

# COOPERATE FOR PROFITS OR COMPETE FOR MARKET? STUDY OF OLIGOPOLISTIC PRICING WITH A BUSINESS GAME

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## **ABSTRACT**

*This study investigated a dilemma faced by companies when they set their prices - to engage in tacit price cooperation to achieve acceptable average profits or to increase market share through intensive price competition. The results obtained in a seven-firm oligopoly were followed for over four years. A comparison of firms competing in THE MULTINATIONAL MANAGEMENT GAME showed that oligopolistic competition led to Nash equilibrium as suggested by Game Theory. Initial profits were transformed into longer-term losses and company share prices fell. The results suggest it is advisable for firms to pursue legal ways to obtain "cooperative competition" which results in benefits to stakeholders, that would otherwise not occur, as well as making the industry an attractive investment, helping to sustain the economy's development while being socially responsible by improving wages and creating and maintaining jobs.*

KEYWORDS: *cooperation; competition; oligopoly*

## **INTRODUCTION**

*"Between the white and the black, there are infinite shades of gray".*

To compete or to cooperate is a perennial pricing dilemma studied by administrators, economists and mathematicians. Although always present such a situation conflict does not allow for a trivial solution. Individuals, families, enterprises and nations have continually faced a seesawing of power which is sometimes in favor of buyers and then sometimes shifting in favor of sellers. Tactics, such as giving in to receive goods, negotiating to produce mutual benefits or threaten to achieve higher profits, produce different results for the parties involved. Some parties aim at the negotiated substance—tangible short term

gains. Others at the relationship between the parties—intangible long term gains.

Over the last number of decades the international markets within which firms compete has undergone major changes. Threats and opportunities brought about by structural, economic and political factors have exacerbated competition. Even the developed economies have had to adjust to the new times with recessionary factors making the situation even more difficult. The global computer industry is a good example of the crisis facing oligopolists. The manufacturers of the world's mainframe computers have had to deal with the disruptive effects of microcomputers, which are substitute products that offer better performance, portability, lower overhead and labor costs, and astoundingly lower prices.

In emerging economies such as Brazil, pronounced changes have occurred. This basically noncompetitive environment of the 1970s, which was contained relatively few suppliers, became highly competitive in the 1990. The market's stable structure, which previously existed through cooperative alliances and protected markets, was replaced by individual initiative and aggressively competitive market practices. As the market's new economic agents engaged in their practices the firm's outputs were were redistributed between its different stakeholders.

## **REVIEW OF LITERATURE**

Some industries are more attractive than others for reasons ensuing from strategy or structure (Porter, 1985). In both cases attractiveness may be measured by profits or return-on-equity (ROE) after discounting the cost of capital as shown in Exhibit 1. Studies concerning attractiveness produced models for portfolio investment analysis such as the Matrix of Attractiveness (Ghemawat, 1999:25). Depending upon industry performance and the company's business strength, it may be advisable to invest and grow, grow selectively, select or collect/divest.

Exhibit 1

Average Economic Profits of Industries in the USA, 1978 to 1996

Industry	ROE	Average Capital Invested
Pharmaceutical goods	15%	Minimum surveyed
Computers and peripherals	-2%	Above average
Airlines	-5%	Above average
Steel	-10%	Maximum surveyed

Source: Ghemawat, 2000:32

According to Warren Buffet, “when an industry with a reputation for economic difficulties finds managers with a reputation of excellence, normally it is the industry whose reputation remains intact” (Ghemawat, 2000:31). Administrators have to do more than acknowledge how profitable the results of various competitive actions have been in the past. They must grasp the reasons behind these effects to (a) enable decisions of where and how their companies will compete, (b) assess the implications of changes in the business scenario and (c) either adjust to them or change the scenario.

Historically three increasingly more generic structures have been proposed as solutions for this problem. These are an analysis for supply-demand of individual markets, examining the structure of the the industry's “five competitive forces” after Porter and the “value network” developed by Adam Brandenburger and Barry Nalebuff (Ghemawat, 2000:43). The first two analytical methods are well-known while the value network method points to the existence of important complementing factors in any industry being studied.

A good example of how the value network approach sheds light on an industry's competitive situation can be seen for the computer industry's hardware and software components. Microsoft's Windows 95 operating system is much more valuable in a computer equipped with an Intel Pentium processor than in another having a 80486 chip and vice-versa. Complementary agents, such as in this example, seem particularly significant in situations in which companies are developing entirely new ways of operation. They add a cooperative dimension to the approach, which is to “make the pie larger instead of fighting with the competitors for the whole pie by developing new complements or by rendering the current ones more available”. Because of this thinking the industrial sector's ambiance bears a strong economic influence on any firm that operates within it, which should in turn affect how players engage in competitive practices in a business game that models the microcomputer industry. To that end this paper examines play within *The Multinational Management Game*<sup>1</sup> (Keys & Wells, 1992).

<sup>1</sup>Special thanks are extended to J. Bernard Keys and Robert A. Wells, as authors of *The Multinational Management Game*, for their generous grant that made this research project possible, to Joseph Wolfe for editorial suggestions

## MARKET STRUCTURES

The idea that the supply-demand relation establishes a natural price comes from the Middle Ages (Ghemawat, 1999:33-4). The debate on “value” prompted the creation of the model of the “Marshall scissors”: it was discussed if the “value” should be governed by costs – on the side of the supply – or by the utility – on the side of demand. Theoreticians recommend that price be established by the point of equilibrium in which, for a given product, the demand curve crosses the curve of supply. Rarely applied until the onset of the recessions of the seventies and eighties, Marshall's ideas came into use for the formulation of strategies, the understanding of costs and the establishment of the level of price stability.

Classical Price Theory presents a model for the analysis of the markets which is based upon seven premises, separated in two types: four structural and three behaviorist as presented in Exhibit 2. Four premises are classified as structural: pure competition, monopolistic competition, the oligopoly and the monopoly. In pure competition a very high number of companies produce identical goods in an environment of informational symmetry, that is to say, all companies know where to purchase low cost raw material and all consumers know where to buy low cost products. In the monopolistic competition, several companies are competing with very similar products. In the oligopoly, there is a small number of companies whose products are differentiated, in accordance with the combination of prices, produced quantities, models, promotional efforts and sales points. In the monopoly situation there is one single source of sales for the products with no substitutes. Companies operating under the rules of pure competition are “price takers” as their prices are established by the balance between supply and demand. They can become “price makers” if they operate in structures of monopolistic competition, oligopoly and monopoly. Because of this they may adjust prices according to their own interests. In this case, informational asymmetry makes-up one of the sources of power.

and to three anonymous reviewers for their contributive comments.

Exhibit 2  
Market structures and their seven premises

Premises	Price Takers	Price Makers		
Structural	Pure Competition	Monopolistic Competition	Oligopoly	Monopoly
Number of sellers	Many	Several	Few	One
Cost conditions	Decreasing returns in production in the short term.			
Number of buyers	Many			
Demand conditions	Identical substitutes	Very similar substitutes	Not very familiar substitutes	No substitutes
Behavioral	Pure Competition	Monopolistic Competition	Oligopoly	Monopoly
Company objectives	Profit maximization in the short term.			
Strategic variables	Produced quantity	Price, produced quantity, promotional efforts, product design and distribution channels.		
Competitors' reactions	None		Depends on competitors' objectives	None

Source: Adapted from Douglas (1992: 363)

### GAME THEORY

When studying a market, an effort is made to identify the price and the quantity in a situation of equilibrium (Pindyck & Rubinfeld, 1994:561). In a market of pure competition the equilibrium price is found when the supplied and the demanded quantities are the same. Once the curve of demand is identical to that of the marginal revenue, the economic profit tends towards zero for the supplying agents. In a monopoly, the equilibrium takes place when the marginal revenue becomes equal to the marginal cost nullifying the incremental profit. Given that in this case the curves of demand and marginal revenue are different, the monopolistic agent achieves positive economical profits by establishing the equilibrium price higher than that practiced in pure competition, thereby

resulting in a lesser quantity of demand. In monopolistic competition, long-term equilibrium occurs when new companies enter the market thereby forcing profits to zero. In these markets, each company assumes a price or demand premise, without concern about the competitors.

In an oligopolistic market, the company determines the price and the volume based upon the expectation of the competitors' behavior. In 1951, the proposition of mathematician John Nash was made about the equilibrium of oligopolies "Each company does the best it can considering the action of its competitors". (Pindyck & Rubinfeld, 1994:561). In oligopolies there is a characteristic dependence that affects the strategy of each company in terms of the competitors. This definition helped to develop "Game Theory", a discipline that studies the imperfect markets described in Exhibit 3.

Exhibit 3  
Characteristics and asymmetries in imperfect markets

Characteristics of Imperfect Markets	Asymmetries Observed
Small number of competitors	Confidential actions among competitors
Restricted information about the market	Incomplete contracts
Possibility of non marketing interactions	Agency relationship

Source: Adapted from Nowak, 2000: 13.

With regard to the strategies adopted by players, the theory is divided in two branches-- cooperative and non-cooperative games (Kreps, 1990:9). In a cooperative game participants wish to maximize the results of the coalition as in Exhibit 4. In the non-cooperative ones the unit for

analysis is the individual who is concerned in maximizing results under the game's rules. In practice cooperation takes place only if it provides the best results at both the collective and individual levels.

## Developments in Business Simulation and Experiential Learning, Volume 30, 2003

Exhibit 4

Cooperative Games *Versus* Non-Cooperative Games

Game Theory Branch	Unit of Analysis	Player's Objective
Cooperative games	Group or coalition	Maximize the group's results
Non cooperative games	Isolated individual	Maximize individuals' results

Source: Adapted from Kreps (1990:9)

The competitive situation faced by oligopolistic companies, and a classic example of the application of Game Theory, can be found in the *Prisoners' Dilemma*.

Two prisoners are accused of having worked together on a crime. They are incommunicable in different cells. Each of them was pressured for a confession of the crime. Were they to confess, both would be condemned

to five years of prison. If one of them confesses and the other does not, the one that confesses will have his sentence reduced to one year and the other will be condemned to ten years. If neither confesses, both can appeal and reduce the sentences from five to two years of imprisonment. If you were one of the prisoners what would you do: confess or not?

Exhibit 5

Matrix of Decisions and Results of the Prisoners Dilemma

		Prisoner B	
		Confess	Not Confess
Prisoner A	Decisions		
	Confesses	- 5 - 5	- 1 - 10
	Doesn't Confess	- 10 - 1	- 2 - 2

Source: Pindyck & Rubinfeld, 1994:581

The sum of the sentences for both prisoners is different in the positions presented in Exhibit 5 shows this is not a "zero sum game". Although most of the examples related to Game Theory deal with two contenders, a game with more participants is merely a generalized form (Owen, 1995:212). Often oligopolistic companies face similar dilemmas. They must decide, "compete" to increase their market share or "cooperate" for the profit, tacitly setting up a coalition. In the latter case they become passive, constrain production and adopt higher prices.

Following the example of the prisoners' dilemma, each company may feel encouraged to "betray the tacit deal" and practice lower prices, fearing a similar action on the part of the competitors. Although this cooperation may be desirable each company is concerned with the possibility that by adopting a passive behavior, its competitors may act aggressively thereby achieving a larger market share. Cooperation becomes questionable under this circumstance and encourages competition that Nash states leads to a new equilibrium with lower profits.

While in the Prisoners' Dilemma the decision is taken only once, in business games the decision-making situation repeats itself indefinitely. Decisions about the quantities to be produced, the prices to be charged and investments to be made, are repeated thereby affecting the equilibrium and interfering in the competitors' future decisions. In this context, cooperation once again becomes a possible alternative.

The political scientist Robert Axelrod (Pindyck & Rubinfeld, 1994:625) designated the robust strategy "tit-for-tat". His logic is simple. The game opens with cooperation.

Afterwards, each movement of the other player is repeated (Nowak, 2000:15). Such a strategy induces cooperation. If per chance the opponent ceases to cooperate, cooperation is interrupted until the opponent retreats. In a complementary manner, when two competitors, Company 1 and Company 2 operate in a rational fashion, for a finite number of repetitions another scenario is outlined (Pindyck & Rubinfeld, 1994: 625) wherein each one will think in the following way:

Just because Company 1 is practicing the strategy of *tit-for-tat*, Company 2 should not sell for less until the next to the last period. It can only do so in the very last period to achieve higher profits, because the game will have ended and there will be no time for retaliations". Company 2 reasons that it will sell for less only in the last period. Considering that Company 1 might have the same idea, it also reduces the price in the last period. On the other hand, how would the next to the last period stand? Company 2 should sell for less during the next to the last period because there may not be any cooperation in the last period. As both might have already thought about this possibility, they would be planning to charge less in the next to the last period. The same rationale is applicable to each preceding month and the only alternative for both would be to practice the lowest price in all of the periods.

Note in this example a high price indicates cooperation and a low price is associated with competition. Once a competitor is not completely rational, two equilibrium

## Developments in Business Simulation and Experiential Learning, Volume 30, 2003

situations may arise: cooperation in the initial rounds, competition in the final rounds. The earlier a player ceases to cooperate, the greater will be the level of rationality (Kreps *et al.*, 1982:245-52).

### RELATIONS WITH STAKEHOLDERS

The specific benefits achieved by companies differ from one industry to the other in accordance with the strategy pursued. When formulating strategies, the manager seeks to adjust them to the expectations of the stakeholders. In view of the diversity of the stakeholders, the resultant conflicts become numberless. More and more the companies' social responsibility imposes commitments that surpass maximization of the profits. As, sometimes companies are very powerful, they must take on social responsibilities. In practice this may entail managing them for the benefit of: the clients, suppliers, employees, local community and also shareholders. On the other hand, Friedman and the neo-Classical School postulated (Silbiger, 1996:52): "companies are engaged in maximizing shareholder value, by means of the prudent use of scant organizational resources, in so far as the company's activities are in compliance with the law". They believed that the government's only role would be to establish the laws that govern player actions. A profitable company benefits society by creating jobs and by enhancing the quality of life for its owners and employees. Companies pay taxes that support the government's social action.

Upon analyzing the different stakeholders, a basis must be sought to enable an integration of the diverse approaches. Every managerial action produces gains and losses for the parties involved, which bring to light rights and responsibilities. The analysis of the stakeholders involved is a procedure adopted to rank the critical aspects, reducing the lengthy list of participants to the more important ones. Finally, a situational analysis guides the decision sequence as follows:

1. List of characters
2. Losses and benefits for each participant
3. Rights and responsibilities
4. Relative power of each party
5. Consequences on the short and the long terms of the decision alternatives
6. Contingency plans for alternative scenarios
7. Judgment and choice

Social responsibilities, return to shareholders and other trends of thought have been discussed to guide the management of organizations. For instance, in utilitarianism it is stated, "an action is justified if it warrants the maximum benefits to the greatest number of people". Regardless of the philosophy adopted there will always be new interpretations, tensions and behavior of those involved that intervene in a dynamic context taking decisions in quest of results.

Exhibit 6  
Expectations of the stakeholders

Stakeholders	Decisions	Expected results
Shareholders	Invest/Disinvest	Higher share price; dividends.
Consumers	Consume/Not consume	Satisfaction of the needs
Suppliers	Supply/Not supply	Sales increase
Managers	Compete/Cooperate	Profits; satisfaction of the stakeholders
Government	Observe/Interfere	Sustainable development
Workers	Work/Do Not Work	Income

### RESEARCH PROBLEM

Comparative analysis of the competition and collaboration strategies and the impacts upon an oligopolistic market were defined as a research problem. The premise to be tested is that in sequential games with a finite number of rounds in an oligopolistic market, the equilibrium of Nash is attained, that is to say competition will decrease the overall profits of the industry.

### RESEARCH METHOD

Contrary to what takes place in case studies where analyses are undertaken of the secondary data of companies under study, it was decided to produce primary data by means of an entrepreneurial environment simulated in a

business game. Business games are simulations directed towards the world of business that may be used in training and development of personnel, evaluation of potential, planning, decision making and preparation of administrators. The number of publications in which business games are adopted as a research method with different approaches has grown (Faria, 2000:90).

### DESCRIPTION OF THE EXPERIMENT

A laboratory environment was created with the aid of the *Multinational Management Game* (MMG), a simulator that provides a challenging exercise of decision-making (Keys & Wells, 1992). It simulates a segment of the global microcomputer industry, through a company headquartered in the United States (domestic market) and which can

## Developments in Business Simulation and Experiential Learning, Volume 30, 2003

operate in Europe (Germany) and in Asia (Malaysia). Each company produces and commercializes two products: microcomputers (consumer goods) and memory chips for microcomputers (intermediate goods). A round of decision-making is equivalent to one year of operations, which intends to provide the system with a strategic characteristic. The game starts with results of the year zero. The industry with up to eight companies (teams) begins with the same history and initial financial position. The game manual supplies information on the market, decision variables and suggestions for the creation of a system to support decision-making.

Yearly decisions are divided into three major groups--marketing strategy; manufacturing strategy and financial strategy. The marketing strategy rests upon the main variables that affect demand of the products such as price and advertising. The manufacturing strategy has orientation on how to produce the products to be sold, taking into account the capacity constraints and the payment policies for direct labor. The financial strategy encompasses decisions regarding the structure of capital, level of indebtedness and policy for distribution of dividends to the shareholders. The market is influenced by macroeconomic factors defined by the game administrator and by the decisions of the competitors, which confronts the participants with a high degree of uncertainty.

In the experiment described here the results were obtained for four simulated years in two environments--cooperation and competition. The industry was comprised of seven companies operating in their domestic market of the United States. The economic environment possessed an average annual growth between 4% and 5% and an inflation rate between 3% and 5%.

### COOPERATIVE ENVIRONMENT

In this situation the seven companies should tacitly adopt the same decisions regarding prices, market actions, production levels, expenditures and investments. They create "passive competition" or coalitions, similar to the behavior of a monopoly. In this ambiance, the economic agents cooperate during four years in the following fashion:

1. **Prices of Products A and B:** the companies maintain prices practiced in the year zero (initial situation) with yearly adjustments according to inflation.

2. **Expenses with advertising, research and development and employees' wages:** all are maintained at historical levels, adjusted by the inflation.
3. **Number of distribution centers, sales representatives and commissions of the salesmen:** the initial structure remains unchanged.
4. **Production levels:** the companies assume a reactive posture, producing in accordance with the predicted demand and investing in an increase of capacity only if there is market growth resulting from marketing decisions. No overtime is programmed.
5. **Other expenses:** a yearly contribution to a sectorial entity in charge of facilitating cooperation between the companies is considered.

### COMPETITIVE ENVIRONMENT

The theory presented above discloses that this game simulates an oligopolistic market structure with few competitors, where the actions of one company affect the actions of the others, permitting to differentiate the product according to price, promotion, design (research and development) and distribution channel. In the competitive environment, seven companies were managed during four years in domestic operations by up to two graduate students of the discipline EAD-5870 – Business Games – of the year 2001 of graduate course at Universidade de São Paulo, Brazil (FEA-USP). All started from the same initial situation, according to the handbook provided at the beginning of the simulation. At each class one or two decisions were taken. The competition was encouraged by the promise that the final evaluations would be partially dependent upon the results of the seven company performance indicators (sectorial multiples).

Prior to the effective start of the game an experimental round took place, where each group could test the sensitivity of the variables of the simulation and become familiar with the dynamics of the exercise. The lessons took place in a laboratory and each group was invited to prepare its own system of support for decision making, operating in a microcomputer. At each round, the teams could buy sectorial reports with data on the industry and on the competitors. Informational asymmetry was encouraged between the simulated companies as well as the ensuing competition, as summarized in Exhibit 7.

## Developments in Business Simulation and Experiential Learning, Volume 30, 2003

Exhibit 7

### Characteristics of the Competition's context

Conditions for the Differentiation and the Competition
Team arrangement, asymmetric assimilation of the problem identical beginning.
Autonomy for decision making
Experimental round to test the sensitivity of the game
Development of a proprietary decision making support system
Information asymmetry, in view of the possibility of acquiring industry reports
Evaluation of the game based upon the performance of sectorial multiples

## ANALYSIS OF RESULTS

Notwithstanding that the conditions encouraged competition, there were moments of cooperation with the conduct of benchmarking sessions for the comparison of some decisions and results of the companies, when the game's administrator left the classroom.

For each stakeholder a distinct effect of cooperation or competition was perceived. Dividends paid to the shareholders were 59.5% higher in the competitive environment. However, in this scenario the average share price was 23.0% lower, considering the larger number of shares in circulation, the smaller profits and the dividend policy (Exhibit 8). Competition also reduced the average market value of the companies by 18.6%

Exhibit 8

### Impact for the Shareholders

Impacts	Shareholders			
	Indicator	Cooperation	Competition	Competition's Effect
Management Actions	Dividends Paid (\$1.00 at present value)	42,000	66,981	59.5%
	Shares Outstanding	875,000	925,000	5.7%
Results	Share price (\$ average present value)	7.19	5.53	-23.0%
	Average companies market value (\$1.00)	6,288,494	5,119,741	-18.6%

For the consumers, however, the impacts of competition were positive as presented in Exhibit 9. Lower prices, better product quality through R&D spending and greater distribution channel activity helped to drive the size of the market. The competitive situation facilitated the access of more consumers to the products in question. The competitive strategy increased the demand for product A by

22% and 32% for product B, disclosing itself as a favorable move for the companies that intended to improve the market share. This was caused by prices that were 10% lower for product A and 13% lower for product B and a duplication of the number of sales representatives as well as by 112% more distribution centers.

Exhibit 9

### Impacts for the Consumers

Impacts	Consumers			
	Indicator	Cooperation	Competition	Competition's Effect
Management Actions	Price product A (\$ average present value)	1,600	1,449	-9.4%
	Price product B (\$ average present value)	225	196	-12.8%
	Total number of sales representatives (annual average)	560	1,117	99.4%
	Total number of DCs (annual average)	35	75	112.9%
	R&D expenses (\$1.000 present value)	280,000	456,904	63.2%
Results	Total demand for Product A (# of units)	3,504,249	4,272,645	21.9%
	Total demand for Product B (# of units)	3,504,067	4,603,723	31.4%
	Sales Lost A (total number of units)	-	179,286	-
	Sales Lost B (total number of units)	-	71,038	-

## Developments in Business Simulation and Experiential Learning, Volume 30, 2003

Suppliers also benefited from the competitive environment according to analysis of Exhibit 10. Additional raw materials were bought, more money was invested in the construction of new workstations and even more loans were made. Those that benefited most were the suppliers of capital goods who sold nearly twice as many workstations

and banks. The total interest paid was 96.0% greater with competition than with cooperation. Next came the raw material suppliers for product A with 21.0% more sales under competition and those for the raw material of product B with an increase of 4.5% in the sales in relation to the cooperative situation.

Exhibit 10  
Impacts for the suppliers

Impacts	Suppliers			
	Indicator	Cooperation	Competition	Competition's Effect
Management Actions	Raw material purchase product A (# units)	3,593,100	4,347,112	21.0%
	Raw material purchase product B (# units)	5,191,200	5,425,118	4.5%
	Workstation bought (total units)	700	1,900	171.4%
Results	Interest paid (\$1,000total at present value)	175,422	343,574	95.9%

When financial indicators are taken into account it is perceived the effects of competition for the companies were most-often negative. An average return on assets of 11.0% in the cooperation case becomes negative (-1.8%) in the competition situation. Another significant change was

noticed in the total profit for the industry. The sum of results of the seven companies from year 1 to year 4 brought to the current level of inflation went from a total profit of \$644 million to a loss of \$82 million. See Exhibit 11.

Exhibit 11  
Impacts for the Companies

Impacts	Managers (Companies)			
	Indicator	Cooperation	Competition	Competition's Effect
Results	Net profit (\$1,000 total of industry at present value)	643,657	(81,536)	-112.7%
	Return on Investment (average)	10.64%	-0.34%	-103.2%
	Return on Sales (average)	10.00%	-5.32%	-153.2%
	Return on Equity (average)	11.00%	-1.82%	-116.6%
	Productivity A (average)	165	168	1.7%
	Productivity B (average)	646	660	2.1%

In the operational field investments in Research and Development rose 63.0% as did the number of people hired or 100.0% more sales representatives and 13.0% more

factory workers, and productivity rates of 1.7% more for product A and 2.1% for product B. See Exhibit 12.

Exhibit 12  
Impacts for the Workers and Sales Representatives

Impacts	Labor (workers and sales representatives)			
	Indicator	Cooperation	Competition	Competition's Effect
Management Actions	Hourly wages of sales rep. (average present value)	42,727	62,303	45.8%
	R&D Expenses (\$1,000 present value)	280,00	456,904	63,2%
	Hourly wages of workers (\$ average present value)	13.47	13.51	4.5%
	# oper. workers at overtime (average)	-	280	-
Results	Turnover and absenteeism (average)	7.50%	7.25	-3.3%

## Developments in Business Simulation and Experiential Learning, Volume 30, 2003

In the same way as for suppliers and consumers, the workers – factory workers and sales representatives – were benefited by management actions in the competitive industry situation as in Exhibit 12 working conditions were improved, wages were 0.3% higher, more jobs were supplied and programming of overtime was increased with a 50.0% premium paid. The most significant impact was with respect to the sales representatives who achieved, in the competitive environment, average wages that were 45.8% higher than in the competitive case.

The governmental context also endured impacts in both situations, be it by social indicators or by its own tax collection. In accordance with Exhibit 13, competition generated more jobs (12.6% more for factory workers and a 99.4% increase for sales representatives). Also with higher average wages, the volume of resources channeled towards

these two social segments was larger by 24%. Similarly, competition provided for a 5.9% greater sales volume than under cooperation.

Exhibit 13 shows the variation of the companies' taxes on profit paid or refunded. As the majority of companies showed accounting losses under the competitive arrangement, the amount refunded was superior to that paid. However, the simulator does not include other taxes, such as those paid by suppliers, workers and sales representatives, or value added taxes. Such distortion restricts the conclusions based upon this indicator, in view of the fact that taxes assessed upon added value might, in other simulations, mitigate this impact. For the economic activity the effect of competition was quite high. The industry aggregated a contribution of 102% for the production of national wealth.

Exhibit 13  
Impacts for the Government

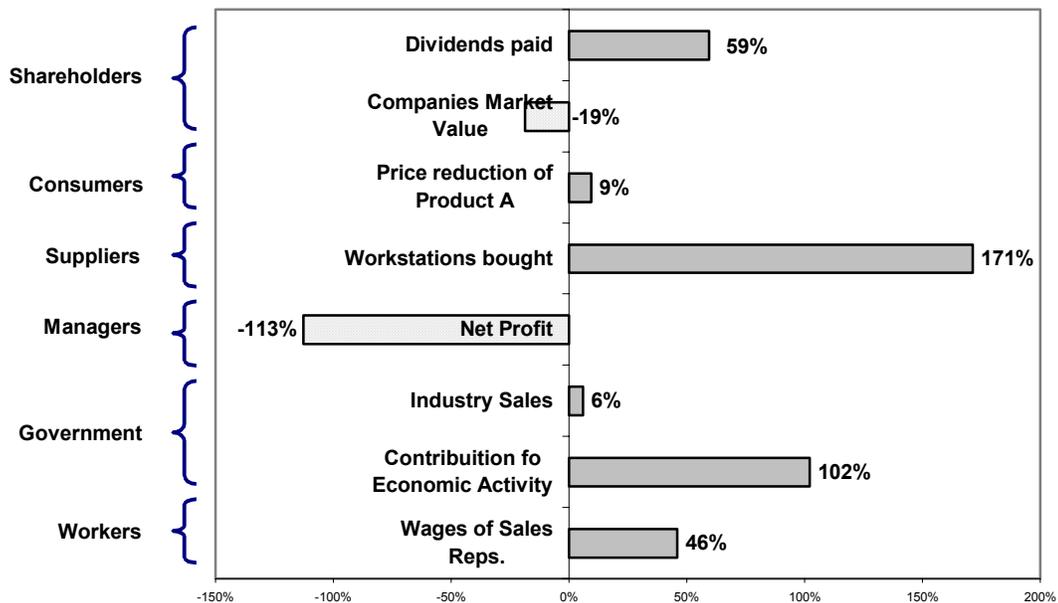
Impacts	Government			
	Indicator	Cooperation	Competition	Competition's Effect
Management Actions	Total number sales rep. (annual average)	560	1,117	99.4%
	Wages paid to sales rep. (total of the industry at present value - \$1,000)	95,709	275,874	188.2%
	Total number workers (annual average)	7,700	8,670	12.6%
	Wages paid to workers (total of the industry at present value - \$1,000)	942,900	1,016,832	7.8%
Results	Taxes paid or refunded (total at present value - \$1,000)	331,609	(42,002)	95.9%
	Industry sales (total at present value \$1,000)	6,394,451	6,773,216	5.9%
	Contribution for the economic activity (\$1,000 at present value)	25,062,474	50,642,295	102.1%

### CONCLUSIONS AND LIMITATIONS

Results in the competitive environment proved themselves as distinct from those of the cooperative environment (Exhibit 14). While cooperation benefited managers and shareholders by favoring the industry with higher profits, competition favored other stakeholders, stimulating the quality of the products, a broader distribution channel, the practice of reduced average prices

and the increase of the economic activity and the generation of jobs. In addition to improved products, more consumers had access to the market. This may be interpreted, as an additional social benefit resulting from the oligopolistic alternative that the companies involved would be implementing by adopting competitive strategies. Such a contribution should be sustainable, without either threatening the interests of the investors or reducing or dangerously nullifying its attractiveness.

Exhibit 14  
Effects of Competition: Gains and Losses



It can be concluded that:

1. In the cooperative experiment (tacit coalition) results were superior. Cooperation “increased the size of the cake” benefiting the competitors without violating the market rules and imputed upon society an apparently affordable cost together with the perspective of a sustainable market structure (showing that in MMG the market does not propose a simple “zero sum game”).
2. In the competitive experiment, the attractiveness of the industry was reduced, an aspect that might discourage investors provoking a rupture in the market structure. The poor average performance of the computer industry also occurred between 1978 and 1996 as reported by Ghemawat (2000:32). The worldwide computer industry continues to face difficulties as exemplified by the recent acquisition of Compaq by the HP (Balieiro, 2002). We are witnessing a somewhat similar situation in the airline industry.
3. Regulation of oligopolies might be an efficient alternative to defend the industry (managers and investors) and protect stakeholders (consumers, suppliers, workers and government).
4. From the pedagogical point of view one may stimulate students playing business simulations to include in their business plan the intention of creating opportunities to cooperate with competitors and legally take advantage of it. Professors should be aware of the importance of cooperation in managerial education, a dimension in the global market more and more important. European leaders intend to include tenths of

developing countries in the European Union market and American leaders discuss AFTA-American Free Trade Agreement to 2005. Critical incidents could be included in the simulations to reinforce the point of view of different stakeholders and the importance of cooperation for sustainable relationship among them.

In the study not many competitors were required to foster competition, once the equilibrium of the oligopolistic market trends by itself towards the Nash Equilibrium, as suggested by Game Theory. To perfect the simulators in the computer industry, Brandenburger and Nalebuff (Ghemawat, 1999) recommend the inclusion of aspects related to the “complementing” agents, fundamental in a “value network”.

One of the main limitations of this study is related to the problems of simulating a real ambiance by means of models and computerized programs. Their utilization takes into account a much smaller number of variables, thereby entailing a significant simplification of the complex reality. Furthermore, the results of this study should not be generalized. As it is the case of a singular sample, repetition of the experiment with other business simulators is desirable to broaden the “insights”. The number of decisions in the simulation was very limited and would be criticized as insufficient. Even if the experiment were much more longer (more than four periods of decision) it is not possible to affirm that results would be different.

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