomous industries on the average sold over 13% more units than did the average firm in the controlled industries.

Table 2 also shows the average prices charged over the 10 quarters in each industry. While the average price was 2.4% higher in the autonomous industries than in the controlled industries, the average price in both types of industries was within the guideline established for prices in the controlled industry. It should be noted however that that firm with the highest ROE in Industry 2 had set its price above $30.00 for the last six of the 10 quarters.

WAGE BILL

Table 3 shows the wage bill for the average firm in quarter 10 in each of the industries. In The Executive Game firms make a production volume decision. Thus if one assumes that the number of workers is directly proportional to the size of a firm's wage bill, the autonomous industries had, on the average, 9.5% more workers in quarter 10 than did the firms in the controlled industries.

TABLE 1

RETURN ON SHAREHOLDERS' EQUITY

Industry Type	Industry Number	Industry Average ROE*	Highest ROE	Lowest ROE
Autonomous	1	5.50%	8.74%	-0.38%
	2	3.19%	17.80%	-2.66%
Controlled	3	7.50%	8.31%	4.95%
	4	7.25%	8.46%	3.35%

*Annualized return on shareholders' equity

TABLE 2

AVERAGE FIRM'S SALES AND SELLING PRICE
FOR 10 QUARTERS OF OPERATION

Industry Type	Industry Number	Average Firm's Sales (units)	Average Firm's Sales (units)	Average Selling Price ($)	Average Selling Price ($)
Autonomous	1	1,366,376	1,424,959	25.81	26.32
	2	1,483,542		26.82	
Controlled	3	1,301,112	1,259,741	25.59	25.70
	4	1,218,369		25.81	

TABLE 3

AVERAGE FIRM'S WAGE BILL IN QUARTER 10

Industry Type	Industry Number	Average Firm's Wage Bill($)	Average Firm's Wage Bill($)
Autonomous	1	1,333,831	1,238,651
	2	1,143,471	
Controlled	3	1,188,105	1,130,745
	4	1,073,384	

This result is clearly in line with the higher sales volume in the autonomous industries. Since the wage bill is 3.5% lower than the sales volume differential, firms in the autonomous industries were using their plants more efficiently than were the firms in the controlled industries.

DISCUSSION

It is the thesis of this paper that business games can be used to study the effects of exogenous policies on business operations. In the example provided the firms in two industries were controlled with regard to 3 of the variables on which they were required to make decisions. The firms in two other industries were allowed to make all of their decisions without any policy constraints. Thus one set of firms operated in a controlled industrial setting while the other set of firms operated autonomously. Since the findings for each industrial condition are similar in each of the industries operated under each respective condition, the findings can be said to be reliable. Since this paper is suggesting a methodology for investigating the effects of different policy conditions on business operations, no attempt is being made to generalize these findings beyond the imaginary consumer goods industry represented by The Executive Game. Thus validity is not a major concern here although it should be in future attempts to apply this methodology to either corporate or governmental policy questions.

The results of this study show that it is possible for management to tie the hands of their managers by overly restricting their freedom to make decisions. In so doing they keep poor managers from making major mistakes, but they also prevent the better managers from producing the kind of results that are possible if they are given more freedom. In this case "results" refers to the profitability of a firm. At least in part, the higher profitability was due to charging higher prices by the most profitable firm. On the other hand the least profitable firms also charged higher prices. Thus part of being more profitable involves not just charging higher prices, but also establishing the conditions under which it is profitable for one to do so.

While autonomy seems to provide an opportunity for a firm to be more profitable than was the case where the firm's freedom to act was circumscribed, one can inquire about the results for consumers. Are consumers better served by industries where, for example, a firm can charge higher prices? It could be assumed that under such conditions less goods would be sold at higher prices. This clearly was not the case in this study. While the prices were 2.4% higher for the autonomous firms, these firms sold over 13% more units than were sold by the controlled firms. The autonomous firms were able to do this by spending more heavily on marketing and R & D than was allowed in the controlled industries. Thus the autonomous firms appeared to serve the consumers better by providing more goods and more differentiated goods than were made available by the controlled firms.

Finally were the workers in the controlled industry any better served than were the workers in the autonomous industry? Since more product was sold in the autonomous industry, one would assume that the number of workers employed would necessarily be greater. It turned out that the wage bill for the average firm in the autonomous industry was 9.5% higher than for the controlled industry. This means that more workers were employed by the average firm in the autonomous industry. Furthermore, the wage bill was 3.5% less than the increase in units sold which means that the average worker in the autonomous industry was more efficiently employed than was the average worker in the controlled industry. This means that workers in the autonomous industry could bargain with their employers for a share of this increased productivity in the form of higher wages and/or benefits.

The foregoing discussion might suggest that granting freedom to act to the executives of firms is best for all concerned since firms were able to become more profitable than was possible in the controlled industry, more goods were sold to consumers, and more workers were employed. It must be remembered that the simulation only extended over a period of 2½ years and that some of the firms in the autonomous industry were in very poor financial condition. Thus one could suppose that were the simulation to continue for a longer period, the unprofitable firms might be forced out of the industry or acquired by the more profitable firms which would result in increased concentration within the industry. There was already a tendency toward this condition in the autonomous industry if one examines the share of the market held by the firms in the industry. The most profitable firm already held 63% more than an equal share of the market. In the controlled industry, while there was some variance in the share of the market held by each of the firms, the disparity was not nearly as pronounced as it was in the autonomous industry. What the results would be for consumers and workers under increased concentration is not clearly evident and in fact it is something that could be investigated by running the simulation for longer periods than was done in this study. Rather than merely speculating as to what the outcome would be, one could either extend the period of the simulation or repeat the simulation, but extend the period over which it is run.

The benefit offered to policymakers by the application of business games as suggested in this paper is that a variety of questions can be examined simultaneously. The results for each firm in the industry can be traced as well as the overall results. This opportunity to make interfirm comparisons within the industry and between industries can add a new dimension to that currently available in the information provided by even the most sophisticated econometric models. The range of questions that can be examined would be limited more by the imagination of the questioner than by the tools of the researcher if business games were used for policy research as proposed herein.

CONCLUSION

It is proposed in this paper that computerized business games be used as a research tool to investigate policy questions posed by either government officials or executives of multidivision firms. Since there are a large number of business games available -- in 1973 Zukerman and Horn (8) catalogued 1086 business games that were either available or in the process of being developed -- it should not be too difficult for a researcher to find a simulation that either fits his needs directly or that can be modified to fit his needs without going to the trouble of developing his own research instrument. The business game can then be used as a vehicle for investigating the research questions. Since business games are accepted as tools of education and training in business decisionmaking, the researcher should not have too much difficulty in securing appropriate participants for his study. The range of questions that can be examined using business games is for the most part limited only by one's imagination. A particular advantage of using business games for research of this type is that the researcher can achieve a high degree of control over the variables and treatments as well as the inestimable advantage of being able to replicate a study or extend it.

While one can be optimistic about what kinds of research can be done using business games as a tool, one must always remember that as in any laboratory experiment, the usefulness of the results obtained is related to the degree of correspondence between the experimental situation and the situation to which the researcher is trying to apply his findings. If strategic variables are omitted or not controlled for, the findings may not apply to the situation which the researcher is trying to study using this research tool. But having said that, business games are a vehicle which can be used to study policy issues in a low-cost, low-risk manner relative to the consequences they could have if implemented without such study.

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