

2008

An Analysis of the Influence of CEO Characteristics on Research and Development Expenditures in Large American Corporations (2005 Data)

Sun Gu Lee

Wright State University - Main Campus

Follow this and additional works at: https://corescholar.libraries.wright.edu/econ_student



Part of the [Business Commons](#), and the [Economics Commons](#)

Repository Citation

Lee, S. G. (2008). An Analysis of the Influence of CEO Characteristics on Research and Development Expenditures in Large American Corporations (2005 Data) . .

https://corescholar.libraries.wright.edu/econ_student/24

This Master's Culminating Experience is brought to you for free and open access by the Economics at CORE Scholar. It has been accepted for inclusion in Economics Student Publications by an authorized administrator of CORE Scholar. For more information, please contact corescholar@www.libraries.wright.edu, library-corescholar@wright.edu.

**AN ANALYSIS OF THE INFLUENCE OF CEO CHARACTERISTICS
ON RESEARCH AND DEVELOPMENT EXPENDITURES IN LARGE
AMERICAN CORPORATIONS (2005 DATA)**

A capstone project submitted in partial fulfillment
of the requirements for the degree of
Master of Science in Social and Applied Economics

by

Sun Gu Lee
MBA, The University of Findlay, 2002
B.S., Kunkuk University, 2000

2008
Wright State University

WRIGHT STATE UNIVERSITY
SCHOOL OF GRADUATE STUDIES

November 17, 2008

I HEREBY RECOMMEND THAT THE CAPSTONE PROJECT PREPARED UNDER MY SUPERVISION BY Sun Gu Lee ENTITLED An Analysis of the Influence of CEO Characteristics on Research and Development in Large American Corporations (2005 Data) BE ACCEPTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF Master of Science.

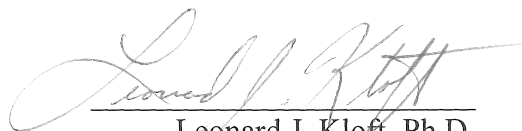
Committee on
Final Examination



Robert Premus, Ph.D.
Project Supervisor



Carol Wang, Ph.D.
Project Reader



Leonard J. Kloft, Ph.D.
Graduate Program Director

ABSTRACT

Lee, Sun Gu, M.S., Department of Economics, Wright State University, 2008. An Analysis of the Influence of CEO Characteristics on Research and Development Expenditures in Large Corporations (2005 Data).

This study analyzes the influence exerted by CEO characteristics (specifically, CEO stockholding percentages and CEO age) on research and development (R&D) expenditures in large American corporations over the twenty year period from 1986 to 2005. Using the Herfindahl-Hirschman Index (HHI) to measure market share concentrations, and making specific reference to two Schumpeterian hypotheses on the correlation between R&D and increases in firm size, this study establishes a positive linear relationship between the dependent variable, R&D expenditure, and the independent variables of CEO stockholding, CEO age, firm size, and market share. This study next describes the corporate and market conditions which promote the development of a positive linear relationship between CEO characteristics and R&D and concludes by identifying the point of high market concentration at which the prominence of R&D activity is superseded by expenditures for advertising.

TABLE OF CONTENTS

	Page
I. Introduction.....	1
CEO Risk-Avoidance Motives and Their Effect on Research and Development.....	3
Literature Review: Entrenchment of Interest vs. Convergence of Interest.....	7
Research and Development in the Context of Schumpeterian Hypotheses.....	12
II. Two Hypotheses.....	18
III. Data and Methods.....	22
Data Sources.....	22
Definitions: Dependent and Independent Variables.....	23
Methods of Analysis.....	24
Models.....	26
IV. Results.....	27
V. Conclusion.....	33
VI. Appendices.....	37
Appendix A. – Cross-sectional Data of Firms.....	37
Appendix B. – Market Share and HHI in 2005.....	39
VII. References.....	61

LIST OF TABLES

1. Definitions of Variables.....	23
2. Descriptive Statistics.....	24

LIST OF FIGURES

1. A Relationship between Advertising and Market Concentration.....	15
2. A Relationship between R&D and Market Concentration.....	16
3. A Trend in R&D from Oligopolistic to Monopolistic Market.....	21
4. Optimal Age of CEOs.....	29

ACKNOWLEDGMENT

For their instruction, thoughtful direction, and professional courtesy throughout each phase of my work on this project, I wish to express my gratitude to the following members of the faculty of the School of Graduate Studies at Wright State University:

Robert Premus, Ph.D.
Carol Wang, Ph.D.
Joseph Eisenhower, Ph.D.
Leonard J. Kloft, Ph. D.

I also wish to thank my family and my friend, Alex In, for their patience and abiding support.

Sung Gu Lee

I. Introduction

This thesis assesses the extent to which research and development (R&D) expenditures in large American corporations over the past two decades are determined by and directly related to the three following operational and structural factors within the corporate environment:

- 1) The percentages of stocks which CEO's hold in the companies they head (considered in relation to CEO age and tenure).
- 2) The growth in firm size and scale (measured in net sales) relative to the increase in a firm's market concentration (measured by the Herfindahl-Hirschman Index).
- 3) The supplanting of R&D expenditures by advertising expenditures as market dominance evolves past the oligopolistic level, at which point market dominance is shared by a few companies, to the monopolistic control of a given market by a single company.

By establishing a positive linear relationship between substantial CEO stockholdings and R&D expenditures (within a context inclusive of low to oligopolistic market concentrations), this thesis argues that this type of correlation results largely from the CEOs' perception that they share a common interest in company growth and profit with external stockholders. This perception of the potential for shared benefit is identified

as evidence of convergence of interest between CEO's and stockholders. Conversely, entrenchment of CEO interest occurs when the CEO's recognition of shared interest with stockholders is obscured by self-interest causing the CEO to avoid investment in R&D out of concern for protecting his or her personal assets in the company.

Pursuant to this argument, the shift from R&D to advertising (occurring as the monopolistic threshold is approached) is the result of the CEO's realization that at this point advertising has a more proven utility for profit generation than R&D. Therefore, the supplanting of R&D by advertising at the monopolistic level is an extension of convergence thinking, not a departure from it, because the benefits of profit generation continue to accrue to CEO's and stockholders alike as total market dominance is reached.

CEO Risk-Avoidance Motives and Their Effect on R&D

As the preeminent corporate insiders, CEO's of large corporations possess a complete range of detailed information on the daily operations, long-range goals, and overall financial status and prospects of the corporate entities they direct. Inherently, their intimate access to vital financial data is both impetus and resource for effective and profitable managerial decisions. An ethical pitfall occurs, however, in the familiar case of CEO's whose personal assets consist largely of substantial stockholdings in their own companies. Having unlimited financial data at their fingertips, CEO's in this category often tend to disregard corporate growth in favor of protecting their own investments by reducing or limiting expenditures for R&D projects which have a discernable risk potential. As usually formulated, this risk-avoidance tendency among CEO's with substantial stockholdings in their own companies can only be understood as a function of the CEO's reprehensible and unethical self-interest.

As a business strategy, spending money on R&D poses a high degree of risk for large corporations, or for a firm of any size. CEO's with large stockholdings, particularly those of advanced age (60 years and older) and therefore close to retirement, could be inclined to decentralize their financial risks and be motivated by inordinate fiscal cautiousness. Accordingly (as the theory goes), high stockholding CEO's who are

close to retirement age and who, by virtue of their position in the company, possess preemptive knowledge and decision-making authority, could tend to invest less robustly and less frequently in R&D projects, particularly those which seem likely to jeopardize the CEO's personal assets in the company.

This tendency of CEO's to avoid or radically curtail R&D projects in order to safeguard their personal assets is usually attributed to the following three risk-avoidance motives: 1) Risk-reduction Motive¹, 2) Shirking Motive², and 3) Short-term Focus Motive³. Each of these motives reflects the general CEO tendency cited above to avoid projects which could threaten their own financial interests to the potential detriment of corporate profitability. On this basis, these motives are grouped within the general category of CEO risk-avoidance.

Risk-reduction Motive

The risk-reduction motive pertains in particular to a CEO's treatment of R&D projects in the mid to high-risk range. The term reflects intransigence on the part of the CEO regarding any project which, based upon precedent and a compelling supportive data, does not guarantee or even strongly indicate a high profit result. In essence, perception of even a moderate degree of risk for the corporation is construed as a prohibitive risk of personal loss for the CEO. The CEO's reaction to this perception is to

¹ Amihud, Y. and Lev, B. 1981. "Risk Reduction as a Managerial Motive for Conglomerate Mergers" *The Bell Journal of Economics*, 12:2, pp. 605-617.

² Alchian, A. A. and Demsetz, H. 1972 "Production, Information Costs, and Economic Organization" *The American Economic Review*, 62:5, pp. 777-795.

³ Narayanan, M. P. 1985. "Managerial Incentives for Short-term Results" *The Journal of Finance*, 5:5, pp. 1469-1484.

reject projects on the basis of a single criterion (i.e., risk of loss to himself) with the result that many projects in the reasonable risk category are not given judicious consideration.

Shirking Motive

The shirking motive impugns the risk-avoiding CEO with the moral failing of shirking the responsibility to implement, or perhaps even to fairly consider, R&D projects which by objective standards show at least the potential to alleviate a financial crisis or otherwise strengthen the company's status in areas of critical or urgent need. An extreme example of this general pattern is the case of CEO's who, in an abysmal act of self-regard, withhold approval of R&D projects even in the absence of a high-risk potential, solely because their contracts would not reward them directly for the project's success.

Short-term Focus Motive

The short-run or short-term focus motive is essentially a restrictive, self-imposed myopia. It describes the tendency of the self-protective CEO to approve only those R&D projects which convincingly demonstrate a maximum potential for profit generation within a short interval (and usually while providing a direct contribution to the CEO's assets.) Within this framework, only those R&D projects which show minimal risk potential to the CEO's stockholdings, as well as the least interval between expenditure and personal reward to the CEO, are likely to be considered.

The theory of CEO risk avoidance is underscored interestingly by Peter (2005) who contends that older CEO's use clever coping-strategies to compensate for shortcomings associated with age –shortcomings such as diminished mental acuity and

emotional assuredness.⁴ These strategies might include the optimizing of increased verbal skills which are said to accompany maturity. For example, although memory gradually declines after the age of twenty, vocabulary and verbal skills are enhanced. The augmented verbal skills of older CEOs, reinforced by their years of practical experience, may be effective means of facilitating and disguising avoidance of R&D projects.

Viewed within the context of these three risk-avoidance motives, the CEO profile which emerges is a complex of unrestricted authority, narrowness, and greed. The intrinsic asymmetry which exists between the CEO and external stockholders in terms of investment and authority could therefore cause stockholders to suffer the adverse consequences of decisions made by the aging, tenured CEO. If, motivated by self-interest, a CEO avoids investing energetically in R&D projects which show the potential to enhance stock value and corporate profit, he or she plainly impairs company growth in order to protect personal interests.

⁴ Peter, C. 2005. "Old. Smart. Productive. Surprise! The Graying of the Workforce is Better News than You Think" *Business Week*, pp. 78-86

Literature Review: Entrenchment of Interest vs. Convergence of Interest

The actual practices of older, large stockholding CEO's with regard to their company's R&D expenditures are usually assessed within the context of two differing hypotheses:

- 1) Entrenchment of CEO Interest Hypothesis; and
- 2) Convergence of CEO Interest Hypothesis.

The entrenchment of interest hypothesis states that substantial CEO stockholding widens the disparity between CEO and stockholder interests with a deadening effect on R&D. Further, the entrenchment hypothesis asserts that, dominated by their desire to protect and maximize their substantial stockholdings, CEO's either refuse to, or lose the capability to, recognize their common bond with external stockholders and can even begin to regard stockholders' interests as inimical to their own interests. Entrenched within this restricted purview, CEO's succumb to self-interest causing one or all of the aforementioned trio of risk-avoidance motives to become operative. As a result, R&D is relegated to occupying an entrenched position on the corporate back burner. This point of view is argued notably by Dechow and Sloan (1991)⁵. They assert that, driven by self-interest, CEO's with large stockholding percentages not only invest less in R&D in

⁵ Dechow, P. and Sloan, R. 1991. "Executive Incentives and the Horizon Problem: An Empirical Investigation" *Journal of Accounting and Economics*, Vol.14, pp. 51-89.

general, but also will demonstrate greater aversion to R&D projects as they approach their final years in the company.

The opposing view, the convergence of interest hypothesis, contends that large CEO stockholdings actually reduce and can even nullify apparent disparities between CEO and stockholder interests resulting in increased, rather than reduced, implementation of R&D projects. The convergence hypothesis is a function of the CEOs' enlightened perception that they and the stockholders are part of the same corporate entity. CEO's with substantial investment in their companies will be likely to recognize that the corporation's growth benefits them and the stockholders simultaneously and mutually. Therefore, increases in CEO stockholding percentages increase the possibility of a convergence of interest between CEO's and stockholders.

This hypothesis is also endorsed by Jensen and Meckling (1976)⁶ who argue that a CEOs' recognition of fundamental corporate solidarity prompts them to be more open to longer-range R&D projects which demonstrate the potential to be profitable for them and the stockholders alike, as opposed to favoring only shorter term projects which promise both quicker profitability and less risk of personal loss. Support for Jensen and Meckling's viewpoint is offered by Cho (1992)⁷ and Francis and Smith(1995)⁸. Cho offers evidence that as a CEO's stock share increases, expenditures for R&D increase

⁶ Jensen, M. C. and Meckling, W. H. 1976. "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure" *Journal of Financial Economics*, Vol.3, pp. 305-360.

⁷ Cho, S. 1992. "Agency Costs, Management Stockholding, and Research and Development Expenditures" *Seoul Journal of Economics*, Vol.5, pp. 127-152.

⁸ Francis, J. and Smith, A. 1995. "Agency Costs and Innovation: Some Empirical Evidence" *Journal of Accounting and Economics*, Vol.19, pp. 383-409.

proportionally. Francis and Smith argue that in “closely-held” firms in which the CEO owns at least 30 per cent of the voting stock, or in which the CEO’s group owns at least 20 per cent of the voting stock, a higher level of R&D projects are implemented than in their more “diffusedly-held” counterparts.

Demetz and Lehn (1985)⁹ offer support of more general nature for the convergence hypothesis arguing that the structure of a firm’s ownership, more than the percentage of CEO stockholding, is the principal factor determining how the benefits of a given enterprise will be distributed among executives and general stockholders. They, however, assert also that high CEO stockholdings exert a positive influence on financial earning rates, the benefits of which necessarily accrue to both CEO’s and stockholders. Again, Demetz (1983)¹⁰, in concurrence with Fama and Jensen (1983)¹¹, argues that increases in CEO stockholding percentages to high levels enhance an enterprise’s overall value.

Hill and Snell (1989)¹² put forth a differing and more neutral point of view. They contend that considered on a per employee basis no statistically significant relationship exists between CEO stockholding percentages and R&D expenditures. In the same vein, Morck, Shleifer, and Vishny (1988)¹³, in their examination of the relationship between CEO stockholding and discretionary power of management within large corporations,

⁹ Demsetz, H. and Lehn, K. 1985. “The Structure of Corporate Ownership: Causes and Consequences” *Journal of Political Economy*, Vol.93, pp. 1155-1177.

¹⁰ Demsetz, H. 1983. “The Structure of Ownership and the Theory of Firm” *Journal of Law and Economics*, Vol.26, pp. 375-390.

¹¹ Fama, E. F. and Jensen, M. C. 1983. “Separation of Ownership and Control” *Journal of Law and Economics*, Vol.26, pp. 301-325.

¹² Hill, C. W. L. and Snell, S. A. 1989. “Effects of Ownership Structure and Control on Corporate Productivity” *Academy of Management Journal*, Vol.32, pp. 25-46.

¹³ Morck, R. Shleifer, A. and Vishny, R. 1988 “Management Ownership and Market Valuation: An Empirical Analysis” *Journal of Financial Economics*, Vol.20, pp. 293-315.

disavow a precise linear relationship between these two factors. They conclude that high percentages of CEO stockholding do not lead necessarily to either conversion or entrenchment of interest. According to Morck, Shliefer, and Vishny, the discretionary powers of management which CEO's exercise, and which prominently include R&D decisions, are determined by variable CEO characteristics such as age and tenure which exert their influence independent of CEO stockholding percentages.

While it might seem plausible that low CEO stockholdings favor convergence of interest with stockholders, and conversely that high levels favor entrenchment, the literature cited above presents a range of diverse opinion and argues that a number of factors other than risk-avoidance driven by self-interest be taken into account in the assessment of the factors affecting CEO attitudes toward R&D. These studies either tacitly question or directly argue against the contention that the three risk-avoidance motives already discussed (i.e., risk reduction, shirking, and short-term focus) unavoidably or even necessarily cause CEO entrenchment of interest leading to the curtailing of R&D expenditures. Considered collectively, these studies prompt similar and related questions: Can high CEO stockholdings coexist with and/or effectively promote a productive CEO identification with the interests of external stockholders? In what ways could such a potential for convergence of interest increase the potential for greater corporate profit and long-range viability through investment in R&D?

To address these questions, this study next considers the correlation between CEO stockholdings and the percentages of both R&D and advertising expenditures. This

correlation is considered within the context of three main factors: 1) increase in firm size; 2) variations in market concentration; and 3) the transformational trend in the national corporate environment from oligopolistic to monopolistic structures. The frame of reference within which these three factors is examined is provided by two familiar Schumpeterian hypotheses which state that increases in firm size and in market concentration are accompanied by increases in R&D expenditures.

Research and Development in the Context of Schumpeterian Hypotheses

Two studies (cited below) which examine recent increases in R&D expenditures in large American corporations indicate a correlation between R&D increases and two closely related factors:

- 1) increase in firm size; and
- 2) increase in a firm's market concentration.

Scherer(1965)¹⁴ affirms that growth in firm size and market concentration are positively linked to R&D expenditures. Thirty years later, Scherer's findings were confirmed by Blundell, Griffith, and Reenen (1995)¹⁵.

Further, each of these studies corroborates two interrelated Schumpeterian hypotheses as follows: 1) Increases in a firm's scale and size are accompanied by increases in R&D expenditures and activities; and 2) Increases in size and scale which also stimulate intensification of market concentration result in an even greater increase in R&D activity. These two Schumpeterian hypotheses also assert that the aforementioned

¹⁴ Scherer, F. M. 1965 "Firm Size, Market Structure, Opportunity and the Output of Patented Innovations" *American Economic Review*, Vol.55, pp. 1097-1125.

¹⁵ Blundell, R. Griffith, R. and Reenen, J. V. 1995. "Dynamic Count Data Models of Technological Innovation" *The Economic Journal* Vol.105, pp. 333-344.

increase in R&D generates an expansion of the firm's efforts in technological innovation¹⁶ as a significant component of the invigorated R&D activity.

Each of these hypotheses is further corroborated by two separate studies: Cohen and Levin (1989)¹⁷ and Symeonidis (1996)¹⁸. These studies also contend, however, that the long-standing Schumpeterian-based view of R&D activities needs to be reevaluated in light of the ongoing structural evolution within corporate America toward oligopolistic conglomerates and monopolies. Driven to overcome the uncertainty, high costs, and risks inherent in highly competitive markets, more and more oligopolistic partnerships continue to emerge in corporate America. Reducing and in some cases eliminating competition by means of monopolistic-type controls, oligopolistic partnerships acquire dominantly high market concentrations which increasingly approached total market dominance.

Analyzing the increasing proportion of high market concentrations produced by oligopolistic partnerships, studies such as those by Cohen and Levin and Symeonidis

¹⁶ When a market becomes unstable, larger corporations can turnover more capital into R&D than smaller firms. As a result, larger firms which possess huge sales are better able to distribute their funds, derived from fixed costs, into technological innovation. Moreover, large oligopolistic corporations can better predict the market due to their dominance, and based on their predictions, generate larger profits which can be used for technological innovation.

¹⁷ Cohen, W. M. and Levin, R. C. 1989. "Empirical Studies of Innovation and Market Structure" in Schmalensee, R. and Willing, R. eds., *Handbook of Industrial Organization*, Vol.2, pp. 1059-1107.

¹⁸ Symeonidis, G, 1996, "Innovation, Firm Size and Market Structure: Schumpeterian Hypotheses and Some New Themes" *OECD Economics Department Working Papers*, No. 161.

show that these high market concentrations are due less to R&D than to a range of marketing strategies. Specifically, advertising strategies such as television ads, mall and billboard displays, and conspicuous logos on clothing and other products are pervasively present in everyday life, as well as being readily understood by consumers in every part of the country from urban to rural locales. Consequently, within the emergent oligopolistic structure, high market concentrations enjoyed by major firms have caused brand name recognition to be a potent influence on consumer behavior, thus reducing both the need for and the effectiveness of R&D. As higher and greater market concentrations are reached, expenditures for advertising are effectively replacing R&D expenditures, thereby challenging the Schumpeterian hypothesis cited above that increase in firm size and market concentration are principally a function of R&D activities.

In their recent analysis of the impact of advertising in the oligopolistic environment, Pepall, Richards, and Norman(2005) demonstrate that high market concentrations are achieved by the power of advertising due to the commanding influence exerted by brand names. They assert that “the monopoly power associated with highly concentrated industries that generate advertising expenditures cause concentration to be high.”¹⁹

Another significant effect of the reliance on advertising in the growing trend toward oligopolistic market structures was suggested by Telser(1964)²⁰. Firms with low

¹⁹ Pepall, L. Richards, D. J. and Norman, G. 2005. “Advertising, Competition, and Brand Names” *Industrial Organization Contemporary Theory & Practice; third edition*, pp. 550.

²⁰ Telser, L. 1964 “Advertising and Competition” *Journal of Political Economy*, Vol.72, pp. 537-562.

market concentrations often have high advertising expenditures relative to R&D. These firms in this category, recognizing the need to remain competitive with the dominant oligopolistic firms, increase advertising expenditures as an effective means of increasing their level of market concentration. Thus, the dominance of oligopolistic firms with high market concentrations creates a growing widespread need for companies need to achieve higher and higher market concentrations. As a result, a national corporate pattern emerges favoring advertising over R&D.

Figure 1 below illustrates the general pattern of parallel increases in advertising expenditures and market concentrations which occurs as the corporate trend continues to evolve from oligopoly toward monopoly.

Figure 1: Relationship Between Advertising and Market Concentration

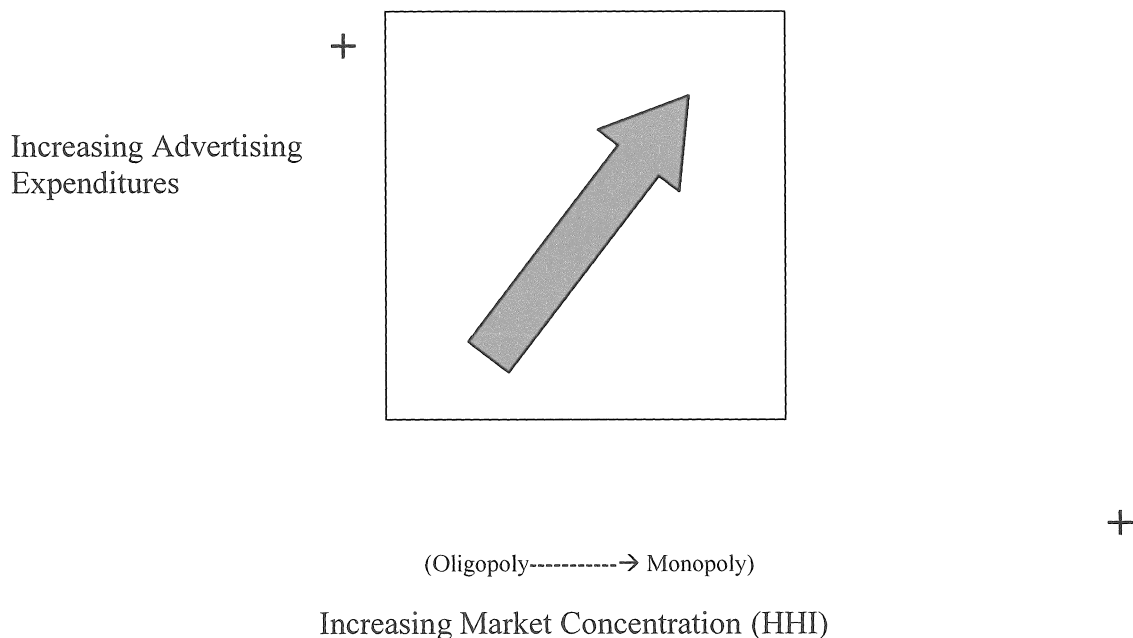
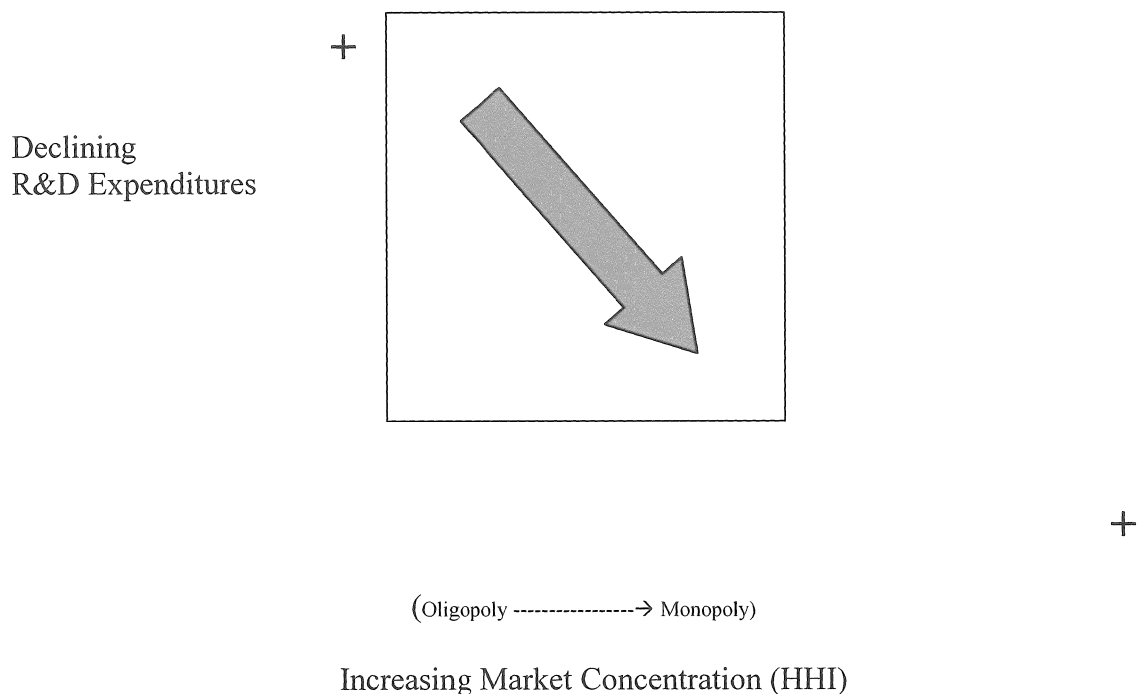


Figure 2 below illustrates the general pattern of decline in R&D expenditures, which occurs in firms with established high market concentrations (HHI) as the corporate trend continues to evolve from oligopoly toward monopoly.

Figure 2: Relationship Between R&D and Market Concentration



A reexamination of the Schumpeterian hypothesis required by the oligopolistic transformation indicates first, the effectiveness of advertising as market concentrations intensify; and second, that as the current corporate environment trends more and more toward oligopoly, R&D is not as likely to increase in unison with firm size and market concentration.

The current trend in the corporate environment is comprised of increasing oligopolistic market dominance evolving toward monopolistic market dominance. This trend reveals that, contrary to the Schumpeterian hypotheses, R&D is less likely to increase as market concentrations intensify and instead is more likely to be replaced by the proven effectiveness of advertising in the current corporate climate. One obvious and basic reason for this change in emphasis is simply that the more a high-concentration company spends on advertising, the less revenue is available for R&D. At the same time, as Pepall, Richards, and Norman (2005) have established, a more substantive reason for the conspicuous de-emphasis on R&D in recent decades is the effectiveness of advertising in achieving and maintaining dominance in the oligopolistic marketplace.

II. TWO HYPOTHESES

The research and opinion surveyed thus far provide a framework to determine how R&D expenditures are used to measure convergence of interest between CEO's and external stockholders. More specifically, this information defines the effect which such a convergence of interest has on R&D expenditures in corporate markets with different levels of industry concentration. This information will now be examined within the context of two major hypotheses as follows:

Hypothesis I

An increase in CEO stockholdings within a company approaching oligopolistic status leads to a positive linear relationship between high stockholdings and a firm's R&D expenditures.

Hypothesis II

As a firm's market structure advances from oligopoly to monopoly, R&D expenditures decrease and are supplanted by a broad range of advertising expenditures.

The CEO risk-avoidance motives, identified in section I as functions of entrenchment of CEO interest, are viewed as a major impediment to R&D expenditures in large corporations. Several recent studies (cited above) which question the accuracy of this notion, point out that the CEO's tendency to avoid the financial risks inherent in long-range R&D projects diminishes with the development of the following conditions: 1) the firm's HHI expands, first achieving a major share of dominance in a given market, and then evolves from the oligopolistic level toward monopolistic dominance; and 2) the CEO's stockholding increases concomitantly with these major increases in HHI.

When these points of growth in market concentration are reached, CEO entrenchment of interest gives way to a convergence of interest with external stockholders. As this occurs, the CEO's entrenchment thinking is displaced by the CEO's recognition of the common interest they share with stockholders in maximizing corporate growth and profitability. Viewed in this context, increase in firm size and market dominance induces CEO's to value their unity with external stockholders and to act upon this perception by investing in R&D projects, which demonstrate the potential to promote corporate growth.

Further, with regard to R&D, the CEO who possesses high stockholdings in a firm with growing market share abandons the 'what's in it for *me*?' risk-avoidance attitude for an attitude favoring R&D expenditures for projects, both long-term and short-term, which show a measurable degree of profit potential for both himself and the stockholders (a 'what's in it for *us*?' attitude). The incentive to invest robustly in R&D

results therefore from the CEO's perception that the potential for his personal benefit is connected integrally with overall corporate profits and thus with the personal gain of the stockholders as well. The continuing increase of conglomerates in corporate America has resulted in a radical reduction if not elimination of competition. In companies enjoying monopoly, the CEO's perception of shared interest with stockholders can generate a climate conducive to a strengthening of interest convergence between the two, rather than a furthering of CEO entrenchment.

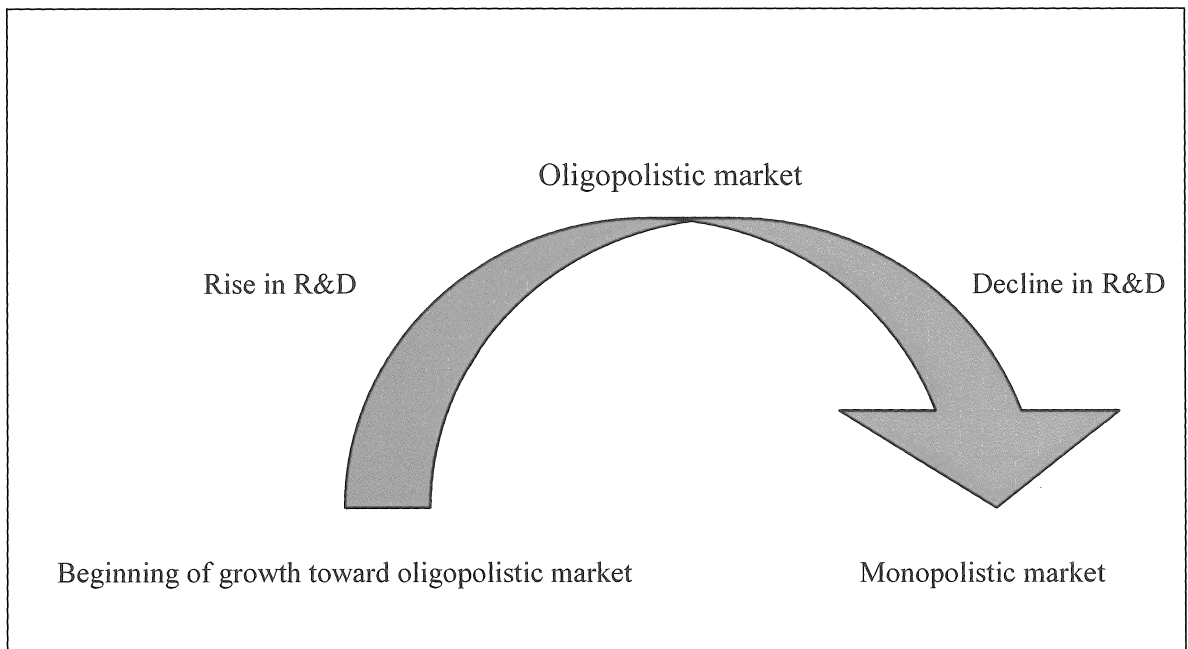
In contrast to the aforementioned Schumpeterian hypothesis, the high, and (following the current trend) often maximized market concentration which oligopolistic and monopolistic firms achieve does not ensure increased R&D expenditures. Instead, when these high levels of market dominance are reached, advertising expenditures (usually of the "invisible" variety in the form of branding) take the place of revenue spent on R&D. In essence, by virtue of a sustained superiority in market position, conglomerates and monopolies enjoy a diminished need to invest in R&D in order to develop new high quality products. They choose instead to invest in familiar, high-recognition advertising venues confident that consumers will continue to respond vigorously to the images and concepts which are both familiar and ubiquitous in the media, malls, and retail chains which saturate the prevailing consumer monoculture.

At these high levels of market concentration, the risk avoidance motives responsible for CEO entrenchment and R&D reduction are therefore likely to be neutralized. Advertising expenditures in a monopolistic setting pose no substantial threat to the CEO's stockholdings comparable to those posed by the uncertainties of R&D

projects. Contrary to Schumpeterian Hypothesis 2, R&D expenditures decrease rather than increase at the monopolistic level even though firm size and HHI are maximized. At this level, corporate profits are also maximized making advertising in established venues to a growing consumer monoculture both less risky and more effective, thus benefiting corporate principals and external stockholders alike.

Figure 3: A Trend in R&D from Oligopolistic to Monopolistic Market Status

Figure 3, below, describes the decline in R&D which occurs when low competition (oligopolistic) market concentrations develop into competition-free (monopolistic) market concentrations.



III. Data and Methods

Data Sources

In this study, cross-sectional data from 44 firms representing a wide diversity of industries is chosen to represent current R&D trends in large American conglomerates. Each of the firms considered has the largest rate of market share in its respective market.

Market concentration data for this study is taken from the Market Share Report 2007 for 2005. Data on the 44 firms is derived from the Standard Industrial Classification Manual (SIC) from 1420 to 7375 (Appendix A). Data on R&D expenditures and on net sales is derived from Thomson Research and Mergent Online.

Each firm's annual report and proxy statement is used to obtain CEO stockholding percentages and CEO ages in 2005.

Table 1(below) illustrates the relationship between the independent variable of R&D expenditure and the independent variables of CEO characteristics (stockholding and age), firm scale (net sales), and market share (HHI).

Table 1: Dependent and Independent Variables

Variables		Definitions	
Dependent variable	R&D expenditure	Real R&D expenditure in firms	
Independent variables	CEO characteristics	CEO stockholding	Amount of CEO's stockholding
		CEO age	CEO's age
	Schumpeterian hypothesis	Scale	Net sales
		HHI	Herfindahl-Hirschman Index

Definitions

Dependent Variable: R&D Expenditures

As indicated in Table 1, the dependent variable of R&D expenditure is a firm's real, verifiable expenditure on research and development within a given time frame.

Independent Variables

As indicated in Table 1, the independent variables considered in this study include CEO stockholding (real amount share), CEO age, firm size (net sales), and market concentration (HHI).

The use of firm scale and HHI as independent variables is required for the analysis of the Schumpeterian hypotheses which define direct correlations between increases in scale, market share, and R&D (summarized above in section I.)

HHI determines a specific percentage of a market structure. Accordingly, if a firm provides all the output in a given market, the pure monopoly value of the HHI should be 10,000. Since this method integrates the number of firms in a market and the discrepancy

in their sizes, this study uses HHI rather than other methods such as three firm concentration (CR3) and Lerner Index (LI).

Methods of Analysis

Table 2 (below) displays the type and level of observations – minimum, maximum, mean, and standard deviation—used in this study to establish correlations between R&D expenditure and the independent variables of CEO age and stockholding, and firm scale and market concentration.

Table 2: Descriptive Statistics

Name of Variables		N	Minimum	Maximum	Mean	Std. Deviation	
Dependent Variable	R&D Expenditure	44	32,338	7,392,000,000	1,247,993,439.5	2,008,561,591.43	
Independent variables	CEO characteristics	CEO stockholding	44	6,625	1,017,499,336	32,603,821.28	156,347,785.73
		CEO age	44	36	68	55.23	6.62224453
	Schumpeterian hypothesis	Scale	44	61,911,000	192,604,000,000	25,901,739,409.1	34,998,550,178.9
		HHI	44	1,333	7,450	3204.95	1,589.12

The sample size consists of 44 firms, and the average R&D expenditure is \$1,247,993 dollars.

The average CEO stock-holding amount is 432,603,821. The average CEO age is 55.23. The average scale is \$25,901,739,409 dollars. The average HHI is 3,204.95. Based on this sample size (44), there is no need for concern about the assumption of normality because the degree of freedom (N-1) is over 40.

Based on a selection of 44 companies from 43 diverse industries, this study broadly selects data from the SIC code (from 1420 to 7300) which is reported by the Market Share Report 2007 for 2005. Since the sample firms are not selected from a limited number of industries, the observations have a broadly-based significance and application. Additionally, the firms selected have the most dominant market share in their respective markets, making them representative of large-sized corporations.

Finally, this study uses two semi log-level models (below) to examine correlations between R&D and each of the independent variables cited. (In order to demonstrate an integrated representation of all four of the factors affecting R&D, semi log-level models are used here as an alternative to log-level models.)

Models

Model 1 describes a nonlinear relationship between a dependent variable (R&D expenditure) and independent variables (CEO stockholding and age; firm scale (net sales growth); and market share (Herfindahl-Hirschman Index)).

$$\begin{aligned} \log(R\&D \text{ expenditure}) = & \beta_0 + \beta_1 CEOstockholding + \beta_1 CEOstockholdingsquare + \\ & \beta_2 CEOage + \beta_3 CEOagesquare + \beta_1 Scale + \beta_1 Scalesquare + \\ & \beta_1 HHI + \beta_4 HHIsquare + u \end{aligned}$$

Model 2 describes a linear relationship between a dependent variable (R&D expenditure) and independent variables (CEO stockholding and age; firm scale (net sales growth); and market share (Herfindahl-Hirschman Index)).

$$\log(R\&D \text{ expenditure}) = \beta_0 + \beta_1 CEOstockholding + \beta_2 CEOage + \beta_3 Scale + \beta_4 HHI + u$$

IV. Results

Model 1, below, specifies the non-linear relationship between the dependent variable of R&D expenditures and the four independent variables cited above (all shown here to have a 60% variability).

Model 1

$$\text{Log (R\&D expenditure)} = -3.494 + 1.356\text{CEOstockholding} - 1.150\text{CEOstockholdingsquare}$$

T-statistic [-0.261] [1.324] [-1.092]

$$+ 0.779\text{CEOage} - 0.006\text{CEOagesquare} + 7.816\text{Scale}$$

T-statistic [1.552] [-1.312] [4.089]***

$$- 2.803\text{Scalesquare} - 0.002\text{HHI} + 2.133\text{HHIsquare}$$

T-statistic [-2.496]** [-1.893]* [1.718]*

Number of observations = 44

R-square = 0.601

Adjusted R-square = 0.509

Durbin-Watson = 1.808

*** $p < .001$

** $p < .002$

* $p < .01$

Significant components within this model are first, the aforementioned independent variables, all of which have positive signs; and, second, the square of each variable, all of which having negative signs.

As established previously (in section II, above), due to the complexities of various closely related risk-avoidance motives, CEO stockholding and CEO age show diverse degrees of correlation with R&D. Model 1 (above) identifies the robust R&D investment of CEO's possessing a low amount of stocks as being consistent with the conduct of firm owners with high stockholdings; both utilize aggressive R&D activities as a way of increasing corporate profits as well as their personal assets. Further, the model indicates the converse correlation between passive investment in R&D and high levels of CEO stockholding (especially in the CEO's later years) as emerging from the desire to reduce risk to existing holdings.

Thus, Model 1 provides corroboration for the 1991 findings of Dechow and Sloan, cited above in section I, which indicate that risk-avoidance motives exert a limiting influence on R&D among older CEOs who have increased stockholdings. At the same time, the overall pattern delineated in Model 1 confirms both the hypothesis of convergence of managerial interest with stockholders and the hypothesis of entrenchment of managerial interest as being relative to and contingent upon differing CEO stockholding levels.

Figure 4, below, shows that CEO age (+sign) and the square of CEO age (- sign) have a non-linear relationship with R&D expenditures in the model. This study identifies 65 as the approximate turnaround point at which CEO interest and investment in R&D begin to decrease. More specifically, CEO's from 36 to 65 tend to invest aggressively in R&D, while CEOs from 65 to 68 tend to decrease their investments

Figure 4: Optimal Age of CEOs

$$|0.779 / (2 * -0.006)| = 64.916666 \approx 65$$

In addition, Model 1 shows firm scale as having a positive sign and firm scale squared as having a negative sign, thus establishing a non-linear relationship between the two independent variables and R&D. Briefly, the model shows that firms with either low or high firm scale have low R&D expenditure and firms of middle scale have high levels of R&D expenditure.

With regard to the Schumpeterian hypothesis which states that increases in both firm scale and size are accompanied by an increase in R&D activity, the data in Model 1 both supports and contradicts the hypothesis as follows: Firms with low net sales and increased R&D expenditures confirm Schumpeter, while firms which have mid-range net sales and which are also endeavoring to decrease R&D, disprove Schumpeter. Lastly, in Model 1 market concentration (HHI) shows a negative sign and the square of HHI shows a positive sign, thus implying a non-linear relationship between HHI and R&D. This aspect of the data is particularly relevant to the de-emphasis on R&D which occurs as oligopolistic market concentrations evolve toward the monopolistic level.

In essence, Model 1 helps to make clear that R&D activities increase when their effectiveness as competitive business tools increases. This is most likely to occur in

intensely competitive markets in which a few high market concentration firms vie for supremacy and continues until the conditions of oligopoly are securely established within the dominance of a limited number of conglomerates. At this point, R&D activities decline and are replaced by other profitable and less costly marketing strategies, particularly advertising. This study, therefore, adds support to the findings of Scherer (1965), Van Reenen (1995), Cohen and Levin (1989), and Symeonidis (1996), (all basically in line with the two Schumpeterian hypotheses discussed above in section I). In addition, and as already noted, this study also identifies the point of oligopolistic market dominance at which considerable more revenue is directed toward advertising.

In contrast to Model 1, Model 2 shows 1) a positive relationship between R&D and the variables of CEO stockholding, CEO age, and financial scale; and 2) a negative relationship between R&D and HHI.

Model 2

$$\text{Log (R\&D expenditure)} = 14.193 + 4.958\text{CEOstockholding} + 0.091\text{CEOage}$$

$$\text{T-statistic} \quad [5.181]^{***} \quad [2.415]^{**} \quad [2.016]^*$$

$$\text{T-statistic} \quad + 3.837\text{Scale} - 0.000\text{HHI}$$

$$[4.475]^{***} \quad [-1.699]^*$$

Number of observations = 44

R-square = 0.464

Adjusted R-square = 0.409

Durbin-Watson = 1.573

*** $p < .001$

** $p < .002$

* $p < .01$

The independent variables included in Model 2 show a 46% variability as opposed to the 60% variability in Model 1; both are, however, functions of disparities in R&D. Furthermore, even though the R square in Model 2 (0.464) is lower than that of Model 1 (0.601), Model 2 integrates all four significant variables – CEO stockholding, CEO age, market concentration, and HHI.

More specifically, Model 2 shows a positive relationship between the amount of CEO stock and R&D expenditure, i.e., a correlated increase in CEO stockholding and R&D expenditure. Model 2 also indicates a positive relationship between CEO age and R&D and thereby supports the argument that older CEO's will tend to invest more aggressively in R&D than their younger counterparts, thus confirming the 1988 findings of Morck, Schliefer, and Vishny cited above in section I.

The basic Schumpeterian hypothesis of a positive relationship between firm scale and R&D is established in Model 2 at the 1% level of significance. The data therefore provides a broad confirmation that, all other factors being equal, the largest corporations invest more aggressively in R&D than smaller companies. The model also illustrates that R&D expenditures and market concentrations are statistically significant at the 10% level, which is low in comparison to the relationship between scale and R&D.

More precisely, the relationship between market concentration and R&D is shown to have a negative sign, thereby contradicting the Schumpeterian hypotheses in this one

particular respect: While in today's corporate climate, the increasing number of oligopolistic firms with lower market concentrations (relative to monopolistic firms) tend to increase the money they spend on R&D, a reduction of R&D expenditures usually accompanies the maximizing of market concentrations as the level of monopolistic dominance is approached.

V. Conclusion

The data presented in the preceding discussion are intended to delineate the conditions under which a particular set of independent variables will affect, either positively or negatively, the underlying policies governing the dependent variable of R&D expenditures. The principal independent variables considered are as follows:

- 1) the CEO characteristics of stockholding percentages and age; and
- 2) the two major firm characteristics of firm scale measured in net sales and firm market concentration measured as HHI.

From within this framework, two major conclusions are reached about the effect which these independent variables have upon R&D expenditures in large corporations. First, CEO stockholding, CEO age (relative to retirement), and firm scale all have a positive linear relationship with R&D, particularly when the firm is in a competitive market and is attempting to increase or maximize its hold on a larger market share. R&D's proven effectiveness in enhancing firm performance and generating greater profits motivates CEO's not only to increase R&D expenditures, but also to continue to increase their personal stockholdings in the company. Recognition of the obvious benefit of increasing personal ownership in an increasingly more profitable company ensures that higher CEO stock-holding and greater R&D expenditure continue to go hand-in-hand.

This endogenous, positive linear relationship is operable in a firm's growth until it reaches oligopolistic market share and scale. Moreover, until this level is reached, the resultant investment in R&D reflects recognition on the CEO's part of the mutuality, or convergence, of financial interest between himself and stockholders and thereby strengthens the CEO's willingness to accept measurable risks inherent in the R&D projects under consideration.

Second, the deviation from this pattern occurs when HHI, or high market share concentrations, begin to have a negative linear relationship with R&D at the point of marked declines in competition. This point is reached when oligopoly evolves into monopoly and, as a consequence, R&D is displaced by well-proven modes of advertising as a means of maintaining market dominance. The possibility that this displacement might be due to cash flow shortages or related fiscal concerns is questionable in light of the high profitability achieved at the level of oligopoly. It seems more likely that the shift to advertising as the monopolistic market concentration is approached is due to its superior effectiveness at this level. Once a huge nation-wide, virtually 'captive audience' of consumers both familiar with and having ready access to the company's product line is established, advertising generates higher sales and profits than R&D.

These conclusions, therefore, contradict the concept of CEO entrenchment of interest hypotheses which states that CEO stockholdings and proximity to retirement age cause CEO's to deliberately and consistently obstruct R&D projects to safeguard their

own assets. The shift from R&D to advertising which occurs at the higher levels of market dominance is more likely a matter of deliberate choice than either narrow self-interest or financial necessity.

As discussed in section I, the risk-reduction, shirking, and short-run CEO motives often are held to cause self-interested CEO's to avoid or even impede R&D projects which could be vital to corporate growth. Model 2 delineates the plausibility of this type of negative linear relationship between CEO stockholding and R&D. The model shows further that this relationship could occur even when CEO stock levels are at a relatively low level and when the likelihood of financial loss due to ineffectual R&D projects is not pronounced. Moreover, it is frequently argued that CEO's with high stockholdings are likely to safeguard their assets by investing in projects which have lower risk than R&D.

The general import of the conclusions reached in this thesis is that the data considered here argues against a negative concept of the self-protective, self-interested CEO. Instead, the data favors the view that CEO's are more likely to rationally appraise the utility of R&D as a means of increasing sales and market share for the mutual benefit of the corporation as a whole. Until the turning point of monopolistic market control is reached, it is the CEO's perception of increased profitability and long-range viability which motivates increased spending for R&D.

With regard to the market concentration factor, the data considered here demonstrate that both high and low concentrations lead to high levels of R&D activities while in firms with mid-range concentrations invest less robustly in R&D. Furthermore,

the data argue that the negative influence of standard risk-avoidance motives are overcome due either to the urgent need to establish a market foothold in a competitive market (low HHI) or to the security and optimism inspired by commanding market share (high HHI).

Overall, increases in profits and stronger market position which accompany increase in firm size result in a predominantly positive linear relationship between CEO stockholding and R&D expenditures. This study therefore affirms the Schumpeterian hypothesis equating increase in firm size and R&D with the qualification that this relationship is interrupted at the point of transition from oligopolistic to monopolistic conditions. At this point, advertising expenditures take the place of R&D expenditures by virtue of their proven effectiveness in the conglomerate monomarket which has become the dominant pattern in corporate America.

VI. Appendices

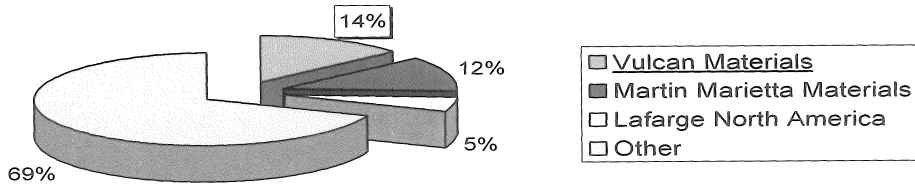
Appendix A. – Cross-Sectional Data of Firms

Code		Classified industry catalogue	Dominated company
SIC	NAICS		
1420	212312	Leading Stone Mining Firm	Vulcan Materials
2013	311612	Top Bacon Maker	Altria
2022	311513	Top Cheese Maker	Kraft Foods
2032	311422	Top Soup Maker	Campbell Soup
2038	311412	Top Frozen Dinner Maker	ConAgra Foods, Inc.
2043	31123	Top Cereal Maker	Kellogg
2066	31132, 31133	Largest Chocolate Candy Maker	Hershey
2520	337214	Leading Office Furniture Maker	HNI
2631	32213	Top Bleached Paperboard Maker	International Paper
2631	32213	Top Linerboard Maker	Smurfit-Stone
2672	322222	Top Tape Maker	3M
2676	322291	Top Cleaning Cloth Maker	Clorox Co.
2761	323116	Leading Pressure-Sensitive Material Maker	Avery Dennison
2821	325211	Leading Polystyrene Marker	Dow Chemical
2833	325411	Top Multivitamin Maker	Wyeth Labs Inc.
2834	325412	Top Drug Maker	Pfizer
2841	325611	Top Landry Detergent Maker	Procter & Gamble
2844	32562	Top Toothpaste Maker	Colgate Oral Pharmaceuticals
2844	32562	Top Baby Lotion	Johnson & Johnson
2899	325998	Top Rug/Room Deodorizer Maker	Church & Dwight
3011	326211	Highway Truck Tire	Good Year
3229	327212	Leading Glass Container Maker	Owens-Illinois
3261	327111	Plumbing Fixture	AVX Corporation
3519	333618	Leading Marine Diesel Engine Maker	Caterpillar
3571	334111	Top Computer Maker	Dell
3631	335221	Top Appliance Maker	Whirlpool
3711	336112	Top Light-Truck Vendor	General Motors
3825	334514, 334515	Leading Automatic Meter Maker	Itron
3841	339112	Excessive Menstrual Bleeding Treatment	Cytec
3842	339113	Drug-Coated Stent	Boston Scientific
3845	334510	Leading Pacemaker Firm	Medtronic
3861	333315	Top Digital Camera Maker	Kodak
3861	333315	Largest Color Copier Maker	Xerox
3944	339932	Leading Game Publisher	Electronic Arts
3944	339932	Leading Board Game Maker	Hasbro
4724	56151	Leading Online Travel Firm	Expedia
4822	51331	Online Postal Market	Stamps.com
4822	51331	Top News Site	Yahoo

5231	44412	Leading Paint/Wallpaper Retailer	Sherwin-Williams Co.
6211	52311	Leading Investment Banking Firm	Goldman Sachs Group, Inc.
7372	334611, 51121	Top Web Brower	Microsoft
7373	541512	Top Server Makers in EMEA	Hewlett-Packard
7375	514191	Leading IT Service Firms in the EMEA	IBM
7812	51211	Top Documentary Firm	Time Warner Inc.

Appendix B. – Market Share and HHI in 2005
Vulcan Materials

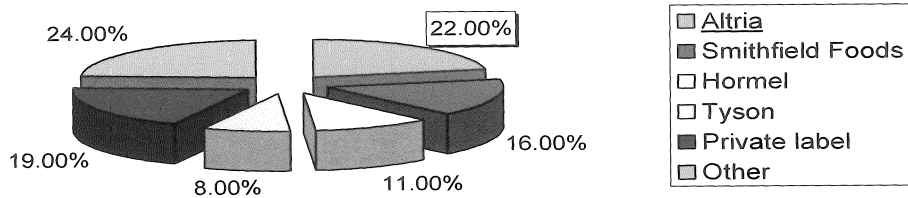
Leading Stone Mining Firms, 2005



HHI = 5,126.00

Altria

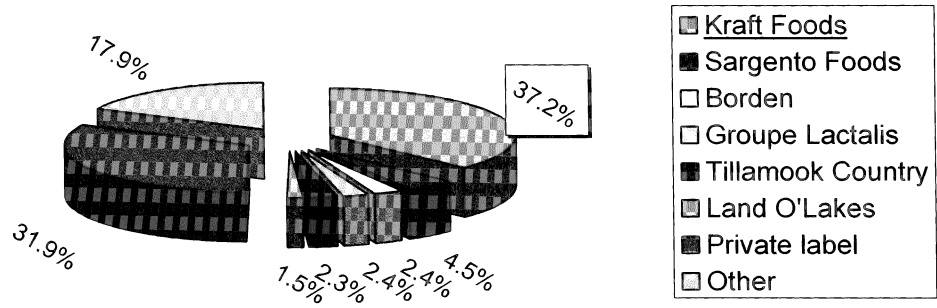
Top Bacon Makers, 2005



HHI = 1,862.00

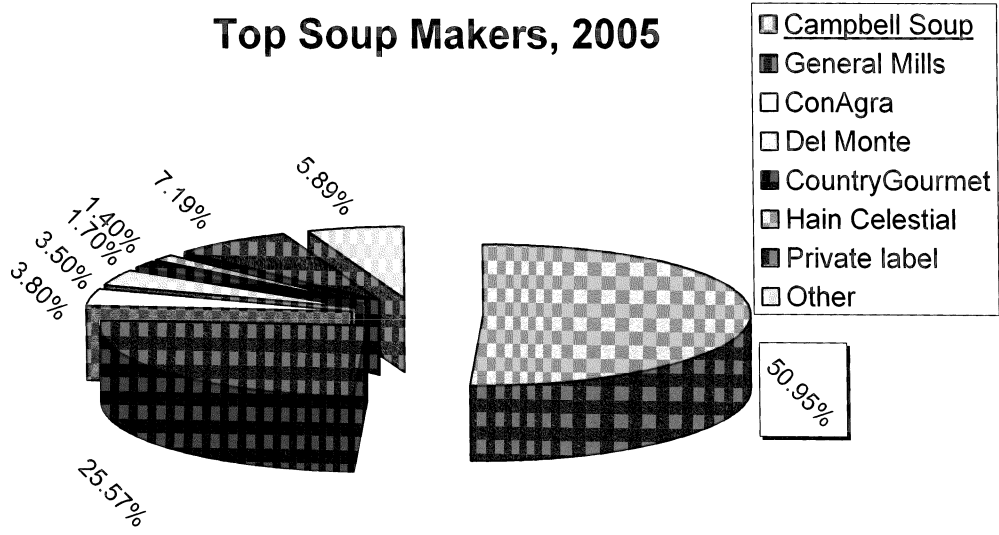
Kraft Foods

Top Cheese Makers, 2005



HHI = 2,061.17
Campbell Soup

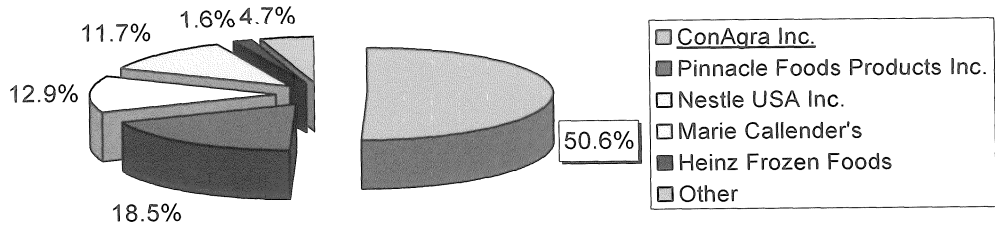
Top Soup Makers, 2005



HHI = 3,074.55

ConAgra Foods, Inc.

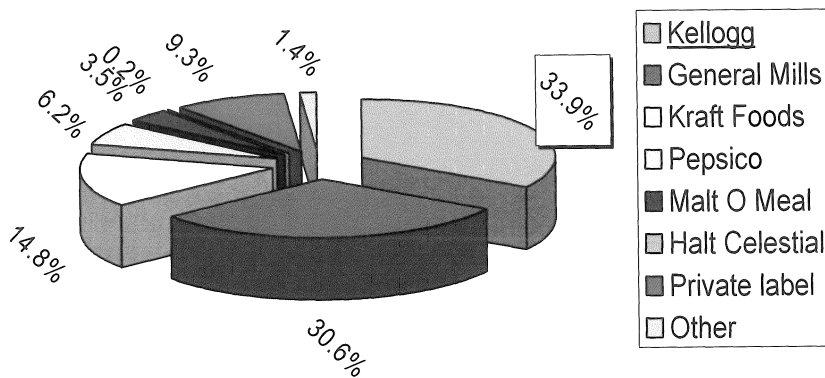
Top Frozen Dinner Makers, 2005



HHI = 3,230.56

Kellogg

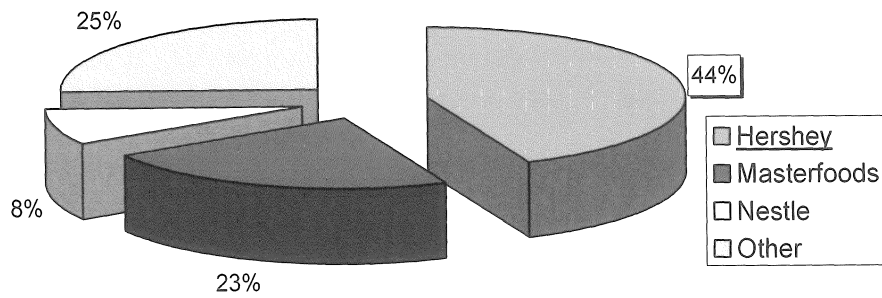
Top Cereal Makers, 2005



HHI = 2,411.83

Hershey

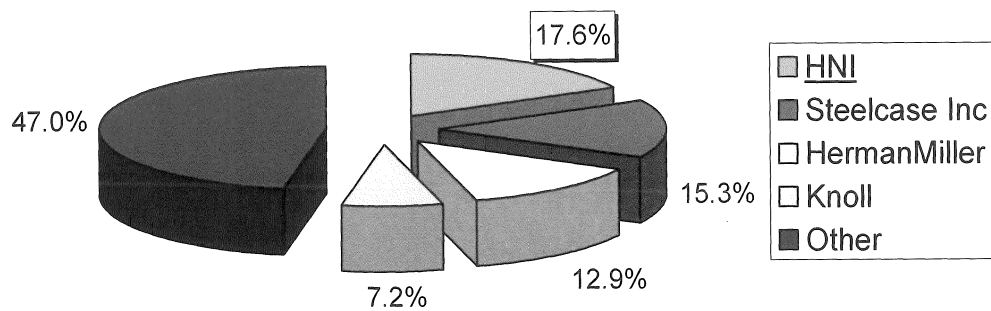
Largest Chocolate Candy Makers, 2005



HHI = 3,121.13

HNI

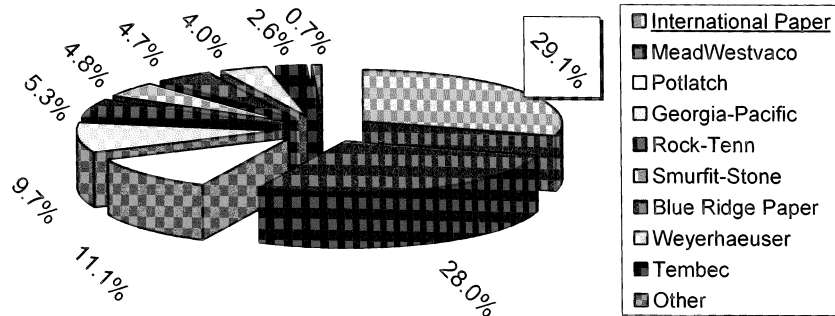
Leading Office Furniture Makers, 2005



HHI = 2,971.10

International Paper

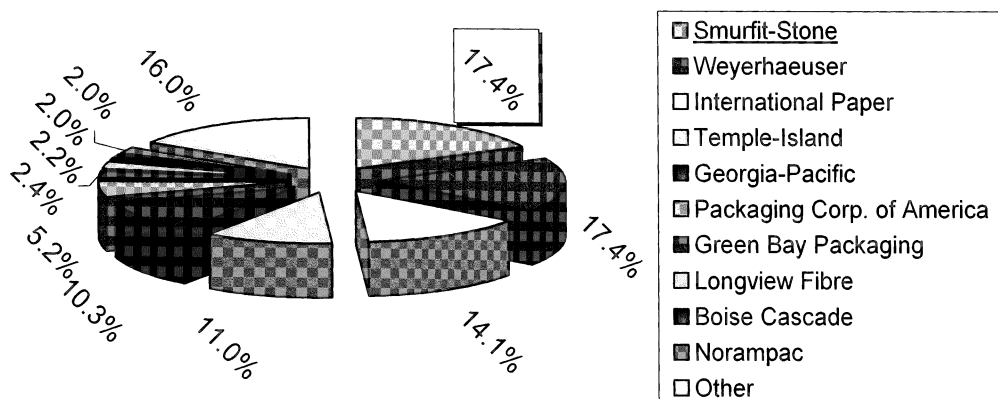
Top Bleached Paperboard Makers, 2005



HHI = 1,944.88

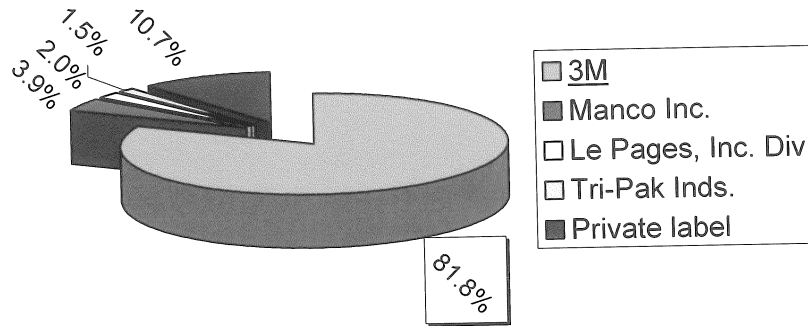
Smurfit-Stone

Top Linerboard Makers, 2005



HHI = 1,333.06

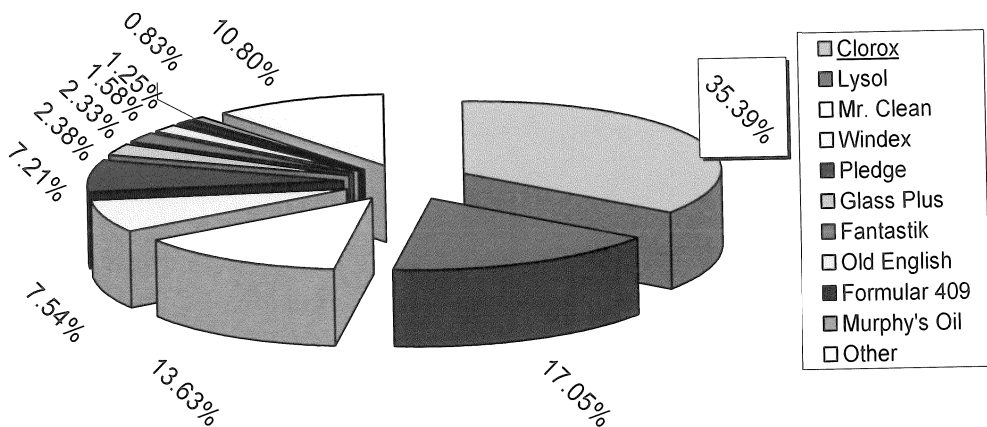
Top Tape Makers, 2005



HHI = 6,562.98

Clorox Co.

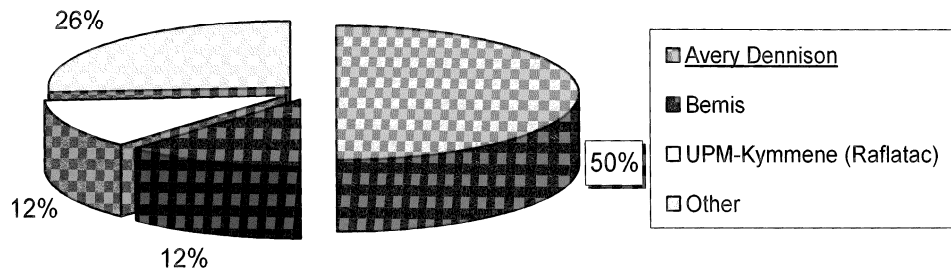
Top Cleaning Cloth firms, 2005



HHI = 1,970.25

Avery Dennison

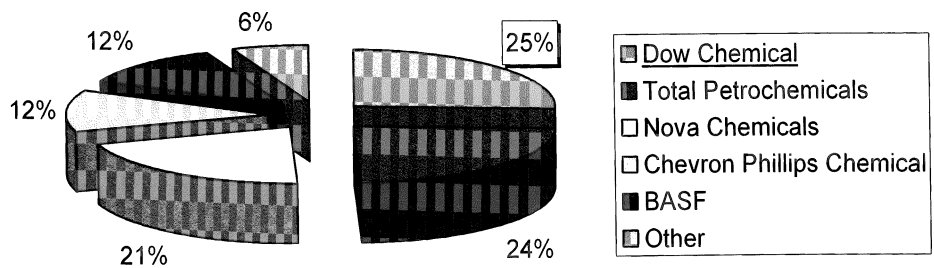
Leading Pressure-Sensitive Material Makers, 2005



HHI = 3,464.00

Dow Chemical

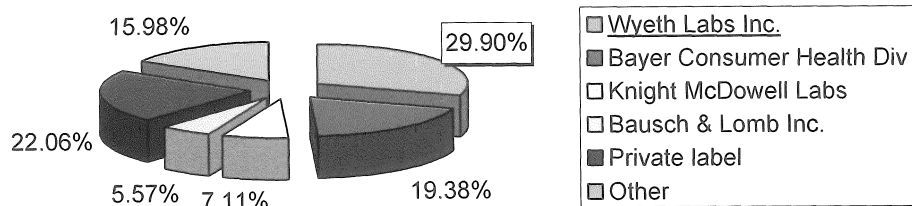
Leading Polystyrene Markers, 2005



HHI = 1,969.28

Wyeth Labs Inc.

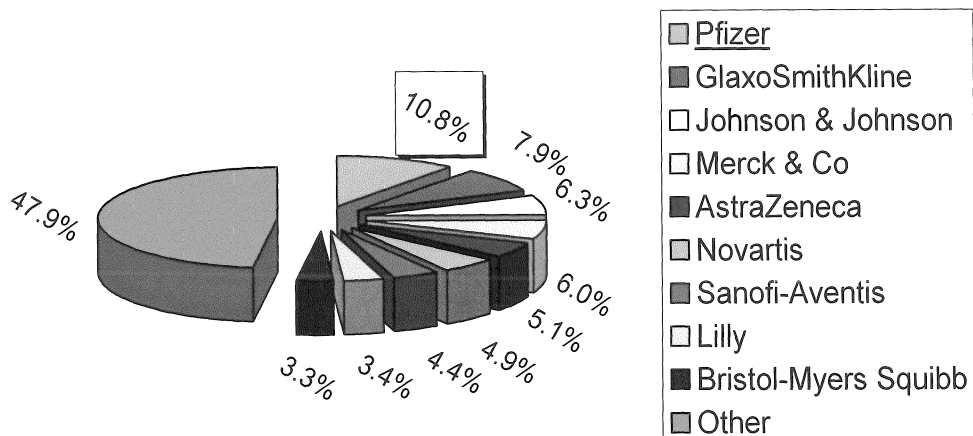
Top Multivitamin Makers, 2005



HHI = 1,969.42

Pfizer

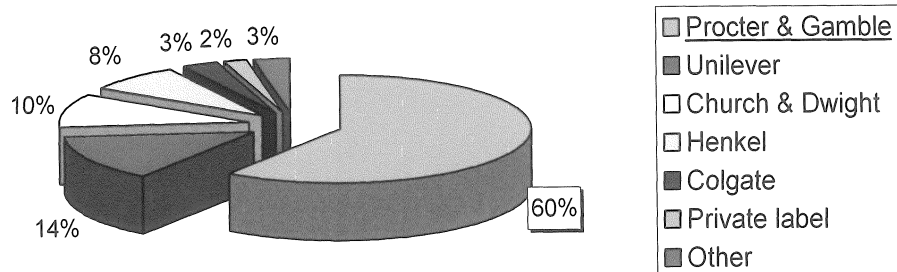
Top Drug Makers, 2005



HHI = 2,640.98

Procter & Gamble

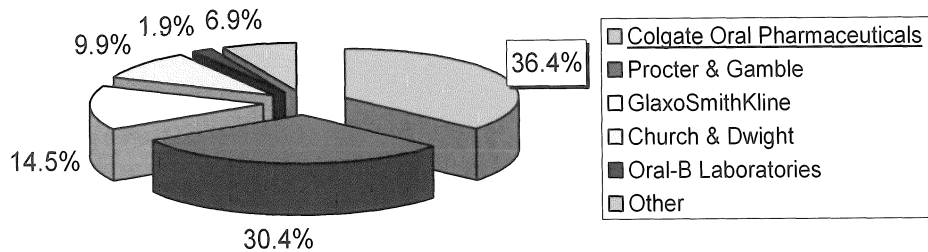
Top Landry Detergent Makers, 2005



HHI = 3,982.00

Colgate Oral Pharmaceuticals

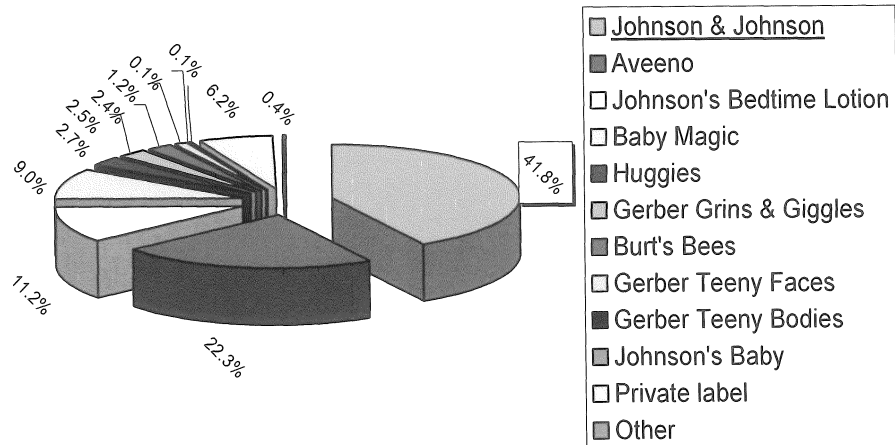
Top Toothpaste Markers, 2005



HHI = 2,608.60

Johnson & Johnson

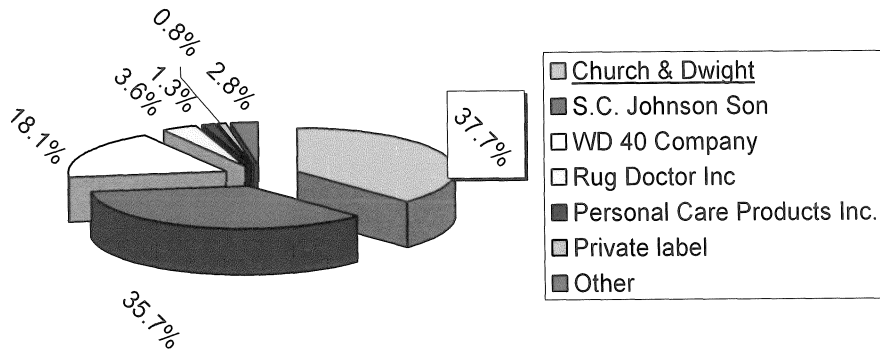
Top Baby Lotion Makers, 2005



HHI = 2510.33

Church & Dwight

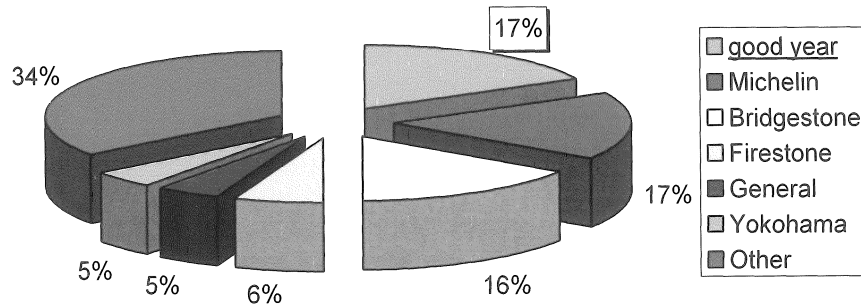
Top Rug/Room Deodorizer Makers, 2005



HHI = 3,046.52

Good Year

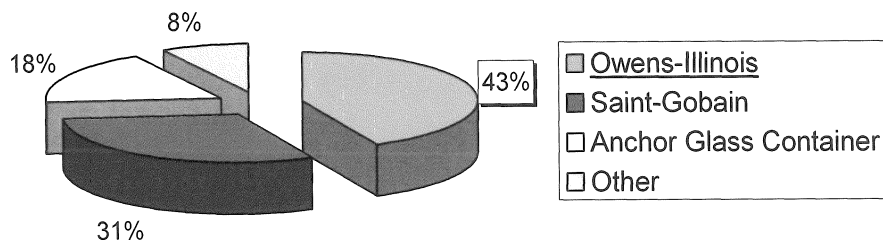
Highway Truck Tire Markers, 2005



HHI = 2,137.00

Owens-Illinois

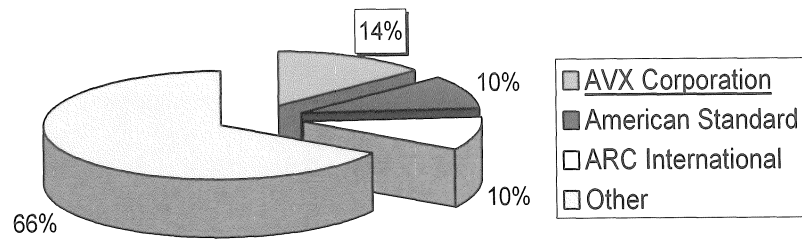
Leading Glass Container Maker, 2005



HHI = 3,198.00

AVX Corporation

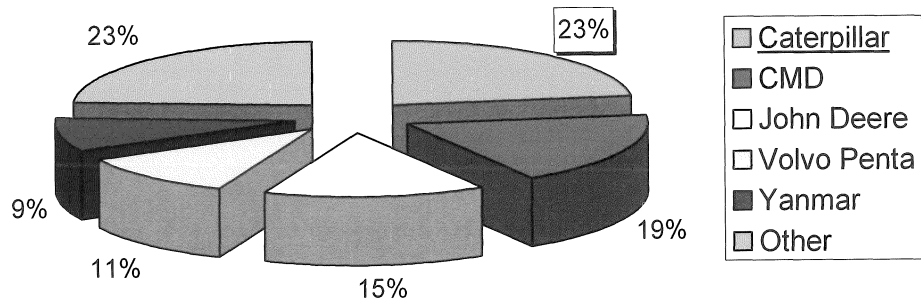
Leading Pottery/Ceramic/Plumbing Fixture Makers,
2005



HHI = 4,752.00

Caterpillar

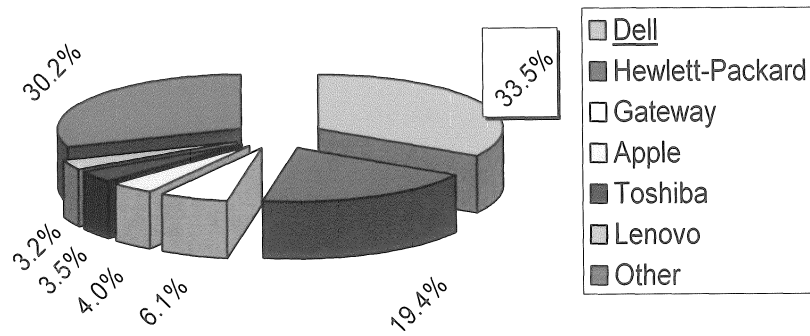
Leading Marine Diesel Engine Makers, 2005



HHI = 1,865.50

Dell

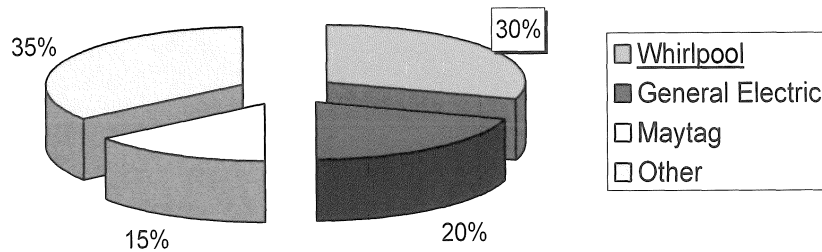
Top Computer Makers, 2005



HHI = 2,492.40

Whirlpool

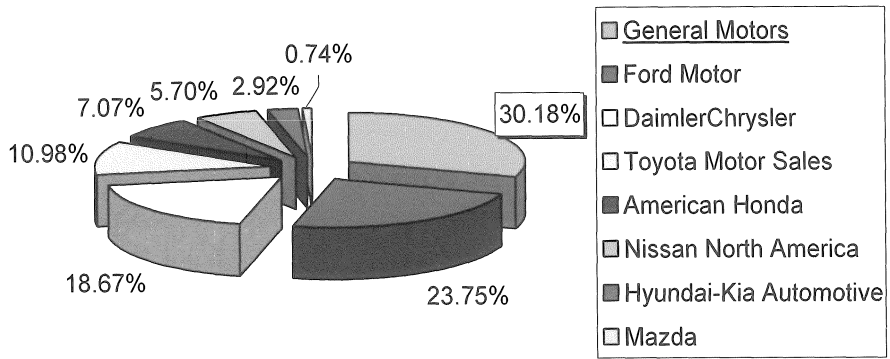
Top Appliance Makers, 2005



HHI = 2,750.00

General Motors

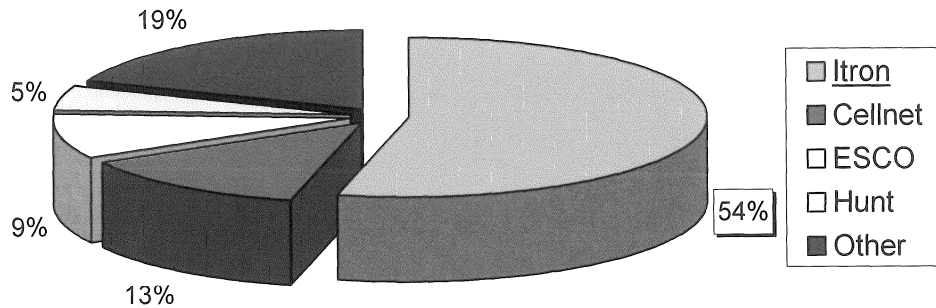
Top Light-Truck Vendors, 2005



HHI = 1,951.21

Itron

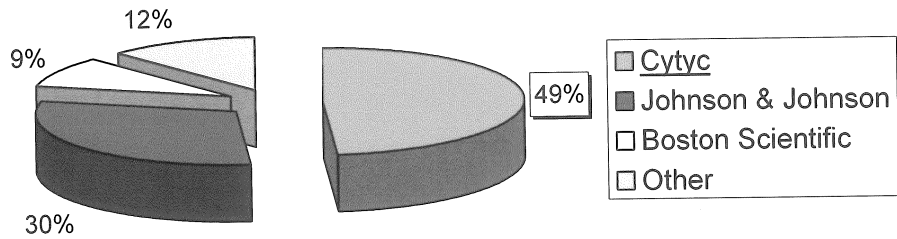
Leading Automatic Meter Makers, 2005



HHI = 3,552.00

Cytc

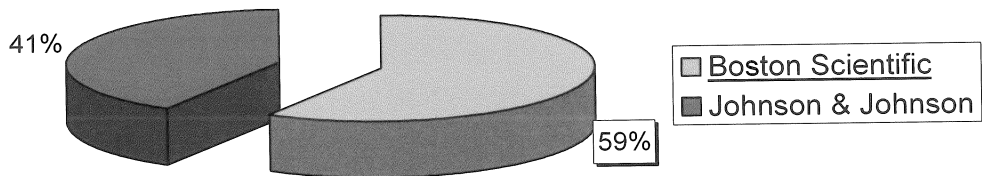
Excessive Menstrual Bleeding Treatments



HHI = 3,526.00

Boston Scientific

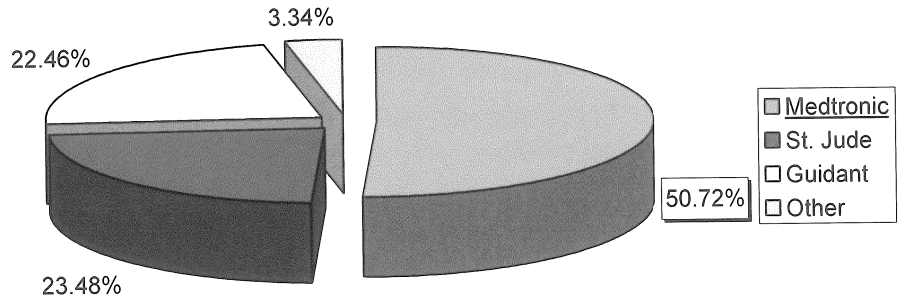
Durg-Coated Stent Market



HHI = 5,162.00

Medtronic

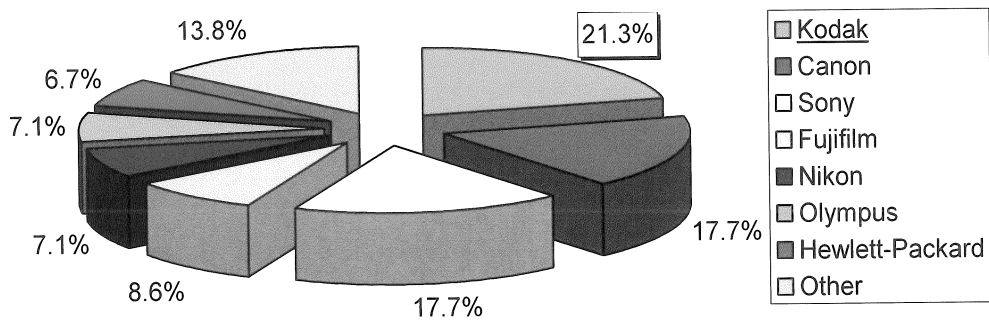
Leading Pacemaker Firms, 2005



HHI = 3,639.44

Kodak

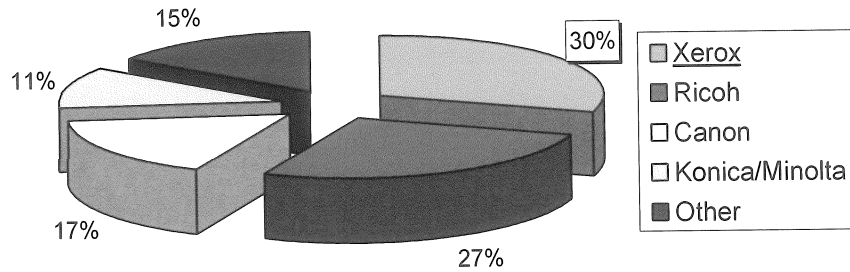
Top Digital Camera Makers, 2005



HHI = 1,490.38

Xerox

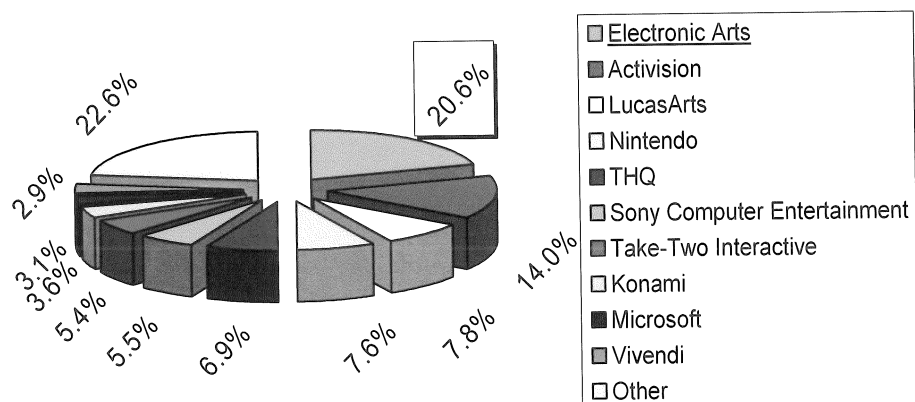
Largest Color Copier Makers, 2005



HHI = 2,264.00

Electronic Arts

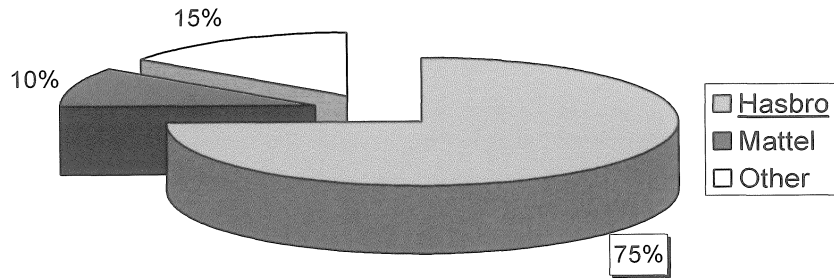
Leading Game Publishers, 2005



HHI = 1,387.72

Hasbro

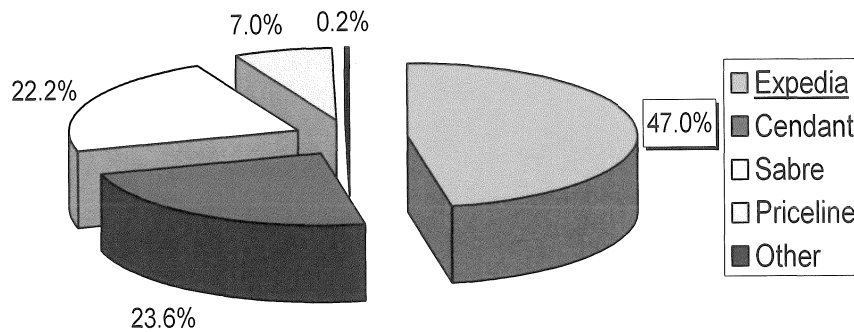
Leading Board Game Makers, 2005



HHI = 5,950.00

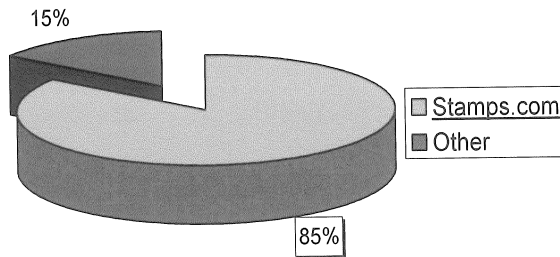
Expedia

Leading Online Travel Firms, 2005



HHI = 3,307.84

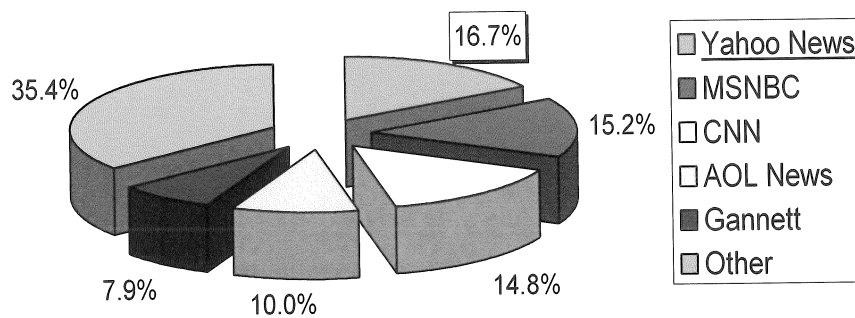
Online Postal Market, 2005



HHI = 7,450.00

Yahoo

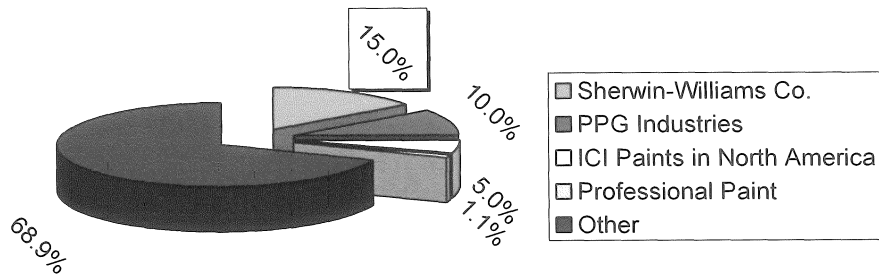
Top News Sites, 2005



HHI = 2,145.43

Sherwin-Williams Co.

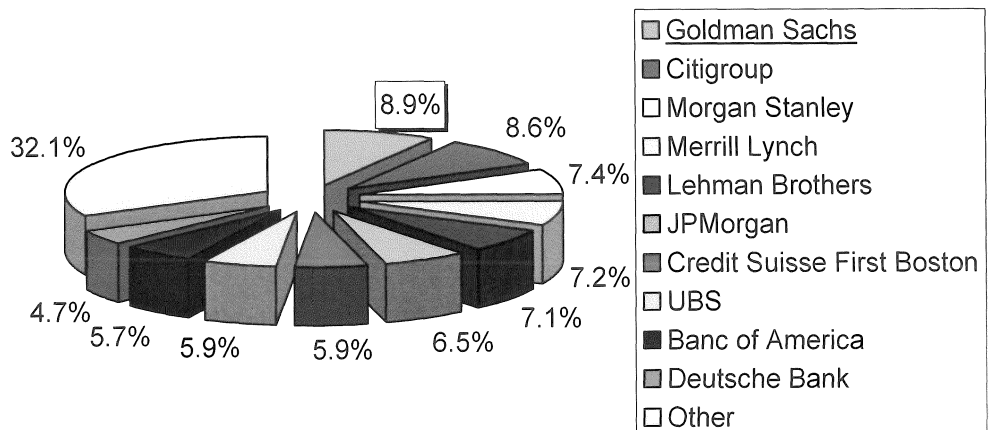
Paint and Wallpaper Stores



HHI = 5,098.42

Goldman Sachs Group, Inc.

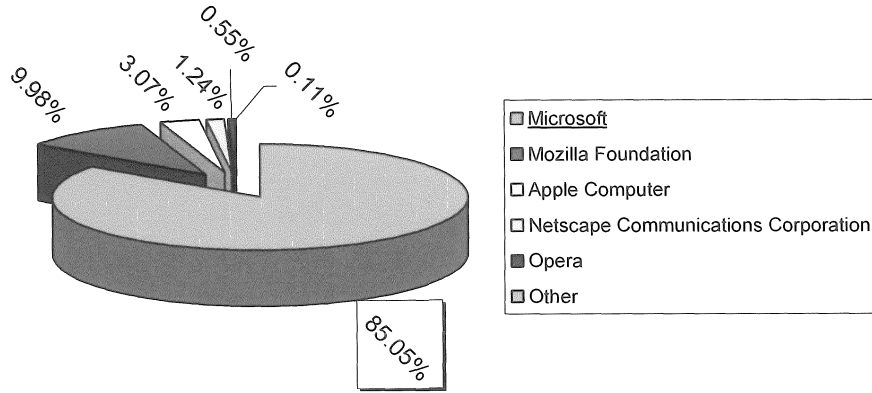
Leading Investment Banking Firms, 2005



HHI = 1,507.04

Microsoft

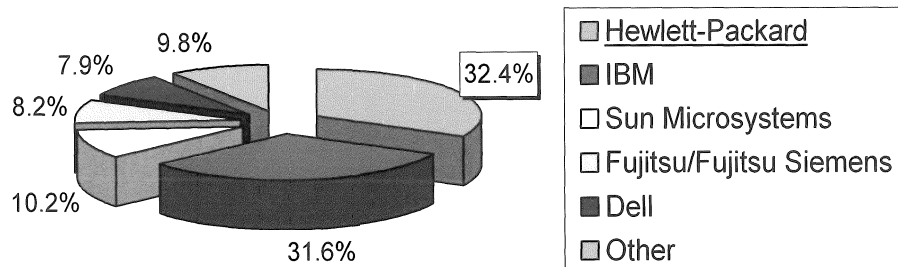
Top Web Browsers, 2005



HHI = 7,344.49

Hewlett-Packard

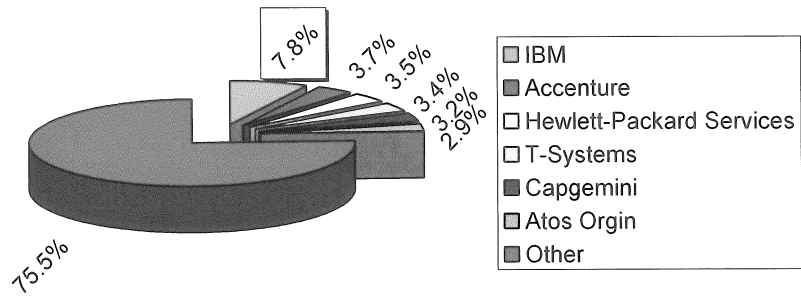
Top Server Makers, 2005



HHI = 2,378.05

IBM

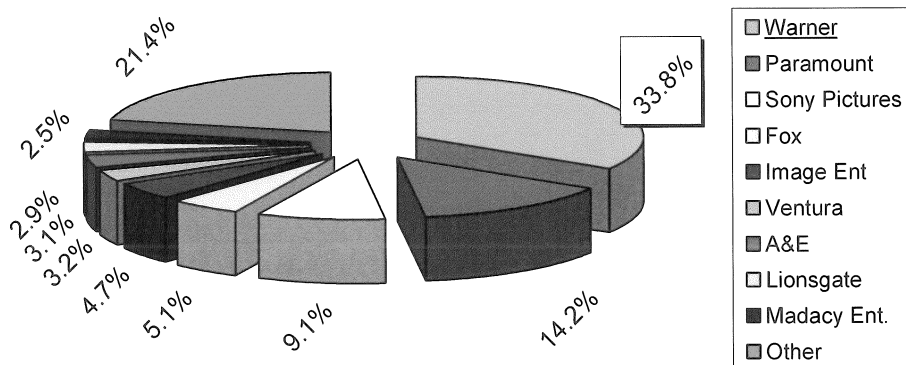
Leading IT Service Firms, 2005



HHI = 5,817.24

Time Warner Inc.

Top Documentary Firms, 2005



HHI = 1,967.46

VII. References

- Alchian, A. A. and Demsetz, H. 1972. "Production, Information Costs, and Economic Organization" *The American Economic Review*, 62:5, pp. 777-795.
- Amihud, Y. and Lev, B. 1981. "Risk Reduction as a Managerial Motive for Conglomerate Mergers" *The Bell Journal of Economics*, 12:2, pp. 605-617.
- Blundell, R. Griffith, R. and Reenen, J. V. 1995. "Dynamic Count Data Models of Technological Innovation" *The Economic Journal*, Vol.105, pp. 333-344.
- Cho, S. 1992. "Agency Costs, Management Stockholding, and Research and Development Expenditures" *Seoul Journal of Economics*, Vol.5, pp. 127-152.
- Cohen, W. M. and Levin, R, C. 1989. "Empirical Studies of Innovation and Market Structure" in Schmalensee, R. and Willing, R., eds. *Handbook of Industrial Organization*, Vol.2, pp. 1059-1107.
- Demsetz, H. 1983. "The Structure of Ownership and the Theory of Firm" *Journal of Law and Economics*, Vol.26, pp. 375-390.
- Demsetz, H. and Lehn, K. 1985. "The Structure of Corporate Ownership: Causes and Consequences" *Journal of Political Economy*, Vol.93, pp. 1155-1177.
- Dechow, P. and Sloan, R. 1991. "Executive Incentives and the Horizon Problem: An Empirical Investigation" *Journal of Accounting and Economics*, Vol.14, pp. 51-89.
- Fama, E. F. and Jensen, M. C. 1983. "Separation of Ownership and Control" *Journal of Law and Economics*, Vol.26, pp. 301-325.
- Francis, J. and Smith, A. 1995. "Agency Costs and Innovation: Some Empirical Evidence" *Journal of Accounting and Economics*, Vol.19, pp. 383-409.
- Hill, C. W. L. and Snell, S. A. 1989. "Effects of Ownership Structure and Control on Corporate Productivity" *Academy of Management Journal*, Vol.32, pp. 25-46.
- Jensen, M. C. and Meckling, W. H. 1976. "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure" *Journal of Financial Economics*, Vol.3, pp. 305-360.

Morck, R. Shleifer, A. and Vishny, R. 1988. "Management Ownership and Market Valuation: An Empirical Analysis" *Journal of Financial Economics*, Vol.20, pp. 293-315.

Narayanan, M. P. 1985. "Managerial Incentives for Short-term Results" *The Journal of Finance*, 5:5, pp. 1469-1484.

Pepall, L. Richards, D. J. and Norman, G. 2005. "Advertising, Competition, and Brand Names" *Industrial Organization Contemporary Theory & Practice; third edition*, pp. 550.

Robert, S. L. 2007. "An Annual Compilation of Reported Market Share Data on Companies, Products, and Services" *Market Share Reporter*, Farmington Hills, MI: Gale Group,

Peter, C. 2005. "Old. Smart. Productive. Surprise! The Graying of the Workforce is Better News than You Think" *Business Week*, pp. 78-86.

Scherer, F. M. 1965. "Firm Size, Market Structure, Opportunity and the Output of Patented Innovations" *American Economic Review*, Vol.55, pp. 1097-1125.

Symeonidis, G. 1996. "Innovation, Firm Size and Market Structure: Schumpeterian Hypotheses and Some New Themes" *OECD Economics Department Working Papers*, No. 161.

Telser, L. 1964. "Advertising and Competition" *Journal of Political Economy*, Vol.72, pp. 537-562