DOMINANCE IN ONLINE BUSINESS GAMES COMPETITIONS

Ricardo R. S. Bernard
Universidade Federal de Santa Catarina
bernard@cse.ufsc.br

Moisés Pacheco de Souza
Universidade Federal de Santa Catarina
mpsouza1980@yahoo.com.br

ABSTRACT

Research concerning performance in business games has strongly demonstrated the persistence of the results as long as the simulations progress. The dominance of the leader companies starts in the earlier period and progress until at the end of the simulation. This paper extends previous studies by using business simulation competitions administrated on line. The goal is to verify if the dominance still remains in competition environments. Academic and general competitions were used involving manufacturing and retailing simulations. Results show that the dominance remains in all analyzed competitions. However, no different levels of dominance were found in terms of type of competition or simulators. Present results add external validity to previous studies about dominance in business games.
Key-words: Management simulation; business game; performance; dominance, competition.

INTRODUCTION

Patz's (1992, 1999, 2000, 2006) studies demonstrated that total enterprise (TE) simulations have a predictable performance pattern. According to Patz, teams that lead at the end of the simulation have led from the beginning and the lead grows as the period progresses. This predictable performance pattern was defined as dominance. Teach and Patel (2007) discuss dominance in business games from an economic theoretical point of view. According to this theory, a firm is considered dominant when it has 40 percent or more market share (Scherer and Roos, 1990 *apud* Teach and Patel, 2007).

However, the definition of dominance from an economic theory it is not appropriate to business games. The starting conditions of simulated companies, and the evaluating criteria used in business games, prevent the adoption of dominance from an economic theory viewpoint. In real world companies can be arranged in monopoly, oligopoly or pure competition. In total enterprise simulations companies are usually designed to compete in oligopoly environments (Goosen *et al.*, 2001). But, oligopolies in real and simulated worlds are formed in different contexts. In real world, companies are created in different years or decades. Thus, they are modeled in completely different economic and social conditions. In academic simulated environments, on the other hand, starting scenarios usually are composed by companies in identical situations. Although, this situation does not occur in real worlds, it is very important in simulated world for evaluation purposes. Otherwise, the instructor would have difficulties in knowing if the company, no matter which criterion used, was the winner because of the team performance or the different initial conditions given. Additionally, the economic theory assumes that the dominance in market share bring economic better results in short or long run to the dominant firm. In business games models, the initial equal conditions to the companies, and the limited simulated rounds, could not give them the necessary economic power and time to translate market share dominance in best economic results. These simulated characteristics can justify the reasons that most instructors of business games exercises prefer evaluate simulate companies based on economic results (Washbush and Gosen, 2001).

Previous studies related to dominance in business games defined this construct as how earlier the winner company starts to lead (Patz, 1992, 1999, 2000, 2006). Dominance in present study was defined as the percentage of rounds led by the winner company. More specifically, the authors consider that the dominance occurs in a business game when the winner company led more than 50% of the rounds (not considering the first period because all companies are in equal situation). For instance, a winner company of eight simulated rounds led rounds 3, 4 5, 8 and 9; that is, it led 5 out 8 rounds. According to the present study the dominance occurred because the winner company led more than 50% of the rounds. However, according to Patz's definition, dominance cannot be considered because the company skipped leadership in rounds 6 and 7. Thus, as a construct, dominance is a matter of degree. Consequently, dominance can exist, or not, depending on the definition considered to the construct.

Previous studies related to dominance in business games were discussed using an academic orientation; that is, using BBA and MBA students from regular courses. Expected outcomes of such exercises were the learning achieved by the participants. Thus, the winner can be considered, at least from an instructor's viewpoint, as a secondary outcome of the exercise. This study extends Patz's (1999, 2000, 2001, 2006) previous research by considering simulations in on line competition environments. Two types of business games competitions were used: competitions encompassing two-year business school students and competitions open to all kind of participants. Eight competitions were analyzed. These competitions have used different simulators (manufacturing and retailing business simulators). In the total, 495 simulations were analyzed,

involving 3,953 simulated companies. In such competitions the learning objectives are supposed to be less intensive, especially because each instructor was responsible for many simulations simultaneously. Moreover, the competitive simulated environment is supposed to be more intense because the competitions select a winner based on the performance of the simulated companies. Consequently, competitions involving business games can also have dominance of the leader, one of the possibilities found in competitive environments, not only in real world, but also in simulated world. Thus, the main research question to be addressed in this study is: Does it exist dominance in online business game competitions?

HYPOTHESES

The research question formulated in the previous item is converted into hypotheses to be tested, as follows:

H1: There is no dominance of the winner manufacturing company in on line business game academic competitions.

H2: There is no dominance of the winner retailing company in on line business game academic competitions.

H3: There is no dominance of the winner manufacturing company in on line business game general competitions.

H4: There is no dominance of the winner retailing company in on line business game general competitions.

Considering the previous hypotheses are discarded, two additional hypotheses will be tested:

H5: There is no significant difference between dominances in online academic competition and on line general competition.

H6: There is no significant difference between dominances in manufacturing simulation and retailing simulation.

THE METHOD

Two different types of competitions were used to test the hypotheses about dominance in business games. First type was composed by competitions inside specific academic institutions. This type is called Academic Competition. Second type was composed by competitions realized annually, and open to all kind of participants. This type is called General Competition. Additionally, the two types of competitions had simulations using manufacturing and retailing simulations. All competitions were conducted toward one online website.

Academic competitions are business simulation competitions composed by two-year business school students. These competitions are a mandatory exercise that all students have to follow in the related academic institutions. The competitions are similar to a regular course, but no formal classes are given. The students form their own teams (each 8 teams comprise one simulation), download the Player's Manual and prepare themselves for a trial round. In the sequence, they have to run rounds on a weekly basis. Results of the simulation are available one day after the deadline to send the decisions. The final round is not known by the students until the end of the competition is declared. The instructor's role is only clarifying doubts about the company and the simulated environment. Face to face interactions occur between the instructor and the students to solve doubts about the simulation. Data were extracted from academic competitions of the years 2006 (two editions), 2007 (one edition) and 2008 (two editions). In the total, 439 simulations from academic competitions were used. Some competitions had 7 rounds while other had 8 rounds (not considering the trial round).

General competitions are business simulation competitions composed participants of all kind of background. However, the majority of participants are accounting and business undergraduate students from different universities. The teams fill out a subscription form, pay a fee to participate and receive a password to have access to the website of the competition. The competition is split in two phases: a qualifying and a final phase. In the qualifying phase, each 8 teams represent a simulation. They have a trial round, followed by 4 rounds on a weekly basis. Results of the simulation are available one day after the deadline to send decisions to the coordination. The final round is known at the beginning of the competition. No communications are made between the instructor and the participants, except by eventual technical computing problems. The winner of each simulation is classified to the final phase. All qualified companies compete again to define the winners. The third, second and first places receive money as prize. Data to this study were extracted only from the qualifying phase, representing 56 simulations from general competitions of the years 2002, 2005 and 2006.

Manufacturing simulations were used in 2002 (general competition), and 2006 (academic and general competitions). A total enterprise simulator was used which companies had to produce and selling a single product to different regions. Production, marketing, human resource and finance were the main managerial functions to be managed (SIND, 2002, 2006). Retailing simulations were used in 2005 to the general competition and in 2006, 2007, and 2008 to the academic competitions. A total enterprise simulator was also used which companies had to purchase different products and selling them in a single region. Marketing, human resource, operations and finance were the main managerial functions to be managed (SIMCO, 2005, 2006, 2007, 2008). The main performance indicator from the two simulators was the stock value of the companies. This indicator is composed by the following indicators: Return on equity (the most important), market share, earnings margin, working capital, indebtedness and return on total assets. The stock value was used in all competitions to define the winner companies.

Considering all competitions, the database to the study was composed by 495 simulations and 3,953 simulated companies. Table 1 presents the number of business game simulations separated by type of competition and simulator, while Table 2 shows the number of simulated companies, also separated by type of competition and simulator.

Table 1 – Number of simulations separated by competition and simulation types

	Manufacturing simulation	Retailing simulation	Total
Academic competition	51	388	439
General competition	32	24	56
Total	83	412	495

Table 2 – Number of simulated companies separated by competition and simulation types

	Manufacturing simulation	Retailing simulation	Total
Academic competition	408	3,097	3,505
General competition	256	192	448
Total	664	3,289	3,953

RESULTS AND ANALYSES

The sample was formed by all companies that led the last round of its respective simulation. In the sequence, it was calculated how many rounds each company led. Such rounds were standardized in percentages because the simulations had different simulated rounds. Finally, these percentages, called dominance level, were diminished by the value 50%. Results higher than zero mean that the dominance has occurred in the given simulation. The maximum result value is 50%; that is, the company led all rounds. Negative results indicate that that winner company led less than 50% of the rounds and it is not, by definition, a dominant company. The minimum result value depends on the number of simulated rounds. However, it can never be -50% (or less) because this value indicates that the company did not lead any round (and all companies of the sample led at least the last round).

Once the data were prepared, statistics procedures were performed to test the first four hypotheses. Basically, the 'dominance levels' were compared with '50% dominance'. Hypotheses **H1**, **H2**, **H3** and **H4** were discarded considering a 5% significance error. That is, the dominance is present in all competitions, no matter its type (academic or general competition) and simulator used (manufacturing or retailing simulator). In other words, in all analyzed competitions, the winner companies have significantly led more than 50% of rounds. Tables 3 through 6 show statistics results discarding tested hypotheses.

The dominance is graphically represented through Figures 1 to 3. They present the number of rounds that the winner companies led the competitions. For example, in Figure 1 one can observe that nine companies led only the last round (frequency 9 to number of rounds led equal 1). Figure 1 shows the number of rounds that the winner companies led their competitions in the academic competitions with 7 rounds (not considering the trial round). Companies that led more than 3 rounds are considered dominant winners, while companies that led the 7 rounds led 100% of the rounds. Figure 2 shows the

Table 3 – Statistics results rejecting Hypothesis 1

	x' - x"
Sample size	51
Minimum	-35.714
Maximum	50
Range	85.714
Mean	5.7423
Std. Deviation	24.1180
Standard error of mean	24.1180
d.f.	50

95% confidence for mean -1.041 to 12.528

t value testing mean=0 is 1.70

Significance level *(p)* is 0.0476 (4.76%) for 1 sided test

One sided test assumes observed difference is the same sign as hypothesized

Where:	*Mean*	*Std. Dev.*
x' = Dominance level (%)	55.74	24.12
x" = 50% of Dominance	50.00	0.00

Table 4 – Statistics results rejecting Hypothesis 2

	x' - x"
Sample size	388
Minimum	-37.50
Maximum	50
Range	87.50
Mean	10.673
Std. Deviation	25.378
Standard error of mean	1.2884
d.f.	387

95% confidence interval for mean 8.1398 to 13.206

t value testing mean=0 is 8.28

Significance level *(p)* is 0.000 (~0.00%) for 1 sided test

One sided test assumes observed difference is the same sign as hypothesized

Where:	*Mean*	*Std. Dev.*
x' = Dominance level (%)	60.67	25.37
x" = 50% of Dominance	50.00	0.00

Table 5 –Statistics results rejecting Hypothesis 3

	x' - x"
Sample size	32
Minimum	-25
Maximum	50
Range	75
Mean	7.8125
Std. Deviation	20.5150
Standard error of mean	3.6266
d.f.	31

95% confidence interval for mean 0.41604 to 15.209

t value testing mean=0 is 2.15

Significance level *(p)* is 0.0196 (1.96%) for 1 sided test

One sided test assumes observed difference is the same sign as hypothesized

Where:	*Mean*	*Std. Dev.*
x' = Dominance level (%)	57.81	20.52
x" = 50% of Dominance	50.00	0.00

number of rounds that the winner companies led their competitions in the academic competitions with 8 rounds (not considering the trial round). Companies that led more than 4 rounds are considered dominant winners, while companies that led the 8 rounds led 100% of the rounds. Finally, Figure 3 shows the number of rounds that the winner companies led their competitions in the general competitions. Companies that led more than 2 rounds are considered dominant winners, while

Table 6 –Statistics results rejecting Hypothesis 4

	x' - x"
Sample size	24
Minimum	-25
Maximum	50
Range	75
Mean	14.5830
Std. Deviation	23.2150
Standard error of mean	4.7388
d.f.	23

95% confidence interval for mean 4.7804 to 24.386

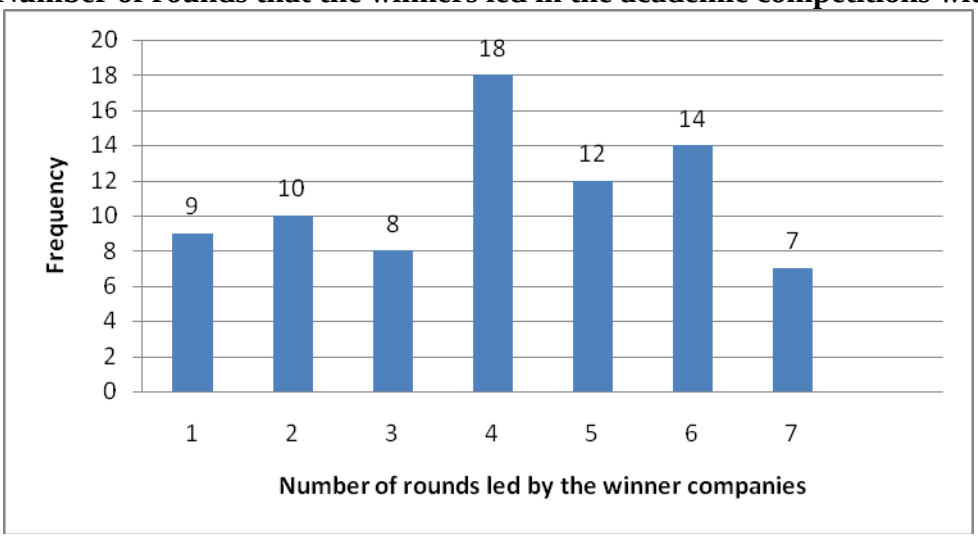
t value testing mean=0 is 3.08

Significance level (*p*) is 0.0027 (0.27%) for 1 sided test

One sided test assumes observed difference is the same sign as hypothesized

Where:	*Mean*	*Std. Dev.*
x' = Dominance level (%)	64.58	23.22
x" = 50% of Dominance	50.00	0.00

Figure 1 – Number of rounds that the winners led in the academic competitions with 7 rounds



companies that led the 4 rounds led 100% of the rounds. Analyzing the figures, one can observe that the highest dominance occurs in the competitions with 8 rounds (Figure 2), while the lowest dominance occurs in the competitions with 4 rounds (Figure 3). These visual analyses indicate that the dominance grows as the period progresses, similar to the findings presented by Patz (2006).

Considering the first four hypotheses were discarded, the next step is testing if the dominance has significant difference in terms of type of competition or type of simulator used. Analyses of variance were used to test **H5** and **H6**. Results indicate that there is no significant difference when comparing the dominance found in academic competitions and general competitions. Thus, **H5** is supported. When comparing the dominance between manufacturing and retailing simulations, again no significant differences were found. Consequently, **H6** is also supported. Tables 7 and 8 show results of the analysis of variance performed to compare dominance in different competitions and simulators, respectively.

Figure 2 – Number of rounds that the winner led in the academic competitions with 8 rounds

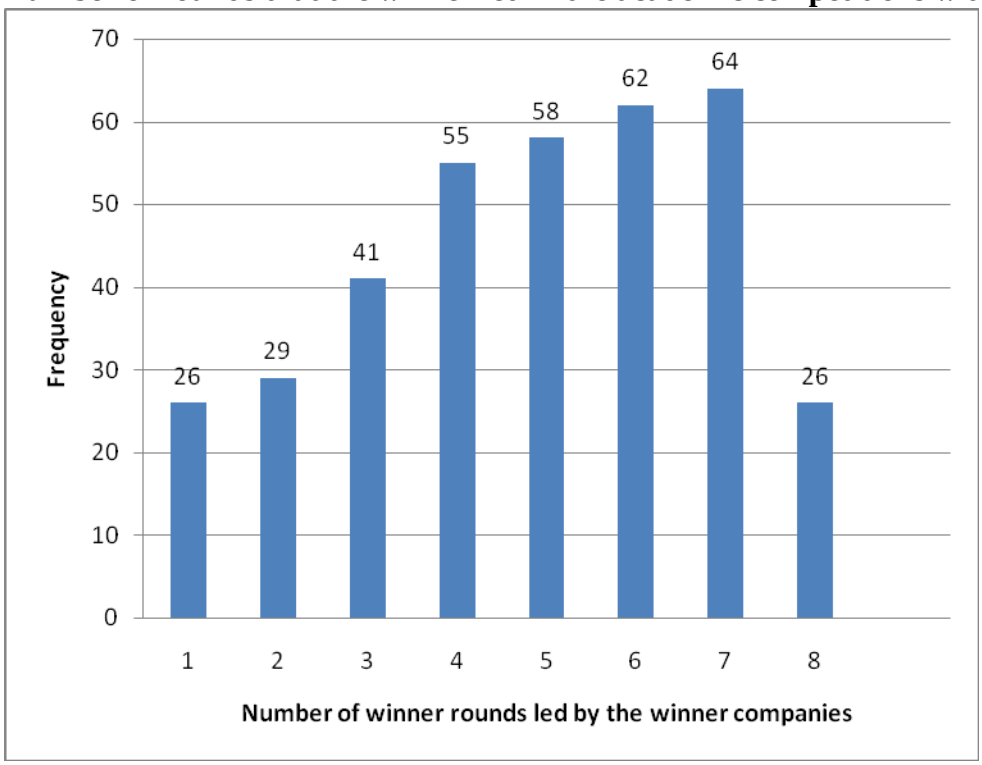


Figure 3 – Number of rounds that the winners led in the general competitions with 4 rounds

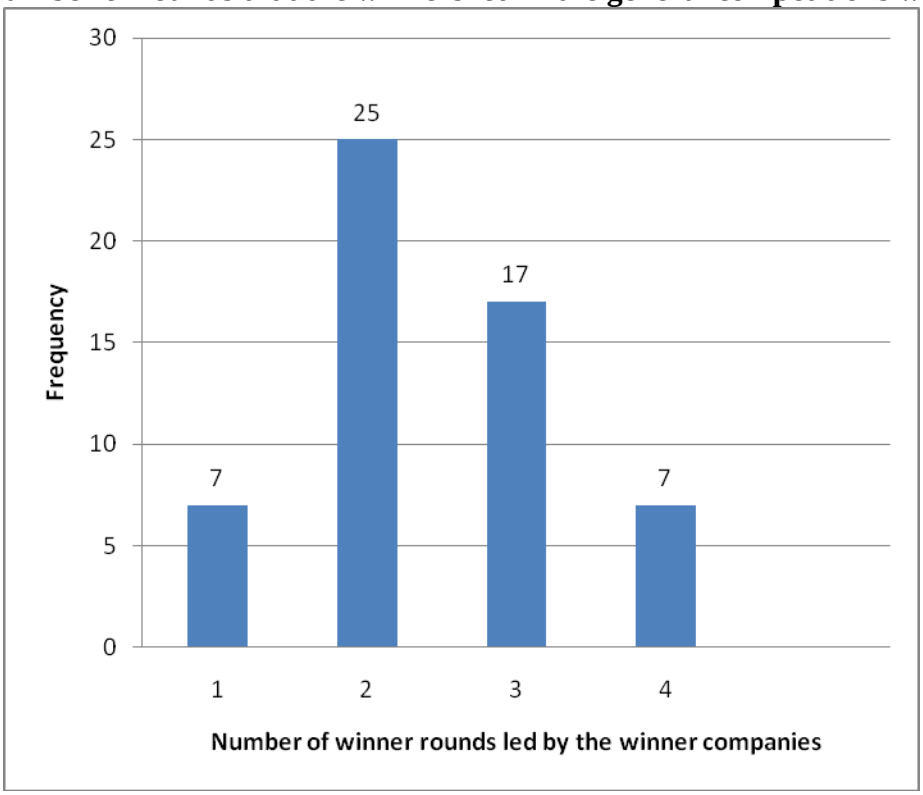


Table 7 – Analysis of Variance –
Academic competition dominance versus general competition dominance

	x'	x"
Sample size	439	56
Minimum	12.5	25
Maximum	100	100
Range	87.5	75
Mean	60.1650	57.143
Variance	638.5085	379.87
d.f.	438	55
d.f. adjusted	493	
Variance adjusted (Sa^2)	573.6503	
t value testing mean=0	is 0.0803	

Significance level *(p)* is 0.9360 (93.6%) for 2 sided test

Where:

x' = Dominance level of academic competition

x" = Dominance level of general competition

Table 8 – Analysis of Variance –
Retailing simulation dominance versus manufacturing simulation dominance

	x'	x"
Sample size	412	83
Minimum	12.5	14.29
Maximum	100	100
Range	87.5	85.71
Mean	60.7010	55.636
Variance	627.2731	503.0863
d.f.	511	82
d.f. adjusted	493	
Variance adjusted (Sa^2)	532.1936	
t value testing mean=0	is 0.155202	

Significance level *(p)* is 0.8767 (87.7%) for 2 sided test

Where:

x' = Dominance level of retailing simulation

x" = Dominance level of manufacturing simulation

CONCLUSIONS

The dominance is present in all competitions analyzed; that is, academic competitions, general competitions, both using manufacturing and retailing simulations. Further, no significant differences were found in terms of dominance in academic competitions versus general competitions and in manufacturing competitions versus retailing competitions. Combined results indicate that dominance does exist in the business games competitions analyzed. However their differences are not significant in terms of competition type or simulator used.

Patz's (1992, 1999, 2000, 2006) studies indicate that dominance exists to different students (BBAs and MBAs), simulators (MICROMATIC, CORPORATION, BSG) and settings (face-to-face and online). Although the definition of dominance had been different than the definition used in Patz's studies, the results found in this paper add external validity to dominance in business games. Replications were conducted in

two more simulators (SIMCO and SIND) and two online types of business games administrations. Most important, dominance is present not only in academic regular courses, but also in competitions as well. As business games competitions have a high abandon rate, one important issue raise: Is the dominance one determinant factor to the abandon of teams in business game competitions? If so, how can the coordination manage this issue to decrease the abandon rate in business game competitions? These issues could be addressed in future research.

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