3 1293 10515 8616

This is to certify that the

dissertation entitled

Entry, Strategic Entry Deterrents,
and Profitability

presented by

John L. Fizel

has been accepted towards fulfillment
of the requirements for

___Ph.D___ degree in _Economics_

Kenneth D. Baye
Major professor

Date _Nov. 9, 1981_

0-12771

JAN 19 '86

JUN 1 8 1998

JUN 15 1997

571 8314
571 201

ENTRY, STRATEGIC ENTRY DETERRENTS, AND PROFITABILITY

By

John Leonard Fizel

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Economics

1981

ABSTRACT

ENTRY, STRATEGIC ENTRY DETERRENTS, AND PROFITABILITY

By

John L. Fizel

The primary objective of this dissertation is to extend the concept
of entry barriers, as defined by Bain, to include strategic deterrents
and in so doing test the hypothesis that investment programs adopted by
established firms facing the threat of entry can influence entrants' ex-
pectations regarding their post-entry profit opportunities. Previous
entry-entry barrier studies considered only structural market conditions
to be barriers to entry, positing a fixed industry structure that deter-
mines the behavior and performance of the firms in the industry. Em-
ploying the concept strategic barriers -- investments made by established
firms which both signal and permit aggressive action against intruders --
in an analysis of entry conditions allows for the unique possibility that
conduct may have a feedback effect on market structure.

In order to determine whether strategic barriers do reduce the rate
of entry, measures of excess capacity and liquidity were incorporated in-
to equations seeking to explain inter-industry differences in the rate
of entry for a set of 40 oligopolies over the period 1959-1968. By uti-
lizing indices of excess capacity and liquidity as direct determinants of
actual entry, this study points out that strategic barriers do reduce the
rate of entry beyond that which would occur due to structural barriers

alone. Consequently, firms can no longer be considered passive agents within a given economic environment. Rather they can be expected to actively shape their environment so it is more conducive to their particular long-run goals.

This dissertation also examines the influence of entry barriers on profits exclusive of their role in entry deterrence. This study concludes that previous positive correlations between profitability and scale economies understate the capacity of scale economies to deter entry whereas such positive relationships between advertising and profits overstate the negative impact of advertising on entry.

In examining the main elements of the dissertation, a number of related hypotheses were tested. Given a particular blend of strategic and structural barriers in an industry, this study shows conclusively that foreign potential entrants are less likely to be deterred than domestic entrants. This study also provides evidence suggesting that entry offers little prospect for constraining oligopolistic behavior.

ACKNOWLEDGMENTS

I would like to extend my thanks to all members of my dissertation committee. With admirable patience and dedication, my Chairman Kenneth Boyer guided me through all phases of the dissertation and to him I am indeed grateful. Special thanks are also due to Stephen Martin and B.T. Allen for comments and suggestions which led to notable improvements in this study. I would also like to express my appreciation to Warren Samuels for his help and encouragement through my graduate years.

In addition I would like to express my gratitude to a colleague, Stephen Husted, who always was a willing listener, perceptive critic, and supportive friend.

Finally, I owe substantial thanks to my wife, Lynn, who was my indefatigable editor. Her efforts to unsnarl sentences that even an illiterate contortion artist could not deliberately comprise was a task surely as relentless as mine. Furthermore Lynn provided valuable and incessant encouragement throughout the dissertation process.

Of course, the author is solely responsible for any shortcomings which may yet remain.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

Introduction

Entry, whether actual or potential, has an important assignment in the framework of microeconomic theory. Under perfect competition, entry by new firms has been shown to enforce allocative and productive efficiency, encourage innovation, and eliminate excess profits. Models of imperfect competition rely on the threat of potential competition -- the probability of entry -- to motivate workably competitive performance.[1] Considering the critical role of entry it becomes crucial to continue research which will enable us to better understand the actual functioning of this phenomenon.

Economists have given extensive consideration to a number of hypotheses concerning the determinants and effects of entry. To date, however, no study has recognized the empirical significance of strategic barriers to entry -- investments made by established firms that both signal and permit aggressive action against intruders. In addition, no study has accurately scrutinized the entry-entry barrier relationship. Studies which have attempted to determine the relative effectiveness of entry barriers have either relied on the implied entry-entry barrier relationship inherent in the theory of limit pricing, used an incorrect measure of entry, and/or have excluded strategic barriers from consideration.

1

The primary purpose of this dissertation is to extend the concept of entry barrier, as defined by Bain, to include strategic deterrents and in so doing test the hypothesis that strategic responses of established firms to the threat of entry are important elements of the entry condition. Contrary to the traditional industrial organization paradigm which states that structure affects conduct which in turn determines performance, this inquiry will emphasize the feedback effects of behavior on industry market structure. In addition to identifying the importance of strategic barriers, this analysis will disentangle the functional role of the hypothesized entry barriers by explicitly accounting for the simultaneity in the profit-entry relationship, determining whether these variables impact indirectly on profitability through their direct effects on entry or whether they impact directly on profitability through an effect independent of entry, or both.

It will be shown that the critical role of entry cannot be fully understood when the response to entry by existing firms is ignored and that precise conclusions regarding the actual entry retarding capabilities of specific entry barriers cannot be discerned by tacitly accepting the fact that entry barriers deter entry.

ENTRY AND EFFICIENCY

The role of entry as a promoter of efficient economic performance originated from the claims for the Pareto optimal condition of a perfectly competitive economy. Although it may be unreasonable to expect the structure of the manufacturing sector of an advanced economy to conform to the textbook standard of perfect competition, the goals remain the same nevertheless. Economists focus on how allocative and

productive efficiency may be promoted, how innovation can be encouraged, and how income and wealth can be equitably distributed. What follows is a summary of the relationship between entry and each of these goals, emphasizing the ability or inability of entry to influence industrial behavior such that performance conforms to the competitive standards.

Allocative Efficiency

Inefficient allocation of resources occurs whenever any producer or group of producers is able to persistently restrict output and charge a price above marginal cost. Such output restrictions foreclose the market to consumers who were willing to pay a lower price but a price which would have covered the opportunity cost of producing the additional unit(s).[2]

The role of entry in restraining this form of misallocation is twofold. If unrestricted, new firms will respond to the abnormal returns by increasing supply in the focal industry and pushing price to the competitive level (equal to marginal cost). Instances of entry should also aid in preventing misallocations from occurring in the first place by reducing the probability that collusive agreements can be invoked and enforced.

The proposition that unrestricted entry will eliminate allocative inefficiency can be simply illustrated in the case of a monopoly.[3] In Figure 1.1 the monopolist faces a short run demand curve AXYB and a corresponding marginal revenue curve MR. The monopolist maximizes short run profits by choosing the price-output combination $X = (P_m, Q_m)$. As a result output is restricted below the level at which marginal cost (MC) equals demand (price) and the firm earns economic profits. In the

PRICE ($)

P_M X

P_C .... Z .... Y .... MC

Q_M Q_C QUANTITY
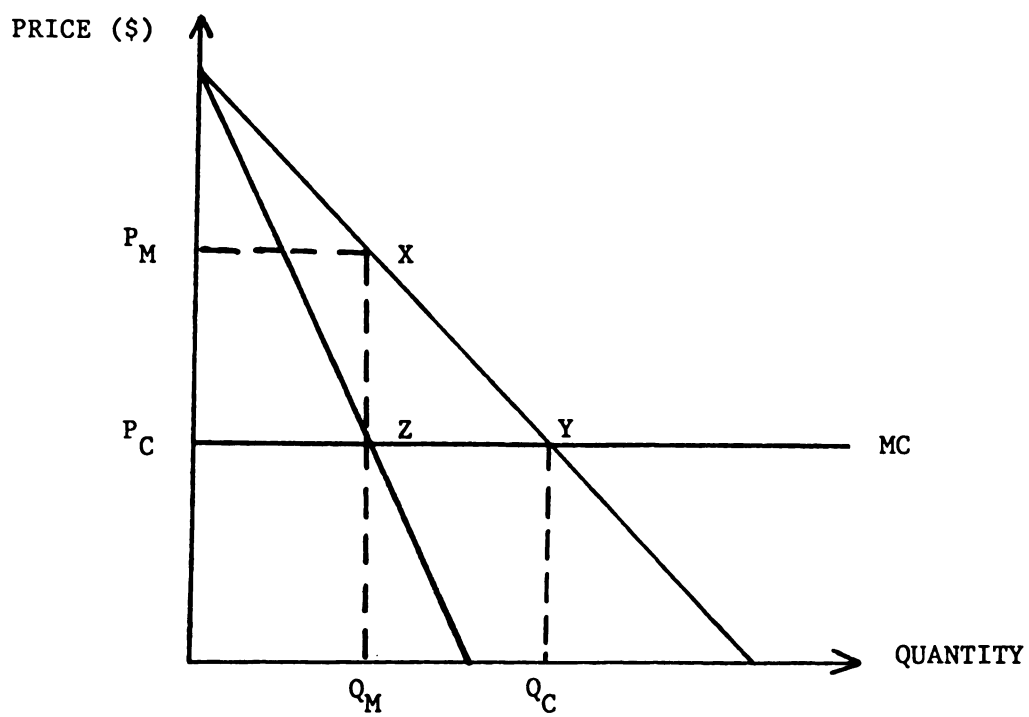
Figure 1.1   Monopoly and Allocative Inefficiency

long run investors are able to react to these "excess" profits and do
so by generating new capacity within the industry. If entry were in-
stantaneous, unrestricted, and complete, rates of return would be nor-
malized across the entire economy. This implies that the segment of
the monopolist's demand curve above MC is unavailable to the single
seller due to the influx of new competitors. The resulting demand curve
facing a monopolist is P_cZYB and the corresponding price-output combi-
nation is Y = (P_c, Q_c).[4]

Producers attempting to restrict output need an agreement, either
explicit or implicit, among the members of the industry to ensure that
all members do not try to sell more than their allotted shares. A
variety of divergent views and influences must be coordinated and coor-
dination requires communication among the concerned parties.[5] Because
the number of two-way communications increases disproportionately with
the number of communicators, increasing the number of sellers through
entry increases the difficulty of determining a cooperative agreement.[6]

Entry also decreases the ability to effectively enforce any col-
lective agreement. As the number of firms expands, "chiselers" will be
more difficult to detect. When violations of an accord are facilitated
and not readily detected, they may flourish.[7] Other firms party to the
industry may find that the difference between their profits that result
from industry cooperation and their contributions to the control of
industry supply is in fact negative unless the group has effective moni-
toring methods and disciplinary sanctions. But as the number of firms
increase, methods to detect cheaters must become more sophisticated
consequently increasing policing costs and reducing the returns from
collusive action.

Entry, therefore, exacerbates the problems associated with coordinating and enforcing output restrictions.

Productive Efficiency

Consideration of the role entry plays in improving the standard of industrial performance cannot be deemed complete after reaching conclusions concerning only the allocative effects resulting from a noncompetitive pricing program.

Restrictions on entry in any particular industry may allow firms within that industry to incur excessive costs. As the vigor of competition is reduced, management may relax cost controls and even tolerate what has become known as "X-inefficiency."[8] These higher costs may accrue due to excessive staffing, lavish office accommodations,[9] generous labor contracts,[10] and relaxed monitoring of the degree and quality of work.[11] The welfare loss attributable to x-inefficiency may be at least as significant as the losses that accrued due to resource misallocation.[12]

Wasteful use of resources may also be realized as firms attempt to create, protect, and extend monopoly power. This variety of expenditures includes the financing of reserve productive capacity, excessive product promotion, and political lobbying efforts.[13] No social utility is gained from any of the inputs consumed in efforts to capture market power. While these efforts may or may not succeed, each case must be counted as a loss to society.

Entry, by increasing the pressure on profit margins, will decrease the ability of firms to have deficient cost controls and to incur

monopoly promoting expenses. Severe competition may even induce cost reductions.[14]

Dynamic Efficiency

Even though imperfectly competitive markets have been shown to violate certain necessary conditions for static economic efficiency, we have yet to consider the elements concerned with dynamic performance. This section is concerned with the relationship between technological advances and competition.

Technological advances occur in three dimensions: invention, innovation, and diffusion. Entry has an impact on each of these phases.

Arguments concerned with the relationship between inventive activity and entry take one of two divergent paths. One proposal suggests a direct correlation between the probability of successful invention and the extent of rivalry in the industry. Increasing the number of independent centers of initiative enhances the range of approaches to invention. Entry therefore increases the number of situations where a new or non-conforming discovery may result.[15]

The Schumpeterian hypothesis claims, on the other hand, that inventive activity is motivated by the prospect of acquiring and maintaining monopoly profits. Furthermore, the hypothesis states that the greater the monopoly power the more accelerated is a firm's inventive activity.[16] Schumpeter's theory incorporates entry as a form of "creative destruction," but emphasizes that if entry is too rapid, profits are dissipated and inventive activity may be retarded.[17]

Although the existence of monopoly may speed the rate of inventive activity, it may also reduce the rate of adoption and implementation of

any invention. A monopolist may tend to delay innovation because he has a vested interest in the current technology and may want to permit full depreciation of existing equipment before introducing a new invention. Such delays are apt to be extended the more secure the firm's excess profits.[18] A statement by Scherer, reinforced by Loury, claims that increased rivalry may reduce a firm's incentive for invention but will lead to an increased probability that an innovation will be introduced at a future date.[19] A firm facing competition is more apt to immediately press its advantage in hopes of capturing customers away from other sellers. Fellner furthers this line of reasoning emphasizing that entry may be the very act needed to ensure the adoption of an invention.[20] Evidence from a number of case studies confirms this point.

Investigations of individual innovations find the rate of diffusion to be more rapid in competitive settings and when encouraged by entry.[21]

In sum, analysis of the relationship between dynamic efficiency and entry indicates some degree of market power may increase R & D effort but that entry tends to promote adoption and imitation of inventions. Therefore entry, on balance, is thought to improve the progressive nature of the firms in the economy.

Income-Wealth Distribution

Due to an inability to analyze interpersonal utility, economists have generally been reluctant to evaluate distributional issues. Consequently this section will only outline, not judge, the ways in which restricted entry affects income and wealth distribution in the U.S.

Excess profits resulting from market power indicate a flow of income from the average consumer to the owners, primarily stockholders,

of the firm(s). Because the wealthiest 6 percent of individuals in the country own more than 72 percent of all corporate securities, such transfers of income are to the relatively rich.[22] Additional income transfers to the affluent may arise in the form of generous compensation to corporate executives.[23]

The redistribution of wealth parallels the redistribution of income. Wealth is created in the process of capitalizing abnormal returns into the market value of the firm. Wealth is directed away from the consuming public to the original owners of the firm. A model made to measure this distributive effect has found it considerable. Comanor and Smiley found that in the absence of market power the share of the wealthiest 2.4 percent of total households would decline by nearly 50 percent. Additional results indicate that the relative wealth position of 93 percent of the households in the country would be improved.[24] In conclusion, we find that serious questions concerning equity conditions will arise when entry restrictions allow market power to exist.

Conclusion

The analysis of this chapter establishes that when entry is restricted in any industry in the economy, welfare losses arise. A relevant question to ask is -- how important are such welfare losses?

Any attempt to quantify welfare losses must serve as a rough approximation due to the dearth of statistical data able to be used directly for this purpose. Arnold Harberger made an imaginative attempt to determine the order of magnitude involved for the U.S. economy.[25] Using data for the years 1924 - 1928 Harberger concluded that the welfare loss due to monopoly was less than .1 of 1 percent of GNP. Stigler

remarked that: "If this estimate is correct economists might serve a more useful purpose if they fought fires or termites instead of monopoly."[26] However he went on to add that there were a number of reasons for believing the estimate was too low. A fundamental criticism of Harberger's evaluation is that it accounts for, at best, allocative inefficiency.[27] Subsequent studies attempting to refine the measurement of allocative inefficiency and to include other facets of monopoly inefficiency found results ranging from 1 to 10 percent of GNP.[28] One study, using a unique approach based on the concept of monopoly capital, calculated the aggregate loss to near or even above 50 percent of GNP.[29] Clearly, no resolution on the extent of inefficiency in the economy has been made.

Even if the aggregate welfare loss attributable to monopoly is small, losses may be high in individual industries. A study by Siegfried and Tiemann measured the total welfare loss in the U.S. in 1963 and found results comparable to Harberger's initial estimate.[30] The significant finding of this study was that 67 percent of this loss could be attributed to five industries, with the automobile industry alone accounting for 44 percent of the total loss.[31] It therefore seems prudent to continue to devote attention to the conditions and activities affecting entry.

In summary, the net effect of entry is to revive competition in industries in which market power exists thereby promoting allocative and productive efficiency, stimulating adoption and diffusion of inventions, and advancing an equitable distribution of income.

Does actual entry alter the behavior and performance of an industry as theory suggests? If not, what factors inhibit its functioning? Are

these factors inherent to an industry's structure or are they manipuable by the incumbent firms in an industry? It is these and other questions to which this study now turns.

NOTES

CHAPTER ONE

[1]See for example: William Baumol, Elizabeth Bailey and R.D. Willig, "Weak Invisible Hand Theorems on Pricing and Entry in a Multiproduct Natural Monopoly," American Economic Review 67(June 1977): 350-365.

[2]Stated another way, the higher prices violate a basic condition for Pareto Optimality. The ratio of prices between goods is no longer equal to the marginal rate of substitution. Misallocation of resources and a deadweight loss to society directly follows.

[3]The following discussion finds its roots in: J.B. Clark, Essentials of Economic Theory (New York: MacMillan, 1907). The geometric analysis is similar to that utilized by William Shepherd in his book The Economics of Industrial Organization (Englewood Cliffs, N.J.: Prentice-Hall, 1979), pp. 288-289.

[4]Existence of conditions which prevent a complete response to the excess profits and/or which delay the intrusion of new competition will reduce the elasticity of the demand curve (i.e., the elasticity will be finite above MC). In such cases all allocative inefficiency may not be neutralized. Even so the welfare loss is diminished when entry occurs than when entry is completely blockaded. See, Raymond DeBondt, "On the Effects of Retarded Entry," European Economic Review 8(August 1977): 361-371 and Raymond DeBondt, "Limit Pricing, Uncertain Entry, and Entry Lag," Econometrica 44(September 1976): 939-946.

[5]Note the analysis in F.M. Scherer, Industrial Market Structure and Economic Performance (Chicago: Rand McNally College Publishing Co., 1980), p. 200.

[6]Disagreements in communications may be derived from cost asymmetries of the engaged parties. R.L. Bishop discusses this point in "Duopoly: Collusion or Warfare?" American Economic Review 50(December 1960): 933-961.

[7]See George J. Stigler, "A Theory of Oligopoly," Journal of Political Economy 72(February 1967): 44-61.

[8]S
Efficienc
372-415 a
Press, 19

[9]
Williams
Cliffs,

10
(Boston

1
the Fir

of Tar
1967)
Regul

monop
signi
Prime
Revie

Remna

(New

pp. 83
of exi
comple
positi

Profits
Statist

1
Under R
374 and
of Econ

[8]See the works of Harvey Leibenstein, primarily "Allocative Efficiency vs. X-Efficiency," American Economic Review 56(June 1966): 372-415 and Beyond Economic Man (Cambridge, Mass.: Harvard University Press, 1976).

[9]Leibenstein, Beyond Economic Man, pp. 29-46 and Oliver Williamson, Corporate Control and Business Behavior (Englewood Cliffs, N.J.: Prentice Hall, Inc., 1970), pp. 41-88.

[10]John Kenneth Galbraith, Economics and the Public Purpose (Boston: Houghton Mifflin Co., 1973), pp. 186-187.

[11]Harvey Leibenstein, "Aspects of the X-Efficiency Theory of the Firm," The Bell Journal of Economics 6(Autumn 1975): 580-606.

[12]See Leibenstein, "Allocative Efficiency."

[13]Examples of this view are: Cordon Tullock, "The Welfare Costs of Tariffs, Monopolies, and Theft," Western Economic Journal 5(June 1967): 224-232 and Richard Posner, "The Social Costs of Monopoly and Regulation," Journal of Political Economy 83(August 1975): 807-827.

[14]A study which compared the productive efficiency of complete monopolies versus duopolies in electrical utilities found costs to be significantly lower where some competition existed. See Walter J. Primeaux, "An Assessment of X-Efficiency Gained Through Competition," Review of Economics and Statistics 59(February 1977): 105-108.

[15]Sidney G. Winter, "Satisficing, Selection, and the Innovating Remnant," Quarterly Journal of Economics 85(May 1971): 237-261.

[16]See Joseph Schumpeter, Capitalism, Socialism, and Democracy (New York: Harper, 1942).

[17]Schumpeter in Capitalism, Socialism, and Democracy, especially pp. 83-106, states that growth should be achieved through replacement of existing products or processes by improved ones. This is to be completed by having successive monopolists, each having attained its position through inventive and innovative activity.

[18]Morton Kamien and Nancy Schwartz, "Potential Rivalry, Monopoly Profits, and the Pace of Inventive Activity," Review of Economics and Statistics 45(October 1978): 547-557.

[19]See F.M. Scherer, "Research and Development Resource Allocation Under Rivalry," Quarterly Journal of Economics 81(August 1967): 359-374 and Glenn Loury, "Market Structure and Innovation," Quarterly Journal of Economics 93(August 1979): 395-410.

[20]William Fellner, "The Influence of Market Structure on Technological Progress," Quarterly Journal of Economics 65(November 1951): 560-567.

[21]Quantitative analyses include Edwin Mansfield, "Technological Change and the Rate of Imitation," Econometrica 29(October 1961): 741-766 and Anthony Romeo, "Interindustry and Interfirm Differences in the Rate of Diffusion of an Innovation," Review of Economics and Statistics 57(August 1975): 311-319.

[22]Scherer, Industrial Market Structure, p. 472.

[23]Oliver Williamson, "Managerial Discretion and Business Behavior," American Economic Review 53(December 1963): 1040-1047.

[24]William Comanor and Robert Smiley, "Monopoly and the Distribution of Wealth," Quarterly Journal of Economics 89(May 1971): 327-336.

[25]Arnold Harberger, "Monopoly and Resource Allocation," American Economic Review 44(May 1954): 77-87.

[26]George Stigler, "The Statistics of Monopoly and Merger," Journal of Political Economy 4(February 1956): 33-35.

[27]One of the most sophisticated critiques of Harberger's analysis is that of Abram Bergson, "On Monopoly Welfare Losses," American Economic Review 63(December 1973): 853-870.

[28]Leibenstein in "Allocative versus X-Efficiency" finds productive efficiencies ranging around 10 percent of costs. For an analysis of aggregate loss see Keith Cowling and Dennis Mueller, "The Social Costs of Monopoly Power," Economic Journal 88(December 1978): 724-748.

[29]Joseph Phillips, "Estimating the Economic Surplus," an appendix in Paul Baran and Paul Sweezy, Monopoly Capital (New York: Monthly Review Press, 1966).

[30]John Siegfried and Thomas Tiemann, "The Welfare Cost of Monopoly: An Inter-Industry Analysis," Economic Inquiry 12(June 1974): 190-202.

[31]The other industries accounting for the major portion of the welfare loss are plastic materials and synthetics, petroleum refining, computers, and drugs.

CHAPTER TWO

Entry Barriers and Entry

The theory of limit pricing has given rise to the concept entry barrier, a differential advantage established firms have over their potential competitors, and the tacit acceptance that entry barriers do indeed deter entry. Specific entry barriers such as scale economies, capital requirements, and advertising intensity have been given widespread attention by economists, yet to date, strategic barriers have been omitted from empirical consideration. Profitability-market structure studies attempting to examine the effects of entry barriers have neglected to examine the entry-entry barrier relationship directly. Rather their inquiries have relied on the implied entry-entry barrier relationship inherent in the limit pricing theory. Their findings, interesting as they may be, fail to discern specific entry-entry barrier relationships but instead provide insight into a number of peripheral questions. Studies which have attempted to directly study the ability of entry barriers to deter entry by entering these hypothesized barriers directly into equations explaining the extent of entry, have been beset by faulty entry measures and the exclusion of specific responses to entry by going concerns. To date, no study has adequately dealt with the question of entry barriers and strategic barriers and their ability to deter entry.

15

LIMIT PRICING AND ENTRY BARRIERS

Early limit price theorists implicitly restricted their analyses to situations in which economies of scale relative to total market size were assumed to be negligible and potential entrants were assumed to be at no absolute disadvantage in relation to their established counterparts. In such situations, the limit price -- the highest established firms could charge without inducing entry -- was equal to the competitive price.[1]

The theory of limit pricing was subsequently advanced by Bain to include and revolve around the concept barrier to entry.[2] An entry barrier is a specific industry condition or characteristic which creates a cost disadvantage for potential entrants. The cost differential, between incumbent firms and prospective entrants, enables the incumbent firms in certain industries to capture abnormal profits because even at higher prices the elevated costs experienced by entrants prevent them from securing normal profits.

Bain defined the margin by which established firms can maintain price above the competitive level as the "condition of entry." Specifically

$$E_C = (P_L - P_C)/P_C$$

where

E_C = the condition of entry,
E_L = the maximum price that can be charged without allowing profitable entry (the limit price),
P_C = the competitive price; P_C = LAC = the minimum technological cost of established firms.

Solving for P_L we find

$$P_L = P_C \ (1+E_C)$$

which explicitly demonstrates that the condition of entry (E_c) is the maximum premium accruing to established firms without inducing entry.

Bain contended that the entry condition was an increasing function of barriers to entry prevailing in the industry in question. He distinguished three such barriers: 1) absolute cost advantages; 2) economies of scale; and 3) product differentiation. A detailed examination of each reveals how the cost differentials arise.

Absolute Cost Advantages

The reasons for an existing firm incurring costs less than those to be experienced by a potential entrant at any comparable level of output are termed absolute cost advantages. For example the availability of inputs, whether due to nearness in location, purity of a lode, or control over access, can alter acquisition costs for any level of output.

Patents represent another absolute cost advantage. No entrant may introduce a product that is identical to a patented product. Patents, in preventing access to and utilization of a unique technique, force entrants to use alternative processes which may be less efficient and more costly.

The required capital needed to accomplish entry may in itself deter entry. New firms have no past credit rating or acquired reputation that an established firm may possess. Because investors lack complete information about their capabilities, the newcomer is afforded less accessibility to borrowed funds. When funds are obtained, entrants are apt to pay a risk premium in the form of a higher interest rate. Entrants will be more hampered the greater the required initial investment for viable entry. More capital is needed as economies of scale warrant a

larger, in absolute size, minimum efficient plant.[3] Capital require-
ments is, then another absolute cost disadvantage.

A portrayal of the limit pricing situation where an established
firm holds an absolute cost advantage over a potential rival is depicted
in Figure 2.1. The cost curves of the prospective entrant and a dom-
inant firm are labelled LAC_e and LAC_f respectively. The demand expe-
rienced by the dominant firm is DD. The demand conditions to be expe-
rienced by the potential entrant depend on the entrant's assumption
about how the current producer(s) will react to entry. Usually a
potential entrant's behavior is analyzed by using Sylos Postulate, the
assumption that existing producers will maintain their pre-entry output.
Given this assumption, the demand curve facing the potential newcomer
is the segment of the market demand curve to the right of the pre-entry
level of output.[4] See Figure 2.2. If this residual demand curve rests
above the entrant's cost curve at any positive level of output, entry
will occur.

The relationship between absolute cost advantages and limit price
hinges upon the use of Sylos Postulate. Is this the policy that estab-
lished firms will adopt? Although current policies may be regarded as
some sort of statement of the firm's future policy after entry, no a
priori reason exists so as to believe this policy will continue when
firms are faced with actual entry. The price that the entrants' product
will attract -- the post-entry price -- is a function of the contri-
bution in output of the entrant and the output response of the incum-
bents. That response could consist of an accommodating output with-
drawal or a hostile output expansion which would be better or worsen,

19
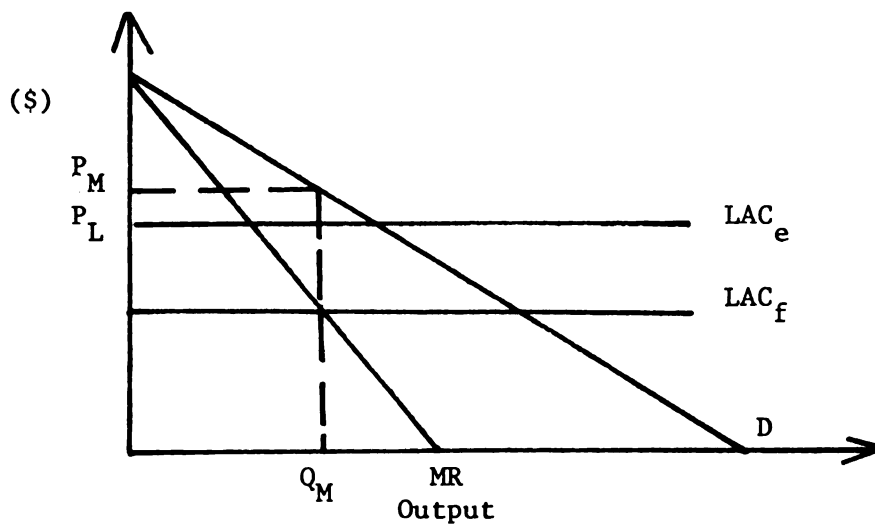
Figure 2.1   Absolute Cost Advantage and its
Consequences for the Limit Price
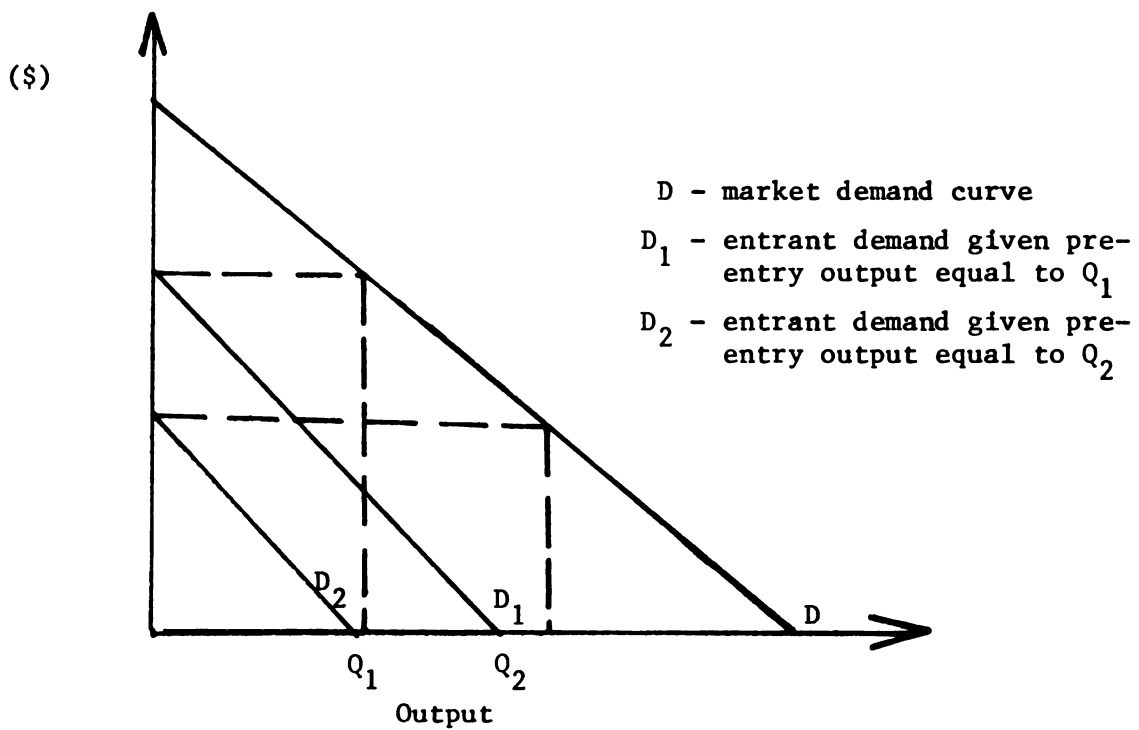
Figure 2.2   A Potential Entrant's Expected Demand Curve

respectively, the condition of entry assumed under Sylos Postulate. By ignoring these responses, the limit pricing model ignores the oligopolistic interdependence between established firms and potential entrants it seeks to explain.

Economies of Scale

The presence of economies of scale, while lowering costs, may provide a substantial barrier to entry. The larger the plant at which scale economies are exhausted, the larger the market share an entrant must capture to produce at minimum costs. But the greater the market share the entrant must necessarily meet, the greater the price decline in the entered market. A lower expected post-entry price given any pre-entry price will lower expected profits of entry making such a course of action less attractive.

If significant scale economies exist, the prospective entrant may contemplate entering the industry with a suboptimal size plant. In so doing the firm would incur per unit costs higher than those of an established firm exploiting all available economies. The cost differential will be exacerbated the steeper the LAC curve. As a result, economies of scale may have a significant impact on the limit price.

The precise relationship between scale economies and the limit price as introduced by Modigliani is as follows:[5]

$$P_L = P_C \left[(1+\bar{X})/(X_C N) \right]$$

where

P_L = the limit price,
P_C = competitive price,
$\bar{X}$ = output of a minimum efficient size plant,
X_C = competitive output or alternatively the size of the market,
N = price elasticity of market demand.

This relationship is represented in Figure 2.3.[6] Given the cost and demand conditions, LAC and DD respectively, an incumbent firm is able to sell quantity X_L without inducing entry. If an entrant offers the additional output $\overline{X}$, the minimum able to be produced optimally, total industry output will equal the competitive output X_C and post-entry price will equal the competitive price P_C. Consequently economic profits are unavailable to the prospective entrant. The larger the minimum optimal scale the higher that both the limit and corresponding profits may be without encouraging new competition.
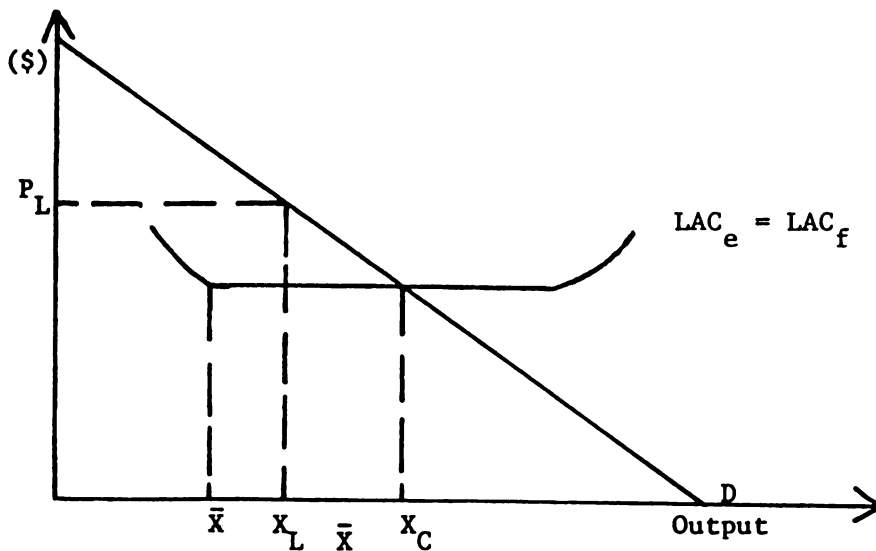
Figure 2.3   Scale Economies and Limit Price

Product Differentiation

Products are differentiated when a firm's product is preferred over competing products at a given price due to either real or perceived differences in the products. Advertising and other selling activities aim

at intensifying these differences. Cumulatively these activities may result in brand loyalties, the preference of buyers to purchase the product of an established firm. In addition, when products are complex consumers are more ready to depend on product reputation, an attitude favoring established firms that have brands already established as household words. To surmount the goodwill surrounding existing products, the newcomer must incur promotional costs greater than that of the incumbent.[7]

The strength of product differentiation as an entry barrier depends on many factors. A few of the most important are: 1) "conspicuous consumption" -- the prestige accorded some existing firms' products; 2) the complexity of the product -- the more complex the more a buyer relies on information from previous purchasers and their successes; and 3) the size of advertising expenditures required to establish goodwill for a new product.[8]

The magnitude of these costs is of particular importance. Studies of advertising expenditures in the cigarette industry indicate that the costs run four to five times more for new brands entering the market than for established brands.[9] Testimony in the Proctor and Gamble-Clorox merger case indicate that P & G felt the entry barrier to be so high in the liquid bleach marekt that the only economical way P & G could enter the market and obtain a sufficient market share was through the purchase of Clorox.[10]

Strategies in the Limit Pricing Framework

The strategy of limit pricing as developed by Bain and Modigliani permitted existing firms to opt for one of two pricing policies. One

option was to price at the short run monopoly maximizing level, permit
entry and face a reduction in market share. The alternative was to
adopt the limit price, forestall all entry and capture the profits
obtainable due to the difference between the limit price and the com-
petitive price. In Figure 2.3 that price is P_L.[11] The former choice
permits higher short-run profits but the precise level of future gains
is uncertain since the precise rate at which entry penetrates the market
is indeterminate. Existing firms must therefore compare the present
discounted value of the certain and persistent profits associated with
limit pricing to the present discounted value of the profits from the
"gamble" alternative, choosing the scheme yielding the greatest return.

The dichotomous pricing strategy is based on the assumption that
the condition of entry is constant over time. As described by Bain,
"it is definitely posited -- on the basis of extensive empirical inves-
tigation -- that the condition of entry, as defined, and its ultimate
determinants are usually stable and slowly changing through time."[12]
However, existing firms have a number of alternative ways to deter
entry, including the use of excess capacity and liquidity reserves. The
result is that some barriers are significantly endogenous and are able
to be manipulated by established firms in order to alter the structural
entry conditions. The implication is that an analysis of the expected
responses of established firms to entry is required to explain entry
behavior.

Bhagwati, by incorporating growth into the limit pricing model, was
able to make the initial demonstration of the inadequacies of the dichot-
omous pricing choice of previous limit pricing models.[13] If demand grows

by the proportion 'λ' of which 'K' percent accrues to the entrant, and if Kλ exceeds the minimum optimal scale, ($\overline{X}$), prevention of entry is impossible by a pricing policy alone. In Bhagwati's words, "the theoretical problem thus shifts from an entry preventing price to a formal analysis of the non-price factors which determine the share of the existing firm in a growing market and the ways in which these are within the range of influence of these firms."[14]

Realizing the incompleteness of the Bain-Modigliani limit pricing choice, economists have attempted to refine the limit pricing model. Recent extensions of the limit pricing idea have permitted the opportunity to choose a trajectory of prices over time rather than a particular limit price and have introduced concepts of entry uncertainty, the recognition that entry takes time and will occur at different rates depending on expected profits. Important as these refined models are, they continue to fundamentally disregard the influences of endogenous entry barriers.

For example, using optimal control theory Gaskins formulated a limit pricing model which enabled him to demonstrate that the optimal policy for a firm facing entry was to choose a price path rather than to engage in discrete price changes.[15] Additionally, Gaskins concluded that the optimal equilibrium price will always be below the short run profit maximizing price and above the entry forestalling price.

The latter of these two conclusions is sensitive to the assumption denoting who is to receive the benefits of demand growth. Gaskins uses the restrictive hypothesis that all increases in demand are absorbed by the incumbent firm. If this assumption is relaxed, allowing only a share of total demand growth to accrue to the established firm, the

dominant firm's long run price must fall to the entry forestalling level.[16] It has been suggested that "once the rate of entry does not depend exclusively on a price policy but simultaneously on other policies of the dominant firm," then the firm will ultimately be able to charge a higher long run price.[17] Modifying Gaskins' model by including a strategy to purchase certain newcomers to the industry, Jacquemin and Thisse found that a dominant firm would claim higher long run profits than if a pricing policy alone were used.[18] This finding indicates that the conduct of a firm can influence the structure of the industry through its effects on entrant behavior, and consequently that non-price factors play an important role in entrant behavior.

Kamien and Schwartz extended the dynamic theory of limit pricing to a probablistic framework.[19] Existing firms are concerned with an optimal pre-entry price, one that will maximize discounted expected profits while being constrained by the uncertainty as to when new rivals will appear. They conclude that the optimal pre-entry price typically lies below the short run monopoly price but above the limit price. Including risk preferences in this particular model, Baron found that increasing risk aversion leads to a lower pre-entry price.[20] If the incumbent firm, considering the risk of entry, undertook an investment program designed for the contingency of entry, entry risk may be reduced and the long run profits of the firm enhanced. Therefore the feedback from conduct to structure must be considered when established firms design a strategy to counter potential entry.

Strategic Barriers

A critical element in determining profitability of an entrant in the response incumbent firms will be expected to make as new firms attempt to penetrate their markets. In the preceding discussion entry was predicted whenever pre-entry price was high enough to offset the potential entrant's cost disadvantage. This conclusion was based on the assumption that established firms would react to entry in a possibly irrational fashion by continuing production of their pre-entry output and depending on the questionable presence of effective barriers to entry. In atomistic markets an individual producer will by definition have no noticeable effect on other producers; therefore we may expect entry not to provoke reaction by incumbent firms. In oligopolistic industries established firms are definitionally aware of and affected by actions of other firms and may be expected to react to entry. If the reactions of the going firms include anything from price wars to accommodation then the knowledge of the existence of entry barriers does not tell us where the entry forestalling price will be unless we know the reaction to entry assumed by the entrant.

The response expected by entrants hinges on the preparedness of the established firms for the contingency of entry. Aggressive action and an aggressive image are more likely when provisions have been made in the pre-entry period and are specifically designed to counter the thrust of a new firm. Aggressive ability is important in that if current producers are incapable of injuring an entrant, the threat of retaliation is no longer credible. "An investment analysis therefore clarifies incumbent firms' conduct toward potential and actual entrants."[21]

Retaliatory capability may be reflected by investments in reserve productive capacity.[22] Holding excess capacity in the pre-entry period enables an incumbent firm, when threatened by entry, to expand output and reduce the residual demand curve facing the potential entrant. If the post-entry residual demand lies below the entrant's anticipated costs the entrant is deprived of a profitable return in the particular industry. Investment into reserve capacity may not necessitate its use. Once in place excess capacity presents a credible price war threat which potential entrants may not wish to challenge. Therefore the potential foreclosure of entrants' post-entry profit opportunities also deters entry.

Retaliatory capability may also be expressed in the large holdings of liquid assets. Ample cash reserves enhance the ability of engaging in a price war. These funds may be used to finance the costs of expanding output, particularly if the use of excess capacity entails operating on the rising part of the firm's average total cost curve.[23] The funds may also be used to alleviate any risk of default on prior obligations during a sustained price war. Only if an entrant builds an equivalent cash reserve will he be able to stand toe-to-toe with the established firm.[24] This additional capital requirement represents an additional absolute cost disadvantage for the potential entrant and as such is an additional deterrent to entry.

Retaliation and reduction of entry may also result from expanded investment into advertising thus solidifying the loyalty consumers have for the established brand(s).[25] The potential entrant is therefore hampered either by increased penetration costs or disadvantages associated with economies of scale in advertising, or both. The damage may

be most acute when the extended advertising program of the established firms is directed toward a specific entrant. Anticipating such a reaction from Kodak, DuPont opted not to enter the color film market.[26]

Each of the investments highlighted above, whether used individually or concurrently, signal to the potential entrant that retaliation is possible upon entry into the industry. The acquired aggressive image of the established firms alters the expectations of the potential entrants resulting in an increase in entry deterrence and consequently a higher limit price.

To aid in the clarification of the effect of strategic barriers to entry consider Figure 2.6. Given the cost differentials between an existing firm (LAC_f) and potential entrants (LAC_e) and the industry demand curve DD, the traditional limit price is P_L. Assume that the established firm maintains excess capacity which may be translated into ($X_L - X_1$) units of output. In this case the established firm can maintain a pre-entry price of P_1 without inducing entry if potential entrants anticipate that the established firm will engage its excess capacity when faced by entry. Consequently, the investment into the strategic barrier excess capacity has permitted the established firm to adopt a pre-entry price higher than would be predicted by the traditional limit pricing model.

The influence of strategic barriers on pricing behavior may be extended to a probabilistic framework. Referring to Figure 2.7, the traditional limit price is P_L. In a world of certainty, without strategic barriers, entry would occur at any price greater than P_L. However, a shroud of indeterminancy often surrounds the entry decision.
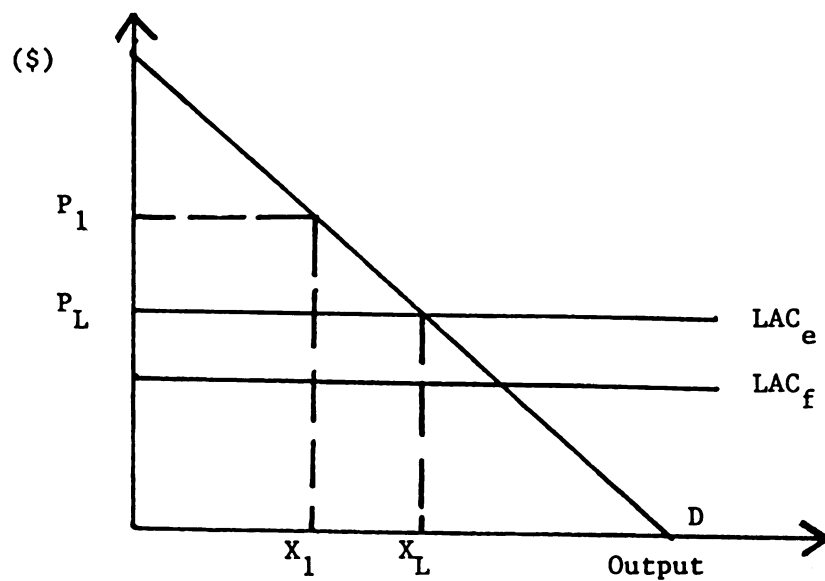
Figure 2.6   Strategic Entry Barriers and Limit Price
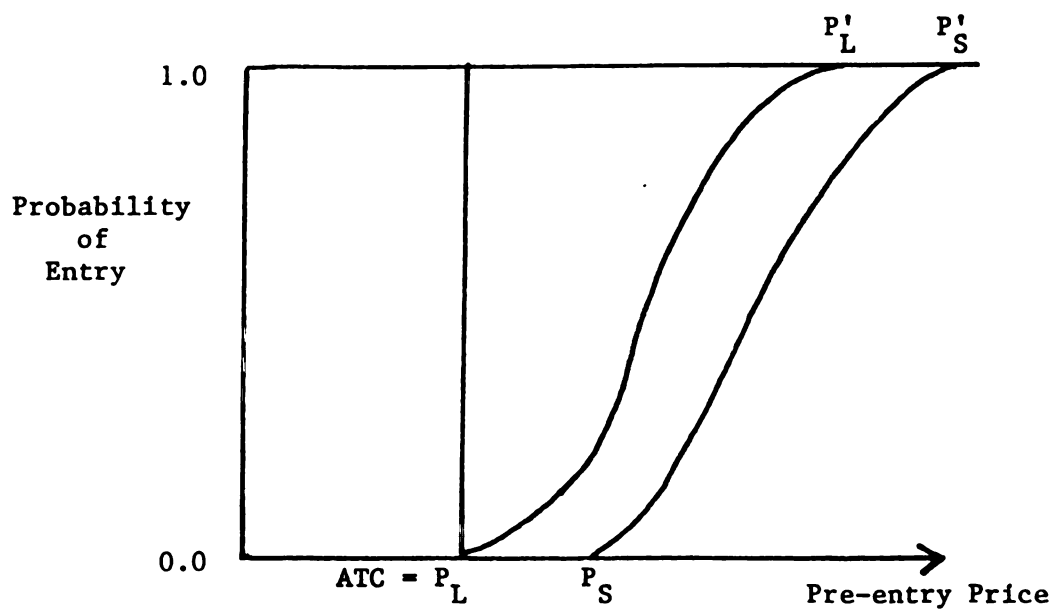
Figure 2.7   Strategic Entry Barriers and the Probability of Entry

Independent of strategic barriers, the entry decision depends on a number of factors including the behavior of other potential entrants, the resources available to the entrant, and projected production costs. Each of these factors affect the probability that an entrant will meet with failure. Consequently, at any given pre-entry price there is some risk to enter an industry. However as pre-entry price moves to levels higher than and farther from P_L, subjective entry risk is reduced and entry is more likely to occur. The probability of entry at various price levels is represented by $P_L P_L'$.

Investments into strategic entry barriers increase the risk of entry. Resources well equipped for retaliation represent the ability of established firms to reduce the post-entry prospects for a potential entrant at any pre-entry price. This results in a reduction in the likelihood of entry at all pre-entry price levels. Established firms now expect to be able to charge a pre-entry price, P_S, without including entry.

Retaliatory capability investments have reduced the likelihood of entry making $P_S P_S'$ the relevant probability relationship between the likelihood of entry and any given pre-entry price. The horizontal difference between $P_L P_L'$ and $P_S P_S'$ can be described as the extent (height) of strategic barriers to entry. This analysis points out that pre-entry pricing need not be as low as traditional limit pricing theory suggests.

To summarize, the earliest models of limit pricing permitted firms to price to either maximize short run profits or to forestall all entry. Subsequent pricing models found intermediate strategies to be more profitable for the firm. Essentially, each of these models may be

criticized for ignoring the response to entry by existing firms. This
is especially important since the expected profits of an entrant are a
function of the actual (or expected) response made by the incumbent
firms. The particular response anticipated by a potential entrant is
manipuable by the incumbent firms. Certain investments make credible
the threat of price warfare and are brandished to deter entry. In
deterring entry these strategic investments allow existing firms to
capture higher profits than would be captured given only a pricing
policy.

EMPIRICAL ANALYSIS OF THE ROLE OF ENTRY BARRIERS

Profit-Market Structure Studies

The limit pricing model implies a direct correlation between prof-
itability and entry barriers based on the hypothesis that if barriers
to entry exist, firms are able to price above cost and earn economic
profits without inducing entry. Consequently, most empirical studies
of the role of entry barriers have focused on the relationship between
profitability and structural variables considered to be entry barriers.
However, without a concomitant entry equation the profit-market structure
specification makes it difficult to form reliable conclusions concerning
the ability of "Bainian" or structural entry barriers to deter entry.
If high profits were found to coincide with high levels of an entry
barrier, this result could be interpreted as indicating that the tradi-
tional entry barrier does truly deter entry only if the analyst tacitly
accepts and relies on the limit pricing hypothesis. Indeed, profit-
ability-market structure studies, the most common empirical study of
entry barriers, have tacitly accepted and relied on this assumption,

therefore their conclusions on the role of entry barriers must be re-garded with skepticism.

Although profit-market structure studies are unable to discern specific entry barrier-entry relationships, this specification has pro-vided insight into a number of peripheral questions. These include the effect of intra-industry competition on profits, the combined entry de-terring and entry independent effects of entry barriers on profitability, the effects of industry growth on profit levels, and less satisfactorily, the effect of new competition on industry performance.

A representative and comprehensive study of the profit-market structure genre is that done by Comanor and Wilson.[27] Seeking to explain inter-industry variability in profit rates by differences in seller concentration, market growth, and hypothesized entry barriers -- capital requirements, economies of scale, and advertising intensity -- the Comanor and Wilson study formed the basis of subsequent empirical work.[28] They found that increases in seller concentration and rapid industry growth increased profit levels. Furthermore, they found each of the entry barriers identified by Bain to be positively related to profits. On the basis of this evidence, they concluded that each of the hypothesized barriers prevented market penetration by new competitors.

Even though the positive correlation between the hypothesized barriers and profitability seems to indicate that structural entry barriers insulate established firms from entry and thus enables them to increase their profits, questions still arise as to whether a strong positive relationship between specific barriers and profits may exist even in the absence of the barrier's ability to deter new competitors. Take, for example, the direct association between advertising intensity

and profits found by Comanor and Wilson. Does this result indicate that advertising is an effective barrier to entry, as hypothesized? Advertising expenditures of established firms may result in a cost disadvantage for potential entrants enabling the incumbents to earn economic profits. Advertising may also enhance profits by expanding the demand for the established product(s) through information dissemination.[29] The first described effect of advertising is clearly that assigned to an entry barrier, but the latter need not be. In Comanor and Wilson's study, it may be that both roles for advertising are represented and together amplify the importance of advertising. Consequently, one cannot take for granted that direct correlations between profitability and an assumed entry barrier result only from the entry deterring effects of that barrier.[30]

An alternative approach to capturing the entry barrier-entry relationship is to introduce entry barriers as direct determinants of entry. By focusing on a single functional role of entry barriers, this direct approach will permit more precise conclusions regarding the entry retarding capabilities of specific entry barriers.

This study incorporates this direct approach into a model which simultaneously considers the various elements explaining profitability. Such a treatment permits conclusions about not only the question of whether entry barriers deter entry but also the questions as to whether static entry barriers have an entry independent effect on profits.[31]

Entry Barrier-Entry Studies

All studies to date that have introduced entry barriers as direct determinants of entry are inadequate in that they omit strategic

barriers from the posited entry conditions and/or utilize defective
entry measures. Therefore the derived results of these studies must
also be considered inconclusive.

The purpose of this section is to review the empirical work
adopting an entry barrier-entry specification. Preceding this review,
however, a definition of entry is presented, one consistent with the
theoretical role ascribed to it. Using this definition as a point of
reference, it will be shown why previous measures of entry have been
unsatisfactory.

Theoretically, entry is an influx of capital into an industry in-
troduced by investors in response to high profits in the given industry.
As a result supply is increased, thereby promoting the socially desirable
objectives of lower prices, efficient resource use, and the elimination
of monopoly profits.

In this context entry involves an addition to industry capacity, by
a firm new to the industry, capable of altering industry behavior and
performance. Small scale capacity disturbances need not entail entry
as it is theoretically described. Only intrusions at a scale signif-
icant enough to reduce the demand experienced by each firm and conse-
quently their profit expectations pose a serious competitive challenge.[32]

A variety of forms of "entry" have been considered in the economic
literature: 1) new firm, 2) diversifying firm, 3) foreign firm, and
4) merged firm. Whether any or all of these are included in an economic
definition of entry depends on how the character of competition is
altered during the process of their appearance.

The conception of an entrant as a newly established firm dominates
economic thinking.[33] Clearly the introduction of newly developed

facilities provides an addition to industry capacity and if the addition
is of significant size new firms must be considered entrants. Neverthe-
less, entrants seldom appear as newcomers and are relatively unimportant
as regulators of competition.[34]

Entrants, as a rule, are either adjacent firms extending their prod-
uct lines or foreign firms expanding their markets. In both cases
capacity additions may be made by creating entirely new facilities, or
by switching capacity from production of a different or discontinued
good to the manufacturing of the new product line. The added production
from these sources is capable of altering the demand conditions faced by
the incumbent firms. Therefore both represent pertinent cases of entry.

Well-established firms, such as these, may be the least disadvan-
taged entrants and thus have the most important influence on the per-
formance of an industry. The rate of entry is apt to be more rapid
than that made by a firm building from scratch. Established firms may
also be able to utilize the goodwill associated with the brand names of
their other products in the entered market. Similarly, past reputations
may enhance linkages to the capital market. Consequently, established
firms may be the wielders of countervailing power.[35]

Entry definitions occasionally and incorrectly include entry by
merger. A merger does not increase the number of entrepreneurs within
an industry. In fact any merger between firms in the same market is a
step toward increased concentration.[36] More importantly, "merger entry"
does not necessarily entail additions to industry capacity. Rather it
represents a loss of potential added capacity; the loss of a potential
entrant.[37]

In defense of merger as a form of entry, it has been argued that merging firms may grow significantly faster than firms expanding internally. Rapid expansion may occur through merger when: 1) small acquired firms in toe-hold mergers no longer face critical capital and product differentiation disadvantages, 2) synergistic unions are attained allowing lower per unit costs or more rapid reductions in unit costs, and 3) improved managerial talent and effort are introduced.[38] Contrary to these suppositions, Goldberg found no statistically significant tendency for mergers to increase the market share of the acquired firm.[39] The pre-merger growth rate of the acquired firms appeared to be the determining factor in their post-merger market shares. On the basis of this evidence, mergers do not appear to promote competition.

Mergers can be motivated by elements independent of the condition of entry. Incentives for acquisitions may result from aberrant stock market behavior. At any point in time a firm may be undervalued relative to its potential earnings and therefore susceptible to take-overs. Acquisitions may also be sought in order to create or enhance monopoly power.[40] These motives are quite divergent from those of a "traditional" entrant.[41] Because mergers do not enhance industry competition by augmenting industry productive capacity and because mergers are not significantly influenced by entry conditions entry by merger should be and is excluded from this analysis.

New firms, diversifying firms, and foreign firms that inject substantial new productive capacity into an industry of which they are a new member are included in the economic definition.

The success of entry penetration is most appropriately measured by the market share of entrants. Market share is the operative variable in describing the current and prospective lowering of the leading firm's residual demand curve. Furthermore, market share describes the relative intensity of entry and therefore the degree to which firms are insulated from entry. Finally and importantly, market share is independent of the current market structure of an industry.

The statistical studies specifying structural entry barriers as direct determinants of entry have utilized a number of different measures of the rate of entry, all but one of which are significantly flawed. What follows is a critical analysis of the rate of entry measures, accompanied by a review of the published works incorporating each of the respective computations.

The rate of entry calculated as a percentage change in the number of independent firms operating in an industry suffers a series of short-comings. The measure ignores the intensity of entry by ignoring the size of entering and exiting firms. Such an omission may give perverse results. If the capacity addition of a single large entrant exceeds the loss of capacity due to the exit of a number of small firms, entry would then be inversely related to the number of firms in the market, reversing the usual belief. An additional problem which arises because size is ignored is that a single entrant into a concentrated industry signifies greater market penetration than that of a single entrant into an unconcentrated industry.[42] Therefore there is an inherent relation-ship between the rate of entry and current industry structure regardless of entry conditions.

A second shortcoming that arises when entry is measured using the number of firms in an industry as given in the statistical data available from the Census or IRS is that one of the most prominent modes of actual entry is excluded. Foreign entry is not included since the Census and IRS data is only national in scope. Knowledge of factors affecting actual entry cannot be furthered when these important cases of entry are absent.

Finally, the Census and IRS data do not permit the effects of mergers to be isolated when identifying the number of companies within an industry at any point in time.

Using the percentage definition of entry, Mansfield engaged in one of the first statistical analyses of the determinants of entry.[43] Mansfield examined the rate of entry in four industries -- steel, petroleum, tires, and autos -- hypothesizing that increases in industry profits make entry more attractive and that increases in the capital requirements of a MOS plant make entry more difficult. The regression results confirmed the prior expectations; entry was positively correlated with profitability and indirectly related to capital requirements.

Duetsch also employed a measure of entry defined as the percentage change in the number of firms operating in a market in an investigation of the determinants of entry into 4-digit Census industries for the periods 1958-1963 and 1963-1967.[44] His model consisted of an equation stating that the rate of entry was a function of industry profitability while profitability was determined by industry growth, product promotion, concentration, and diversification. The concentration variable was used in an attempt to explain the probability of incumbent firm reaction to entry; the greater the seller concentration the more likely

entry would elicit an established firm response. The role of the diver-
sification variable was essentially to capture the effect of the stra-
tegic deterrent, liquidity. Increases in diversification are expected
to increase the potential for predatory pricing. Duetsch found the rate
of entry to increase with rapid industry growth, decreased promotional
activity, and reductions in diversification, all as anticipated. How-
ever, contrary to his expectations, Duetsch found concentration to be
directly related to the rate of entry. Duetsch attributed this result
to a desire, on the part of potential entrants, to enter industries where
there were possibilities for collusion and consequently higher profits.

Studies of Canadian industries have used a measure of gross entry
calculated as the average number of new firms beyond a given size that
have appeared in a specific industry in a given period of time. Using
the absolute number of entrants instead of the percentage definition
eliminates the difficulty associated with the initial industry popula-
tion but retains all other shortcomings. The defects include the con-
siderable weight given to small firms, the exclusion of new foreign
rivals and the inability to distinguish entry by merger from new capacity
entry.

Orr, in a cross section study of entry into 71 Canadian manufac-
turing industries, specified a model of entry consisting of two equa-
tions.[45] The first stated that the long run profit rate predicted for
an industry based on the level of entry barriers (a limit profit rate)
was a function of the size of a MOS plant, capital requirements, adver-
tising intensity, research and development intensity, industry risk,
and seller concentration. The second equation declared that the rate
of entry was related to the difference between the past industry profit

rate and the limit profit rate and to the industry growth rate of demand. Orr found that capital requirements, advertising intensity, economies of scale, and concentration were significant barriers to entry, whereas growth provided an incentive for entry.

In utilizing the same measure of entry as Orr, Gorecki classified entrants as specialists or diversifiers, domestic or foreign, in an attempt to ascertain whether or not the entry retarding capability of any specific entry barrier will depend upon the character of the potential entrants.[46] As discussed earlier, certain prospective entrants may be capable of enduring and overcoming many entry barriers. He found that rapid growth in industry demand spurred entry by all classes of entrants. His evidence also indicated that specialist and/or domestic firms were deterred by all hypothesized barriers. On the other hand, no entry barriers were able to thwart entry by either diversifying or foreign firms.

Berry examined entry made by any of the 461 largest U.S. corporations into 4-digit SIC industries. The market share of entrants was calculated "estimating total employment, times 2500, of all plants operated in the 4-digit industries in question in 1965, by firms reporting no plants operated in that industry in 1960, divided by the value of shipments in the industry in 1963."[47] A trio of problems sully this definition: 1) mergers are included, 2) imports are excluded, and 3) a constant output per labor quotient is assumed for all industries. The primary goal of Berry's study was to investigate the relationship between this measure of entry, which primarily measures the degree of diversification, and growth. As expected, increases in the industry

growth rate were found to enhance the rate of entry. An additional re-
sult of some consequence was that there was no significant relationship
between concentration and entry.

Only a single empirically constructed measure of entry has appeared
which is consistent with the economic definition of entry derived here.
Harris measured the market shares of large entrants, domestic and
foreign, over the years 1950-1966.[48] His measure also separated
capacity entry from merger entry.[49] By regressing the rate of entry on
entry barriers, Harris attempted to assess the degree of insulation
barriers to entry provided the firms in 27 4-digit SIC industries. He
found that capital requirements tended to increase the rate of entry
but that advertising intensity and economies of scale do, indeed, repel
incoming firms. However, the factor most powerful in explaining the
extent of entry was pre-entry profitability.

Although the Harris study overcomes the principal flaw found in
most entry studies, the mis-measurement of the degree of entry, his
study remains incomplete because it largely ignores the expected re-
actions of established firms to the appearance of new competitors.[50]
If potential entrants perceive established firms as holders of retal-
iatory capabilities and thus anticipate that these firms will react
aggressively toward entrants, price may exceed cost by more than the
structural barriers alone would seem to warrant. Consequently, by
omitting strategic barriers the previously posited relationships between
entry barriers and the rate of entry have been beset by a misspecified
entry condition.

To capture this conjectural feature facing potential entrants
requires the use of detailed and specific indices of retaliatory

capability. Being aware of the ammunition -- excess capacity and liquid
assets -- held by established firms, potential entrants can make a
judgement as to whether or not the use of the available ammunition is
sufficient to rule out any possibility of profitable investment, given
the industry's structural entry conditions.

A number of earlier studies have used seller concentration as a
proxy for the anticipated reactions of established firms. The hypothesis
behind the use of the concentration ratio is that optimal action by a
group of firms facing potential entry necessitates strong collusion be-
tween the dominant firms in the industry, and a prerequisite for suc-
cessful parallel behavior is a relatively concentrated industry. The
results arising from the use of the concentration ratio were mixed and,
at times, contradictory. One reason for the ambiquity in these results
may stem from the inability of this variable to indicate resources avail-
able for retaliatory purposes. Certainly some relatively high level of
concentration may be needed before interdependence between incumbents
and newcomers is realized, but a hostile response directed towards a
newcomer is only feasible when the established firms have prepared in
advance for such a contingency.[51] Therefore, direct measures of excess
capacity and liquidity obviate the need for using an indirect and general
measure such as concentration.

SUMMARY

A review of the limit pricing model has shown that to accurately
depict the condition of entry, strategic entry barriers must necessarily
be included. A direct examination of the entry barrier-entry relation-
ship is a valuable tool in determining the deterrent capabilities of

strategic as well as structural entry barriers. Once the impact of entry barriers on entry is determined, it is then possible to conclude whether previous positive correlations between profit and structural entry barriers did result from the barriers' deterring effect as is usually concluded, or whether these positive correlations arose from effects independent of any entry barrier-entry relationship. In the next chapter, a theoretical framework is constructed which, when analyzed empirically, will provide additional evidence and insight into both the entry-entry barrier relationship and the profitability-entry-entry barrier relationship discussed above.

NOTES

CHAPTER TWO

[1]For example refer to: Nicholas Kaldor, "Market Imperfections and Excess Capacity," Economica 2(February 1935): 33-50.

[2]Joe S. Bain, Barriers to New Competition (Cambridge, Mass.: Harvard University Press, 1956).

[3]Mansfield, "Entry, Gibrat's Law, Innovation, and the Growth of Firms," American Economic Review 52(December 1962): 1020-1030, presents evidence that the rate of entry is inversely related to the absolute cost of providing capital for a plant of minimum efficient scale.

[4]The assumption was developed by Bain, Barriers, and independently by Paolo Sylos-Labini in Oligopoly and Technical Progress (Cambridge, Mass.: Harvard University Press, 1962). Both Bain and Sylos-Labini emphasize that this assumption represents the most probable response of established firms. Bain further contends that this assumption of output maintenance is justified because an "entrant is likely to read the current policies of the established firms as some sort of statement of future intentions regarding their policies after entry has occurred." However, it is too much to expect that established firms will lie idle as new firms reshape the economic environment within which decisions by established firms are made. Consequently, no apriori reason yet exists that declares Sylos Postulate to be a better assumption than either agressive output increases or entry accommodating output decreases.

[5]Frances Modigliani, "New Developments on the Oligopoly Front," Journal of Political Economy 66(June 1958): 215-232.

[6]This representation follows the presentation made by Modigliani. For a more standard description as adopted from Modigliani's work see footnote 11, this chapter.

[7]Suppose that a dominant firm faces constant unit production costs and a decreasing average advertising cost function such that the average total costs for the firm are equal to AC_f. Independent of any other barriers to entry, the entrant would presumably face the identical average total cost curve. However, to overcome existing brand loyalties and penetrate the market, an entrant must incur additional promotional cost represented as PC_e. PC_e increases as the degree of penetration

needed for viable entry increases. Therefore the average total cost curve facing an entrant is AC_e which is the sum of AC_f and PC_e. Consequently, the dominant firm can raise its price to P_L and capture economic profits without inducing entry.
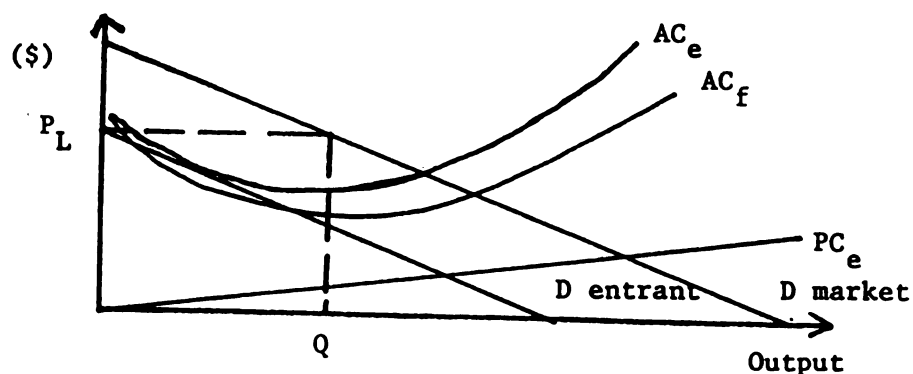
Figure 2.4   Advertising and Limit Price

[8]For a synopsis see William Comanor and Thomas Wilson, "The Effect of Advertising on Competition: A Survey," Journal of Economic Literature 17(June 1979): 453-476.

[9]Federal Trade Commission, Staff Report of the Bureau of Economics on Cigarette Advertising and Output (Washington, D.C.: Government Printing Office, March 1964).

[10]FTC v. Proctor and Gamble Co., 386 U.S. 568 (1967). In a recent study, "Estimating Advantages to Large-Scale Advertising," Review of Economics and Statistics 55(August 1978), p. 434, Randall Brown indicates that the required advertising costs per unit of sale is 48% higher for a new brand than an established brand.

[11]The results of this demonstration would be identical to that of an entrant facing higher costs resulting from operating at a suboptimal scale. The effect of minimum optimal scale is shown in Figure 2.5. Potential entrants facing cost conditions AC_1 will not enter if pre-entry price is set at P_L which is the price at which post-entry profits will be normal, given Sylos postulate. This occurs when the entrant's average cost function is just tangent to its residual demand curve. Similarly, potential entrants facing costs AC_2 will be deterred at

prices equal to and below P'_L. Therefore limit price is directly related to the size of a minimum efficient plant.
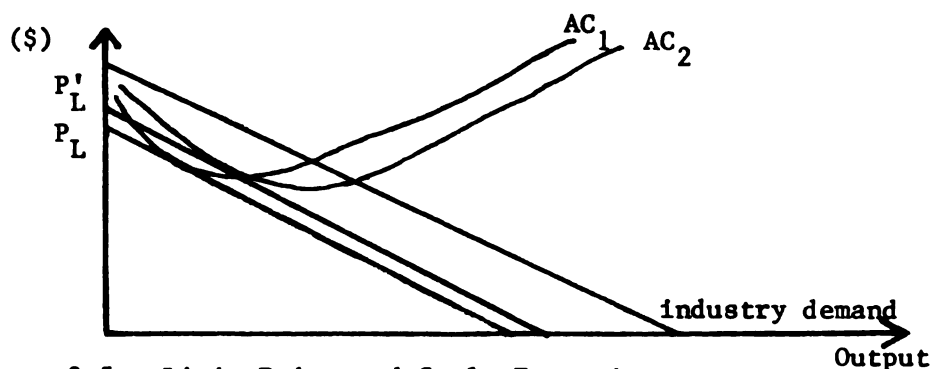
Figure 2.5   Limit Price and Scale Economies

[12]Bain, Barriers, p. 18.

[13]Jagdish Bhagwati, "Oligopoly Theory, Entry Prevention, and Growth," Oxford Economic Papers 22(November 1970): 297-310.

[14]Bhagwati, "Oligopoly Theory," p. 310.

[15]Darius Gaskins, "Dynamic Limit Pricing: Optimal Pricing Under the Threat of Entry," Journal of Economic Theory 3(September 1971): 306-322.

[16]N.J. Ireland, "Concentration and the Growth of Market Demand," Journal of Economic Theory 5(October 1972): 303-305.

[17]Alex Jacquemin and Jacques Thisse, "Strategy of the Firm and Market Structure," in Keith Cowling, ed., Market Structure and Corporate Behavior (London: Gray-Mills, 1972), p. 71.

[18]Jacquemin and Thisse, pp. 71-73.

[19]Morton Kamien and Nancy Schwartz, "Limit Pricing and Uncertain Entry," Econometrica 39(May 1971): 441-454.

[20]David Baron, "Limit Pricing, Potential Entry, and Barriers to Entry," American Economic Review 63(September 1973): 666-674.

[21]Richard Caves and Michael Porter, "From Entry Barriers to Mobility Barriers," Quarterly Journal of Economics 91(May 1977): p. 245.

[22]For discussions concerning the use and effectiveness of excess capacity as a barrier to entry, see Caves and Porter, "From Entry Barriers," and Michael Spence, "Entry, Capacity, Investment and

Oligopolistic Pricing," _Bell Journal of Economics_ 8(Autumn 1977): 534-544 and John Wenders, "Excess Capacity as a Barrier to Entry," _Journal of Industrial Economics_ 20(November 1971): 14-19.

[23]Retaliation with excess capacity may not necessitate higher costs if the plant in use provides minimum costs at the expanded output level or if the plant provides constant costs over a wide range of output. See Wenders, "Excess Capacity."

[24]If an established firm "finds itself matching expenditures or losses, dollar for dollar, with a substantially smaller firm, the length of its purse assures it of victory ... The large company is in a position to hurt without being hurt." For an extended analysis review Corwin Edwards, "Conglomerate Bigness as a Source of Power," in _Business Concentration and Price Policy_ (Princeton: Princeton University Press, 1955), pp. 351-359.

[25]Spence, "Entry, Capacity," espouses this view.

[26]This example was extended by James Brock in "The Photography Industry," unpublished Ph.D. dissertation, Michigan State University, 1981, p. 90.

[27]William Comanor and Thomas Wilson, "Advertising, Market Structure, and Performance," _Review of Economics and Statistics_ 49(August 1967): 423-440.

[28]For a discussion of a number of subsequent profit-market structure studies refer to: Leonard Weiss, "The Concentration-Profit Relationship and Antitrust," in _Industrial Concentration: The New Learning_, H. Goldschmid, et.al. (eds.) (Boston: Little, Brown, 1974): 201-220.

[29]Information dessimination may be the prominent role of advertising in certain industries. Refer to Kenneth D. Boyer, "Informative and Goodwill Advertising," _Review of Economics and Statistics_ 56(November 1974): 541-548.

[30]This is equally true for empirical work using qualitative measures of entry barriers. Note Bain, _Barriers to New Competition_ and H. Michael Mann, "Seller Concentration, Barriers to New Entry, and Rates of Return in Thirty Industries, 1950-1960," _Review of Economics and Statistics_ 48(August 1966): 296-307.

[31]In a system of equations explaining profitability, advertising, and concentration, Martin attempts to answer a similar question. His investigation attempts to determine whether entry barriers affect profitability directly or indirectly through their effects on concentration; he finds the latter to be true. Stephen Martin, "Entry Barriers, Concentration, and Profits," _Southern Economic Journal_ 46(October 1979): 471-488.

[32]Within the framework of the limit pricing model, the demand experienced by each firm will be some portion of the total industry demand with the slope of the demand curve facing each firm being identical. Effective entry will cause a parallel inward shift in each incumbent firm's demand curve. For a detailed exposition see France Modigliani, "New Developments on the Oligopoly Front," Journal of Political Economy 66(June 1958): 215-232.

[33]This concept was promoted by Joe S. Bain, Barriers to New Competition (Cambridge, Mass.: Harvard University Press, 1956). Although Bain later recognized the possibility of entry by a firm supplying other markets his limit pricing model focused on the new establishment.

[34]Iowa Beef Packers represent an exception to this rule.

[35]Analysis of diversification can be found in: Howard Hines, "Effectiveness of Entry by Already Established Firms," Quarterly Journal of Economics 71(February 1957): 132-150 and Charles H. Berry, Corporate Growth and Diversification (Princeton: Princeton University Press, 1975). For a study of import competition see Peter C. Frederiksen, "Prospects of Competition from Abroad in Major Manufacturing Oligoplies," Antitrust Bulletin 20(Summer 1975): 339-371. A synthesis is made by Frank Kottke, "Market Entry and the Character of Competition," Western Economic Journal 5(December 1966): 24-43.

[36]The merger of two or more firms within an industry may allow them to compete more effectively if increased size enables the "new" firm better access to capital and/or realization of scale economies. On the other hand the smaller number of firms may make firms more aware of their interdependence and lead to parallel behavior.

[37]The courts have reviewed the potential competition doctrine in several cases. A pair of cases with divergent results are: 1) U.S. V. Falstaff Brewing Corp., 410 U.S. 526 (1973) and 2) FTC v. Proctor and Gamble Co., 386 U.S. 568 (1967).

[38]The efficiencies may occur but do not necessitate the acceptance of mergers. See Scherer, op. cit., p. 136.

[39]Lawrence Goldberg, "The Effect of Conglomerate Mergers on Competition," Journal of Law and Economics 16(April 1973): 137-158.

[40]Any merger in the same market is a step to decreasing competition. A vertical merger may exacerbate the capital problems facing a new entrant. A conglomerate merger may destroy competitors through cross-subsidization or deny access to sellers and markets through reciprocal buying and selling arrangements.

[41]Substantiation of divergent motives for capacity entrants and merged entrants is found when Michael Gort reports that mergers increase as entry barriers increase. See "An Economic Disturbance Theory of Mergers," Quarterly Journal of Economics 83(November 1969): 624-637.

[42]One entry divided by a few incumbent firms is greater than one entry divided by several established firms.

[43]Edwin Mansfield, "Entry, Gibrat's Law, Innovation, and the Growth of Firms," American Economic Review 52(December 1962): 1023-1051. Refer to Appendix 2A for an exhaustive account of the entry studies.

[44]Larry Duetsch, "Structure, Performance, and the Net Rate of Entry into Manufacturing Industries," Southern Economic Journal 41 (January 1975): 450-465.

[45]Dale Orr, "The Determinants of Entry: A Study of Canadian Manufacturing Industries," Review of Economics and Statistics 56(February 1974): 58-66.

[46]See the following by Paul Gorecki, "The Determinants of Entry by New and Diversifying Enterprises in the U.K. Manufacturing Sector, 1958-1963," Applied Economics 7(June 1975): 139-147 and "The Determinants of Entry by Domestic and Foreign Enterprises in Canadian Manufacturing Industries," Review of Economics and Statistics 58(November 1976): 485-488.

[47]Berry, Corporate Growth, p. 126.

[48]Maury Harris, "Entry and Barriers to Entry," Industrial Organization Review 4(NO. 3 1976): 165-174.

[49]This study, in an attempt to identify cases of entry, adopts the entry search strategy used by Harris. This strategy involves the scanning of trade journals and studies, general business publications, and government documents. Although the strategies to locate entry are the same, the entry measures of this study differ from those used by Harris because different time frames are analyzed. For a detailed account of the process used to construct the entry variable in this analysis, see Chapter 4, and for a list of the most relevant sources, refer to Appendix 4A. In addition to this difference, this study deviates from the Harris study in the measurement of the structural entry barriers. Furthermore, as will be discussed, Harris omits strategic barriers.

[50]In good conscience, Harris cannot be held singularly accountable for this critical omission, since all other previously cited entry-entry barrier analyses also ignore the retaliatory capabilities of existing firms.

[51]For example, assume there are two industries both of which have identical high levels of concentration but industry one includes firms with substantial productive and financial reserves whereas industry two includes member firms which possess insignificant reserves. Further assume that an analysis of structural conditions alone indicates that both industries would permit identical rates of return to a new

entrant. Given this framework, it is predicted that potential entrants would rather enter industry two where the threat to potential profits is weaker or non-existent.

APPENDIX 2A

A Survey of Entry Studies

APPENDIX 2A: A Survey of Entry Studies

STUDY	ENTRY MEASURE	UNIVERSE	PERIOD	PURPOSE	MODEL	SIGNIFICANT RESULTS
Mansfield (1962)	% change in number of firms	Autos, Steel, Tires, Petroleum	varying 10 yr. periods 1916-1959	capture effects of capital req. on entry	$E = a_1 P^b K^c e$ estimates log linear form	K reduces entry P induces entry
McGuckin (1972)	% change in number of firms	151 Census Industries	1947-1963	change in concentration due to entry	correlated the change in concentration with the entry measure	entry reduces C - weaker association in later periods
Deutsch (1974)	% change in number of firms	Census Industries 134 4-digit 307 4-digit	1958-1963 1963-1967	examine determinants of entry	1. $E = A_0 + a_1 P + e_1$ 2. $P = b_0 b_1 G + b_2 A + b_3 C + b_4 D + e_2$ estimated reduced form of the model	entry affected by: G(+): C(+): A(-): D(-). the indirect correlation of E and D supports use of liquidity as a strategic barrier
Orr (1974)	absolute change in number of firms	71 3-digit Canadian industries	1963-1967	direct test of entry barriers using model based on limit pricing model	1. $P^* = f(S^*, K^*, A, R, r, C)$ 2. $E = g(P - P^*; G)$ substitutes (1) into (2) in log linear form	entry affected by K*(-); A(-); R(-); r(-);C(-); S*(-).

51

STUDY	ENTRY MEASURE	UNIVERSE	PERIOD	PURPOSE	MODEL	SIGNIFICANT RESULTS
Berry (1975)	market share entrants including merger)	461 Fortune corporations—4-digit Census Industries	1960-1965	illustrate industry conditions and how affect entry	$E = a_0 + a_1 AS^* + a_2 C + a_3 CV + a_4 G + e1$	entry affected by: GV(-); G(+).
Gorecki (1975)	absolute change in number of firms	51 U.K. Industries	1958-1963	distinguish between new and existing firm entry	$E = a_1 + a_2 S + a_3 A + a_4 G + e$	new firm entry affected by: G(+); A(-); S(-). going firm entry affected by: G(+).
Gorecki (1976)	absolute change in number of firms	71 3-digit Canadian Industries	1963-1967	distinguish between foreign and domestic entry	refer to Orr (1974)	domestic firms: S*(+); K*(-); A(-); R(-); C(-). foreign firms: S*(+); G(+). barriers affect only new and/or domestic firm entry.

1. The coverage ratio indicated the ease of entry. As the value of the ratio rose, barriers increased and the ease of entry declined.

STUDY	ENTRY MEASURE	UNIVERSE	PERIOD	PURPOSE	MODEL	SIGNIFICANT RESULTS
Harris (1976)	1966 market share of post 1950 entrants, (includes new, existing, and foreign firm entry)	27 industries analyzed by either Bain or Mann	1950–1966	use actual entry measure to determine effectiveness of entry barriers	$E = k(P, S, K, A, G, C)$	entry affected by: $P(+)$; $K(+)$; $S(-)$; $A(-)$.

VARIABLE KEY

E=entry

P=received profits

P*=limit profits

G=industry growth in demand

C=4-firm concentration ratio

A=advertising/sales ratio

S=measure of MES

S*=log(S)

K=capital requirements – usually average assets in industry times MES

K*=log(K)

R=level of research and development

r=risk measure

AS=industry size (in shpts.)

AS*=log(AS)

CV=coverage ratio

e_i=respective error terms

CHAPTER THREE

A Framework for Evaluating the Importance
of Strategic Entry Barriers

The limit pricing models described in the previous chapter dis-
tinguished between two types of competition, actual competition between
established firms, and potential competition arising from potential
entry of firms outside the industry. Actual competition has great
importance as a regulator of business activity. Each firm recognizing
its interdependence with other established firms in the industry must
formulate policies acknowledging that any change in policy is likely to
elicit a response from its rivals. However, high oligopoly prices de-
pend on more than the ability to control competition among existing
firms. Potential competition is also a determinant in policy-making.
Unusual profits from oligopoly pricing provide incentives for investors
to enter the industry. Entry of new firms will reduce concentration
within the industry making coordinated actions among existing firms in-
creasingly difficult. Furthermore, entry will tend to force profits and
prices toward competitive levels. Therefore, there exists a double form
of interdependence -- interdependence between the established firms and
also interdependence between established firms and potential newcomers
to the industry.

Previous models have recognized portions of this interdependence
and have totally neglected other aspects. A major assumption to date
is that firms are constrained by given market structures and must do

the best for themselves within the context of that environment. As far as structure itself is concerned the established firms are considered largely passive. One must reject the assumption that firms are fixed bodies of assets unable to take an active role in influencing their economic environment and recognize that sellers are able to control entry by various investment strategies, which in turn, preserve or alter the industry structure to the long run benefit of the firms.

In this chapter, a conceptual model of the limit pricing paradigm is constructed which enables analysis of the entry decision from both the perspective of existing firms and potential entrants. As a basis for the conceptual model, the Gaskins dynamic limit pricing model is described and employed. The Gaskins model is then transformed to explicitly account for strategic barriers, including both the costs to the incumbent firms and the benefits that accrue to those firms as a result of the strategic barrier's ability to deter entry. Next, the extended Gaskins model is generalized to make it operational for empirical analyses, resulting in a new and unique specification with which hypotheses about entry, entry barriers, and profitability can be tested.

Specifically, tests are conducted to evaluate the following:

1) the potential entrants' perceptions of strategic barriers and consequently, the impact of those barriers on the behavior of entrants;

2) the effectiveness of the traditionally hypothesized entry barriers in deterring actual entry; and

3) the influence of the traditional entry barriers on profits exclusive of their role in entry deterrence.

In examining these main elements, a number of related hypotheses are able to be tested. These include:

1) the differential impact of static and strategic barriers on different classes of entrants; and

2) the competitive impact of entry, including the individual as well as the composite effects of foreign and domestic entry.

GASKINS MODEL

Gaskins models the long-run profit maximizing behavior of an established dominant firm/group when constrained by the possibility of entry.[1] Gaskins' basic premise is that the rate of entry into a particular market in an increasing function of the difference between the existing price and the limit price. In order to solve for the time path of prices yielding the highest long-run profits for the firm, he maximizes the functional

$$(1) \quad V = \int_{t=0}^{\infty} [p(t)-c][f(p(t))-x(t)]e^{-rt}dt$$

subject to the rate of entry condition

$$(2) \quad \frac{dx}{dt} = k_0[p(t)-\bar{p}]$$

where

$$
\begin{aligned}
V &= \text{present value of dominant firm profits,} \\
p(t) &= \text{product price at time t,} \\
c &= \text{constant average total cost,} \\
f(p(t)) &= \text{industry demand schedule at time t,} \\
x(t) &= \text{level of rival sales at time t,} \\
r &= \text{firm/group's discount rate,} \\
k_0 &= \text{entrant's response coefficient,} \\
\bar{p} &= \text{limit price.}
\end{aligned}
$$

The Gaskins model captures the simultaneity inherent in the potential entrant-established firm relationship through the interaction of the variables $x(t)$ and $p(t)$. The value of entry output $x(t)$ influences the pricing policy of the dominant firm at any point in time while concomitantly the choice of a pricing policy affects the rate of entry $\frac{dx}{dt}$. Even so, the model, as is, ignores the interactions between investment policies of the firm (strategic barriers) and the rate of entry.

Nonetheless, the Gaskins model of limit pricing can be adapted to incorporate the costs and benefits of entry retarding investments. Let $c_1(I)$ represent the costs incurred by investing in such strategic entry barriers as excess capacity or a reserve of liquid assets. If investment in excess capacity entails the building of a plant either designed to minimize production costs at the retaliatory output level or to provide constant average costs for a range of output, the cost penalty to the incumbent firm amounts to the increased pre-entry per unit costs of production. Moreover, these costs depend on the elasticity of demand which describes the extent that additional production is required to reduce pre-entry price to or below the potential entrant's breakeven price. Added costs also accrue to a firm maintaining large liquid reserves. Maintaining such liquid reserves may not be part of an optimal portfolio. The essential cost of holding liquid assets is, therefore, the opportunity cost incurred by not investing these particular funds in capital projects or longer term securities.

In a very simple model the costs of strategic barriers may be introduced as a reduction in the present discounted profits such that

(3) $\quad V = \int\limits_{t=0}^{\infty} \{[p(t)-c][f(p(t))-x(t)]-c_i(I)\}e^{-rt}dt.$

Investments in strategic barriers may result in not only a direct effect on the firm's profits, but also a preservation of the current industry structure. As potential entrants come to anticipate the utilization of retaliatory capability held by the established firm, the rate of entry declines.[2]

(4) $\quad \dfrac{dx}{dt} = [k_0(p(t)-\bar{p})+k_1(I)]$

In equation (4), $k_1(I)$ represents the reduction in the rate of entry given any pre-entry price where it is assumed that

(5) $\quad k_1^r(I)<0; \; k_1^{r}(I)\geq0.$

The problem is then to choose a level of strategic investment (I) which maximizes V, subject to (4), taking into account the effect of the choice on both the rate of profit and the rate of entry. The problem may be solved by applying the Pontryagin Maximum Principle to the following Hamiltonian:

(6) $\quad H = \{[p(t)-c][f(p)-x]-c_I(I)\}e^{-rt}+z[k_0(p-\bar{p})+k_1(I)]$

where z is the adjoint variable; the multiplier associated with the rate of entry constraint. To obtain the necessary conditions for a maximum, set the partial derivative of (6) with respect to I equal to zero:

(7) $\quad -e^{-rt}\dfrac{dc_1}{dr} + z\,\dfrac{dk_1}{dI} = 0$

which may be rewritten

(8) $\quad Z\,\dfrac{dk_1}{dI} = e^{-rt}\,\dfrac{dc_1}{dI}$

The left hand side of (7) is the shadow value of a marginal decline in the rate of entry resulting from investment in strategic barriers; the right hand side of (7) is the marginal cost of strategic investments.[3] It is profitable, therefore, to invest in retaliatory capability until the marginal cost of such a program equals the marginal benefit of reduced entry.

In the previous chapter, it was hypothesized that strategic barriers would enable incumbent firms to increase their entry forestalling price and thereby increase their long-run profits (refer to Figure 2.7). A comparison of the optimal price paths derived in Gaskins' original model and the extended model presented here clarifies this point. The differential equations depicting the respective optimal price trajectories are:

(9) $\dot{p} = \dfrac{k_0(\bar{p}-c)+r[x-f(p)-(p-c)f'(p)]}{-2f'(p)-(p-c)f''(p)}$ (Gaskins original)[4]

(10) $\dot{p} = \dfrac{k_0(\bar{p}-c)-k_1(I)+r[x-f(p)-(p-c)f'(p)]}{-2f'(p)-(p-c)f''(p)}$ (Gaskins extended)

The only difference in the two equations is the term $-k_1(I)$ which describes the reduction in the rate of entry resulting from strategic investments. If these investments are indeed effective, $k_1'(I)$ 0, then the dominant firm will charge higher prices at every point in time than if the investments had not been made.

THE THEORETICAL MODEL

The theoretical model is a generalization of the extended Gaskins' model of dynamic limit pricing. Preserving the primary implications of the Gaskins model, it assumes that existing firms take into account the entry inducing effects of their pricing decisions and it is also assumed

that potential entrants are conscious of an expected post-entry price level below which they will not enter the industry. Accordingly, the theoretical model is presented in two parts; the first examines the factors influencing the entry decision of potential entrants, the second studies the elements conditioning the behavior of established firms.

The Potential Entrant

In this section an equation is derived which focuses on the determinants of entry. This expression permits direct investigation into the relative importance of individual factors which may enhance or impede the rate of entry and also allows investigation into how these factors influence the entry decisions of different classes of potential entrants. The expression is based on the extended rate of entry equation, previously presented.

(4) $\frac{dx}{dt} = [k_0(p-\bar{p})+k_1(I)]$.

Consistent with the extended Gaskins model, the rate of entry (E) is assumed to be directly related to the difference between pre-entry profit levels (π) and the limit profit rate (π_L), and the level of investment into strategic barriers (I).[5] This equation may be generalized to form the potential entry function

(11) $E_{t+1} = E[(\pi-\pi_L)_t; I_t]$.

where

$$E_{t+1} = \text{the rate of entry in period } t+1,$$
$$\pi = \text{dominant firm profitability in period } t,$$
$$\pi_L = \text{the limit rate of return in period } t,$$
$$I_t = \text{strategic entry deterring investments made in period } t.$$

Given that the limit profit rate is unobservable, a complete understanding of the above relationship begins with the necessary examination into the origin of the limit profit rate.

The limit profit rate is considered to correspond to the limit price, as described by Bain, and is, therefore the profit margin which established firms can persistently capture without attracting entry. The level of the limit profit rate is dependent upon the condition of entry.[6] Focusing on the specific components of the condition of entry, the limit profit rate may be presented as a function of the structural barriers to entry and the industry growth rate of demand:

(12) $\quad \pi_L = \pi_L[S;C;A_t;G_t]$

where

π_{L_t} = the limit rate of return in pre-entry period t,
S = the output of a minimum optimal size plant,
C = the capital requirements of a MOS plant,
A_t = advertising intensity of established firm in period t,
G_t = the growth rate of industry demand.

Each of the limit pricing models presented in the previous chapter hypothesized that structural entry barriers would be positively related to the limit profit rate. However, certain modes of entry may be able to overcome or endure these alleged barriers. Therefore it is expected that

(13) $\quad \dfrac{\partial \pi_L}{\partial B} \geq 0$

where B denotes both the particular entry barrier -- S, C, or A -- or an amalgamation of the specific barriers.

Entry barriers through their effect on the limit profit rate are expected to have a negative impact on the rate of entry. The more

extensive the barriers to entry, the higher the limit profit rate, and the narrower the gap between the observed dominant firm profit rate and the limit profit rate. Consequently, higher structural entry barriers imply a reduced entry rate.

The limit profit rate is also a function of the growth rate of demand. In the previously cited works of Ireland and Bhagwati, growth was incorporated into a limit pricing framework and found to decrease the entry forestalling price or, in this case, the limit profits.[7] This relationship may be expected to occur for a number of reasons. First, when market demand is growing, the price decline associated with any given entry size is smaller. Additionally, growth may imply the influx of customers without established buying patterns who are therefore more easily captured by an entrant. Finally, managers of certain potential entrant firms may be motivated and attracted by growth prospects thereby using rapid demand growth as a signal to enter an industry. It follows that independent of any anticipated reaction, hostile or accommodating, by established firms to entry, that

$$(14) \quad \frac{\partial \pi_L}{\partial G} < 0.$$

The inverse relationship between growth and limit profits indicates that rapid growth will be related to low limit profits thereby increasing the difference between observed profit rates and limit profits. Accordingly it is assumed that growth has a positive impact on the rate of entry.

In addition to the impact of actual profits and limit profits on the rate of entry, behavioral variables, representing the expected post-entry reaction of established firms, could affect the potential entrant's

decision to enter. In particular, if the usual production capacity exceeds industry demand, the level of excess capacity in the industry can indicate retaliatory capability. However, the mere existence of excess capacity need not always be considered a pre-emptive investment. Excess capacity may result from the accumulation of obsolete capital -- old and inefficient machinery differing considerably from the more technologically advanced equipment used on a regular basis by the firm. An interesting example of the role of excess capacity was discussed in the Wall Street Journal.[8] The chairperson of Marquette Cement Manufacturing Company stated that a disclosed plan of the Mississippi River Fuel Corporation to diversify into cement manufacturing "exhibited a colossal ignorance of the facts of business." The statement was in reference to the existing overcapacity in the cement industry. Countering, the chairperson of the Mississippi River Fuel Corporation pointed out that "a very substantial part of the cement capacity is obsolete and the industry knows it. That is why it doesn't want anyone to come in." If available capacity cannot, therefore, be used to threaten potential entrants, entry may occur. If, on the other hand, production has grown steadily and substantially, the presence of excess capacity may be inferred to be a signal of potential harm to entrants and part of a response existing firms have made to the threat of possible entry.[9] It is this study's contention that potential entrants predominately perceive excess capacity as a weapon to be used in retaliation and, therefore, exhibited increases in excess capacity are expected to dampen the rate of entry.

Substantial levels of liquid assets, held by established firms, may also present a threatening signal to potential entrants. These funds

are available for consumption if the need so arises. Specifically,

liquid assets may be consumed to prevent liquidation or bankruptcy

during a price squeeze designed to combat infiltration of the in-

dustry.[10] Even in the absence of excess capacity entry may be thwarted

when these assets are used to finance an output surge made by a plant

previously operating at capacity. Furthermore, liquid assets may be

consumed in the financing of a promotional campaign aimed at an entrant;

the introduction of additional temporary and competitive brands that

correspond to the entrant's product, and also changes in an existing

product's quality to counter the entrant's "better" product.[11] The

larger the total fund the more prepared are incumbent firms for the

contingency of entry, the more likely entry will be deterred.

Summarizing the a priori expectations of this study, it is antici-

pated that the rate of entry will rise with increases in pre-entry

profits and the rate of growth of the industry demand. It is also

assumed that both the static barriers outlined by Bain and the dynamic

barriers will vary indirectly with the rate of entry. However, it will

be shown that certain entry barriers are ineffective against the most

prominent modes of actual entry, foreign and diversifying firms.

The Established Firm

In this section an attempt is made to explain the profitability of

an established firm by constructing a framework which includes the inter-

dependence between the established firm and both the existing and poten-

tial competition. The steady-state value of profits resulting from the

long-run pricing decision of the firm, as formulated in the extended

Gaskins model (equation 3), can be considered to be a function of the

current state of competition (CR), the nature of the entry condition

including the effects of structural and strategic barriers (E,CE), and

the price elasticity of demand (GR,A). The other structural barriers

are included to determine if they have an entry independent effect on

profitability.[12] Accordingly, we have

(15) $\pi_t = \pi[CR_t, G_t, CE, E_t, A_t, S, C]$

where

π_t = the actual profits of the dominant firm(s) in period t,

CR_t = 4-firm concentration ratio of industry in current period t,

G_t = growth in industry demand, period t,

CE = interaction term of entry and concentration,

E_t = the rate of entry in current period t,

A_t = advertising intensity of the dominant firms in period t,

S = output of a minimum optimal size plant (MOS) relative to the market size,

C = capital requirements of a MOS plant.

The concentration ratio describes the current market structure and

indicates the probable degree of industry collusion. Oligopoly theory

suggests that the ability of firms to collude (tacitly or overtly) in

order to maintain prices above the long-run average cost of production

is greater in industries in which a few sellers dominate the market.[13]

Firms in industries characterized by low levels of concentration will

find it difficult to create and maintain a coordinated pricing policy.

It is therefore hypothesized that increases in concentration will de-

crease intra-industry rivalry and enhance industry profitability.

Empirical studies, in general, have substantiated the hypothesized

positive correlation between profitability and concentration. A notable

departure is the work of Brozen which attempts to prove that the direct

association is a phenomenon of disequilibrium.[14] Nonetheless, the

expected result for this study, based on overwhelming theoretical and empirical evidence, is that higher concentration levels will promote higher profit rates.

Growth in industry demand, as has been described, will tend to lower the limit profit rate. Potentially, therefore, profits established within a fast growing industry may be reduced. However this indirect effect of growth on profitability will be captured by the rate of entry variable.

Profitability may also be directly affected by the rate of growth in industry demand. In periods of rapid expansion, profits may rise either through increases in output sold or through increases in price depending on whether capacity either approximates or lags, respectively, the rate of demand. Conversely, growth may destabilize the market and upset the collusive pattern of activities, reducing the level of profits. Empirical studies do not provide a clear indication as to which of these two roles for growth will dominate.[15] A recent theoretical model focusing on the dual role of growth lends support to the former role.[16] Accordingly, higher rates of growth will be expected to elicit higher rates of profit.

The established firm equation also contains a variable reflecting the interaction between market structure and the threat of entry. This variable is designed to explore an implication of the limit pricing theory, focusing on the premise that prospective entry should have a larger impact in the more concentrated markets. For example, if a market were perfectly competitive, potential entry would not be expected to have any influence on price. In a highly concentrated market, however, the interdependence between the established firm and the potential

firm should be significant enough to constrain current pricing power.
The limit pricing hypothesis suggests that the interaction term and
profitability will be inversely related.

As described in the previous chapter, static entry barriers may
influence actual profits in two ways. First, the entry deterring ef-
fects of entry barriers will increase the level of profits that could be
earned while still forestalling entry. Second, entry barriers could af-
fect profitability directly, independent of their effects on entry;
e.g., advertising intensity can expand the demand for the product of an
established firm thereby increasing the firm's profits. The first of
these two roles, analyzed in the preceding section, explained that the
effectiveness of barriers in impeding entry would be reflected in the
rate of entry variable. An analysis of the direct impact of entry bar-
riers on profitability remains.

In particular, the direct impact of advertising on profitability
is unclear. Profitability may be increased as advertising expenditures
increase if those expenditures effectively induce more customers to
purchase the firm's product at every available price. On the other
hand, if the information provided by advertising extends the effective
range of product choice, price and profit may decrease as advertising
increases. For example, Benham found that in states which permitted
advertising of eyeglasses, the average price of eyeglasses was less than
half the price exhibited in states restricting advertising.[17] Because
there are no compelling theories regarding the direct impact of adver-
tising, insight into its primary function must be sought empirically.

The direct impact on profits of the other barriers employed in the profitability equation; S-scale economies and C-capital requirements is equally unclear. In fact, not a single hypothesis concerning the effects of these barriers independent of their entry impeding influences was discovered. An empirical approach to this issue will attempt to yield more satisfying conclusions.

The complete theoretical model, which describes both the behavior of established and potential firms, may be summarized by restating the principal equations and reviewing the anticipated effects of the various components,

$$(15) \quad \pi_t = \pi[\underset{(+)}{CR_t}, \ \underset{(+)}{G_t}, \ \underset{(-)}{CE}, \ \underset{(-)}{E_t}, \ \underset{(?)}{A_t}, \ \underset{(?)}{S}, \ \underset{(?)}{C}] \qquad \text{(The established firm)}$$

$$(16) \quad E_t = E[\underset{(+)}{\pi_{t-1}}, \ \underset{(+)}{G_t}, \ \underset{(-)}{A_t}, \ \underset{(-)}{S}, \ \underset{(-)}{C}, \ \underset{(-)}{EXC}, \ \underset{(-)}{LIQ}] \qquad \text{(The potential firm)}$$

where

> EXC = excess capacity,
> LIQ = holdings of liquid assets.

NOTES

CHAPTER THREE

[1]Gaskins, "Dynamic Limit Pricing."

[2]Other modifications in the rate of entry equation may be used which result in identical qualitative implications. For example, a general formulation could find the response coefficient, k, to be a function of I such that: $\frac{dx}{dt}=k(I)(p-\bar{p})$ where $\frac{\partial k}{\partial I}<0$. For other examples of entry reducing policies formulated via Gaskins' model, see Stephen Martin, "Gaskins Models of Entry Impedance," Econometrics Workshop Paper #7902, Michigan State University, August 1979.

[3]This conclusion is based on the interpretation of Z as the shadow price of an additional unit of rival entry at any point in time. Refer to Gaskins, "Dynamic Limit Pricing," p. 308. A probablistic approach to the entry deterring effects of investment into product differentiation which derived comparable conclusions may be seen in Spence, "Entry, Capacity."

[4]Gaskins, "Dynamic Limit Pricing," p. 309.

[5]Even though the previous discussions of entry centered on limit pricing, it is justifiable to substitute pre-entry profits for pre-entry price and limit profits for limit price, since the qualitative effects are very similar. In addition it has been argued that a limit rate of profit is more appropriate than a limit price, Caves and Porter, "Mobility Barriers." Furthermore, this substitution appears to be an accepted practice. Refer to Appendix 2A for substantiating evidence.

[6]The condition of entry, as defined by Bain, is the premium accruing to established firms which charge a price, P_L, higher than the competitive price, P_C, but not high enough to induce entry. This profit margin may be analytically expressed as $E_C=(P_L-P_C)/P_C$ which may then be transformed to an expression explaining the limit price: $P_L=P_C(1+E_C)$, where E_C is the condition of entry. It is important to remember that the limit price (limit profit rate) so defined is derived using "Sylos Postulate." The reactions to entry by established firms are analyzed separately later in the text.

[7]Ireland, "Concentration and the Growth," and Bhagwati, "Oligopoly Theory."

[8]Wall Street Journal, May 27, 1963, p. 7.

[9]Reference the previously cited Alcoa Case.

[10]Price squeezes may be more effective deterrents to entry than an alternative strategy of buying up new entrants. Entrants in the former case face possible ruin but in the latter case an entrant firm remains an entity, only now it is under new ownership. The strategy most apt to disable the entrant is the strategy most apt to deter the entrant.

[11]As an example, refer to J.A. Menge, "Style Change Costs as a Market Weapon," Quarterly Journal of Economics 76(November 1972): 632-647.

[12]Initial analysis of the model also included the strategic barriers to entry in the profitability equation, testing whether these variables had an entry independent influence on profitability. However, the strategic barriers failed to exhibit statistically significant explanatory power, and were subsequently excluded.

[13]Stigler, "A Theory of Oligopoly," and Weiss, "The Concentration-Profits Relationship."

[14]Yale Brozen, "Concentration and Structural and Market Disequilibrium," Antitrust Bulletin 16(Summer 1971): 241-248.

[15]For further explanation and empirical analysis of these hypotheses, see William Shepherd, "Trends of Concentration in American Manufacturing Industries, 1947-1958," Review of Economics and Statistics 46(May 1964): 200-212 and Stephen Martin, "Entry Barriers, Concentration, and Profits," Southern Economic Journal 46(October 1979): 471-488.

[16]Takeo Nakao, "Demand Growth, Profitability, and Entry," Quarterly Journal of Economics 94(March 1980): 397-411.

[17]Lee Benham, "The Effect of Advertising on the Price of Eyeglasses," Journal of Law and Economics 15(October 1972): 337-352.

CHAPTER FOUR

Strategic Barriers To Entry

In this chapter an empirical specification is presented, stipulating the interactions between prospective and existing producers as conceptualized in the preceding chapter. Attention primarily centers on how potential entrants react to specific investment strategies undertaken by current producers. Do potential entrants limit their penetration into a market where established firms hold reserves of productive capacity and/or liquid assets, perceiving these investments to be devices for retaliation? Concurrently the chapter will focus on the role static industry conditions play in the entry decisions of potential entrants. Subsequent to this analysis, the varying influences that both strategic and static entry barriers exert on specific classes of entrants will be scrutinized.

DESCRIPTION OF VARIABLES

Entry: Following the earlier discussions of the economic definition of entry, the rate of entry variable was measured as the estimated market share of de novo, diversifying, and foreign entrants. Separate calculations were made for domestic and foreign firms.

Data for domestic entry was derived primarily from the Fortune publication Plant and Product Directory.[1] The Directory consists of survey data identifying the plants of the largest 1000 U.S. industrial corporations, and the 5-digit SIC products of those plants. The

initial step in finding entrants is to compare operating plants from one edition of the Directory to the next. If a new plant under a new company name appears in an industry, entry is concluded to have occurred. These "entrants" are then screened against other sources to insure that the new firm is indeed "new", not merged, and not a firm that has grown so as to be included in the top 1000 firms.[2] The extent of entry was calculated by taking the employment size of the entrants' plant(s) from the Directory and attributing to that plant the output of a comparably sized Census plant.[3] Dividing this output level by the total value of shipments in the industry generates the percentage market share of the entrants. A variety of other sources were consulted to identify other significant cases of entry and to validate the year entry was actually realized.[4]

Foreign entry market share was derived from Census tabulations which display imports as a percentage of industry output.[5] The specific market share was calculated by subtracting the 1959 share of imports to total industry output from the 1968 import share. Revisions in this calculation were made when the 1968 value of import share was an anomaly -- not persisting for more than a year. In these instances, the last persistent level of import share was substituted for the 1968 value.[6]

Measuring foreign entry as the market share of imports suffers two shortcomings. Imports need not emanate only from foreign firms. Many times imports are transfers from an overseas subsidiary operation to its U.S. based mother firm. This category of imports is an element of current market structure and as such cannot be expected to neutralize

market power. Using the import share as the measure of foreign entry also omits direct foreign investment, the building of new capacity in the U.S. by a foreign firm. The output from these plants would be included in domestic output causing the foreign entry variable to be understated. Despite these omissions, the measurement of foreign entry based on imports should capture the main source of foreign firm penetration into domestic markets.

Using the described procedures, new capacity entry data was amassed for 40 4-digit manufacturing industries over the years 1959-1968. Since the limit pricing model on which this study is based is an oligopoly pricing model, the sample industries, in principle, should be oligopolies. The overwhelming majority of industries selected do indeed fit into this category.[7] However, due to the limited availability of entry data, particular non-oligopolistic industries were added to the sample. These additional industries are manufacturing industries previously analyzed by Bain or Mann therefore permitting comparison of the results of this study to well-known profit-structure studies.

The time frame, 1959-1968, is important for a number of reasons. To capture the effects of the long-run strategy of limit pricing requires the use of an extended period of time, of which ten years should be appropriate. To lessen the likelihood that any relationships arise due to a disequilibrium phenomenon, analysis must be done over a time interval sufficient for appreciable structural changes to occur. The particular years chosen were selected to minimize the problems associated with the merger wave of the late 1960's.[8]

Profitability: The profit rates used in this study are measured by net profit after taxes as a percentage of stockholders equity. Although subject to the vagaries and discretionary allocations permitted by accounting practices, this measure is deemed appropriate for both theoretical and empirical reasons. Because stockholders have voting rights and assume the main risk of the firm the return on equity represents the profits to the true ownership of the firm. Empirical justification for this measure was found by Hall and Weiss.[9] Each rate is the average dominant firm yearly profit -- the first denoted as PR was calculated for the pre-entry period, the second denoted as P was calculated over the entire 1959-1968 period.[10]

Profitability of dominant firms was used in order to capture the important consequences of entry. If entry substantially effects industry performance, that effect must be felt by the leading firms within the industry since these are the firms most apt to hold and utilize market power.

However, reported dominant firm profits may not be an accurate indicator of potential returns to be reaped by entrants. The reported profit rates may be influenced by the existence of technical or x-inefficiencies. These excess costs may reduce the reported profits but not the profits an efficient producer may claim. In such cases reported dominant firm profits may play a minute or "perverse" role in the entry decisions of potential entrants.

Moreover the greater the dominant firm profitability, the greater may be the risk of entry. As hypothesized by Stonebraker, "most entry occurs on a small scale and entrepreneurs are likely to estimate the

risk of entering an industry on the basis of the performance of existing small firms."[11] Using the percent of small firms with profit rates below the competitive rate and the extent to which these rates fall below the competitive rate as a measure of small firm risk, Stonebraker finds that small firm risk is indirectly related to dominant firm profitability. In other words, the worse the experience of small firms, the greater the risk of entry, and the higher the profits of dominant firms. Consequently, the rate of entry may decline as dominant firm profitability increases.

Demand Growth: The measure of an industry's growth rate of demand is the average yearly percentage rate of growth in the industry's value of shipments from 1958-1967.[12]

Concentration: Concentration ratios were taken from Shepherd's adjusted 4-firm concentration ratios estimated for the year 1966.[13] Certain ratios did not necessitate altering, in which case the unadjusted Census ratios for 1963 were used. In that the adjustments made to the 1966 concentration ratios would apply equally well to the 1963 ratios, the utilization of ratios from different years is not inconsistent.

Static Barriers to Entry

Economies of Scale: The output of a minimum optimal size (MOS) plant relative to the total industry output was used to explain the extent of economies of scale existing within an industry.[14]

An alternative measure of scale economies, also utilized in this study, arises from the interaction of the market share of a MOS plant with a cost disadvantage ratio (CDR), calculating the CDR as the value

added per worker in the smallest plants producing 50% of industry output divided by the value added per worker in the largest plants accounting for the remaining 50% of industry output. The interaction reflects the fact that with modest cost disadvantages, suboptimal entry may be rational, and scale barriers different than that implied by the MOS variable alone. In this case, scale economies were defined as MOS when CDR $<$ .90; MOS = 0 when CDR $\geq$ .90.[15]

Capital Requirements: Capital requirements were measured as the capital investment needed to finance a MOS plant -- the output share of a MOS plant multiplied by the book value of gross depreciable assets for the industry.[16]

Although this measure is often used in empirical work, additional costs may be part of the capital requirements facing a potential entrant. For example, if book value assets are less than replacement costs, then the funds needed to build productive capacity are understated. This calculation is further understated since it excluded the funds an entrant may need to withstand a price or an advertising war. Furthermore, the capital required to set up distribution channels was also omitted from this measure. Consequently, any entry deterring effects that may be statistically attributed to the capital requirements variable are probably understatements of its true impact.

Advertising: Advertising intensity is used as a proxy for the degree of product differentiation in the industry. In this study, advertising intensity was calculated as the average annual advertising sales-ratio of the dominant firms in the industry as stated in the August issues of Advertising Age for the appropriate years. When advertising figures for

the dominant firms were unavailable, the industry advertising-sales ratio was used.[17]

Aggregate Entry Barrier Classifications: Although aggregate entry barrier classifications are necessarily judgmental, they were utilized as a point of departure from and expansion on earlier examinations of entry conditions and their impact on industry performance. Industries were classified according to demarcations drawn by Shepherd.[18]

Trade Barriers: A dummy variable was used to categorize the extent of trade restraint. Both the height of the nominal tariff rate and the presence of non-tariff barriers were considered in constructing this variable.[19]

The trade barrier was included to improve the specifications of the empirical model by accounting for factors affecting foreign entrants. Interestingly, trade barriers may also affect the rate of domestic entry. If trade protection is provided for declining industries, protection may perpetuate the use of inefficient capital resources in the specified industry. Consequently, trade barriers may promote entry by a producer introducing new and efficient technology. Trade barriers may also protect infant domestic industries. In turn, as the domestic industry grows and matures, domestic entry may be anticipated. Based on these assertions, a positive correlation between trade barriers and domestic entry is expected.

Strategic Barriers to Entry[20]

Liquidity: The holding of liquid assets by established firms was described in two ways: 1) the ratio of liquid capital to total capital, and 2) the absolute value of liquid capital. The first value is

computed as the average ratio of current assets to total assets for the dominant firms in each industry. The second value of liquidity is the dominant firms' average holdings of current assets. Both measures are the average yearly values found during the years 1959-1968. The second measure of liquidity most accurately reflects the level of funds available for consumption; however, it is concurrently related to absolute firm size. The former normalized variable purges the liquidity measure of this discrepancy.

Excess Capacity: One excess capacity variable was generated using McGraw-Hill capacity data.[21] Excess capacity was computed as the average annual difference between the preferred operating rate of plant utilization and the current operating rate over the span of three years, 1964-1966. These particular years were chosen because they occur at or near the peak of a business cycle. Observations of excess capacity during a boom period should indicate the policies of the established firms in maintaining reserve productive capacity. Because the McGraw-Hill data are available only for 3-digit industries and the industries examined in this study are at the 4-digit level, it is assumed that the excess capacity held by the 4-digit industries comprising each 3-digit industry exhibit similar excess capacity holdings.

Another proxy for excess capacity was calculated as the ratio of the rate of growth of fixed assets to the rate of growth of sales for the dominant firms in each industry. This excess capacity proxy was expressed as a dummy variable, taking the value one when asset growth is greater than sales growth. This variable necessarily implies that the output/asset ratio is constant in each industry. However, if

technological advances occurred during this time span, the output/ asset ratio may decline and the measurement of excess capacity would be understated. On the other hand, if investments were made into non-productive assets, e.g. pollution abatement equipment, the excess capacity variable would overstate the actual extent of idle capacity. In that the latter circumstances are deemed insignificant, the rate of entry should be indirectly related to increases in the excess capcity variable.

A list of the variables and their respective acronyms is contained in Table 4.1. Table 4.2 gives a statistical description of the variables.

ENTRY AND STRATEGIC ENTRY BARRIERS

The purpose of this section is to emphasize that market structure can no longer be considered an unalterable condition but must rather be perceived as a set of conditions which are open to manipulation by the firms in that market. Firms can be expected to actively participate in programs, which entail incurring additional present costs, in attempt to change or sustain conditions of its market such that long-run returns to the firms are enhanced.

In this context, the empirical analysis of this study focuses on those investments made by established firms which both signal and permit aggressive action towards possible entrants. By ignoring this feature in previous studies, Caves and Porter argue that

> "a modicum of determinancy has been bought at an exhorbitant price in foregone understanding of influences on newcomer's decisions to enter and of the selection and use by going firms of devices to discourage entry."[22]

TABLE 4.1 : VARIABLE LIST

E	market share of all entrants
ED	market share of domestic entrants
EF	market share of foreign entrants
PR	the average pre-entry rate of return on equity for the dominant firms in an industry
P	the average rate of return on equity for the dominant firms in an industry
G	industry growth rate of demand
A	advertising-sales ratio of dominant firms in an industry
S	share of industry output of a MOS plant
SC	share of industry output of a MOS plant adjusted by the cost disadvantage ratio
C	absolute capital requirements of a MOS plant
CC	absolute capital requirements compensating for the possible operation of a suboptimal size plant
EX	static excess capacity (McGraw-Hill) in the industry
EXC	dynamic excess capacity (output/asset ratio) of the dominant firms
LQ	ratio of current assets to total assets held by the dominant firms
LIQ	quantity of current assets held by dominant firms
HB	very high entry barrier category
SB	substantial entry barrier category
CR	4-firm concentration ratio
TB	trade barrier dummy variable
CE	concentration-entry interaction variable

TABLE 4.2: DESCRIPTION OF VARIABLES				
Variable	Mean	Standard Deviation	Minimum	Maximum
E	2.34%	2.15	0	7.82
ED	1.14%	1.66	0	6.90
EF	1.20%	1.87	0	6.00
P	11.93%	3.80	5.70	19.79
PR	11.49%	3.58	5.31	19.79
G	6.03%	19.40	-0.96	11.35
A	3.29%	3.98	0.23	17.00
S	5.79%	7.49	0.11	37.97
SC	2.87%	4.84	0	22.46
C	$30.46m	37.77	0.43	127.38
CC	$11.95m	21.20	0	66.02
EX	2.11%	1.43	-0.90	4.40
EXC	0.48	0.51	0	1
LQ	0.44	0.18	0.15	0.86
LIQ	$397.05m	558.00	24	2512
HB	0.38	0.49	0	1
SB	0.35	0.48	0	1
CR	73.7%	17.70	35	98
TB	0.40	0.50	0	1

The particular devices, or as named here strategic barriers, under evaluation in this study are holdings of excess productive capacity and holdings of liquid asset reserves. It is hypothesized that the maintenance of either or both of these strategic barriers portrays to a potential entrant that the established firm is willing and prepared to battle for the market share under attack. Consequently it is assumed that increases in excess capacity and liquidity will be found to reduce the rate of entry.

Estimation

The model employed for analyzing prospective and current producers' behavior is a simultaneous equation model, described by equations (4.1) and (4.2):

(4.1) $E_t = a_0 + a_1 Pr + a_2 G_t + a_3 (EB)_t + a_4 (SB)_t + a_5 (TB) + U_t$

where

> EB = a vector of static or structural entry barriers (S, SC, C, CC, A);
> SB = a vector of strategic entry barriers (EX, EXC, LQ, LIQ);
> U_t = disturbance term of the regression;
> all other variables as previously defined.

(4.2) $P = b_0 + b_1 G_t + b_2 (EB)_t + b_3 (CR)_t + b_4 (CE)_t + b_5 E_t + V_t$

where

> V_t = disturbance term of the regression;
> all other variables as previously defined.

The particular nature of this model is such that the behavioral equations exhibit a unilateral cause and effect relationship. Entry in the current period (E_t) is dependent on the profitability of established dominant firms in a prior period (Pr). The current level of penetration by new firms (E_t) influence the current profitability of the existing

firms (P). Clearly the causal chain runs from $P_{t-1}(PR) \rightarrow E_t \rightarrow P_t(P)$. Due to the recursive nature of the model, ordinary least squares would normally be used to estimate the parameters of each equation, those estimates being unbiased and consistent. This result necessitates that the system of equations have only exogenous independent variables.

In this instance, it may be argued that concentration and advertising intensity are endogenous to a complete system of equations explaining industrial structure, conduct, and performance.[23] By the same reasoning, the strategic barriers should be considered endogenous since these variables reflect the results of decisions which are made by firms within the system; they are not given by technical production conditions.

This analysis, accordingly, considers each of these variables to be endogenous except for concentration. Previous structural equations utilized to explain concentration appear to be nothing more than a disguised entry equation.[24] These equations have expressed concentration to be a function primarily of structural entry barriers and growth. Consequently this study imposes the entry equation (4.1) as an improvement over a concentration equation. For those who would argue that entry should be listed as an independent variable in a concentration equation to show the effects of entry in reducing concentration, this study adopts an interaction term between concentration and entry (CE) which captures that possible relationship. Even with concentration considered exogenous, the existence of other endogenous variables in the system requires that an instrumental variables technique be used for consistent estimation.

The set of instruments include all exogenous and predetermined variables from both the entry and profitability equation. In addition, the squares of each of these non-dummy instruments are contained in the utilized set of instrumental variables.[25]

Although the estimation of the structural equations by ordinary least squares (OLS) will result in biased and inconsistent parameter estimates, it has been found that OLS is more robust against specification errors than the instrumental variables technique.[26] In view of this, OLS estimates of the structural equations explaining entry and profitability are reported in Appendix 4B and Appendix 5A, respectively, for use as a standard of comparison.

EMPIRICAL RESULTS AND INTERPRETATION

The parameters of the rate of entry equation are estimated and analyzed from two perspectives.[27] First, the effect of entry conditions, in particular strategic barriers, on the total entry variable (E) are presented. Alternative specifications of the variables are then utilized to test the reliability of the estimated coefficients. In a following section, regressions are performed which explain, separately, the domestic (ED) and foreign (EF) rate of entry; indicating the viability of treating entry as a homogeneous process.

Total Entry

Table 4.3 presents estimates obtained before strategic barriers are introduced into the analysis. The independent variables most comparable to previous studies are those reported in equations (1) and (2). With strategic barriers excluded, these estimates are similar to those reported by Harris, except that they 1) refer to oligopolistic industries

TABLE 4.3: REGRESSION ANALYSIS OF TRADITIONAL FACTORS DETERMINING THE ENTRY CONDITION

Independent Variables	Regressions[3]							
	(1)	(2)	(3)	(4)	(1A)	(2A)	(3A)	(4A)
Constant	5.24	4.77	5.25	4.86	5.14	4.17	5.21	4.60
G	0.63	0.29	0.70	0.51	0.25	-0.009	0.47	0.37
	(1.22)	(0.49)	(1.28)	(0.84)	(0.56)	(0.21)	(0.99)	(0.73)
A	-0.15*	-0.17*	-0.13*	-0.10*	-0.56***	-0.62***	-0.48***	-0.42***
	(1.68)	(1.64)	(1.51)	(1.50)	(4.32)	(4.93)	(3.78)	(2.97)
S	-0.06	-0.08**	---	---	-0.05*	-0.06**	---	---
	(1.22)	(1.81)			(1.36)	(1.88)		
SC	---	---	-0.06	-0.13**	---	---	-0.04	-0.08*
			(0.83)	(1.40)			(0.60)	(1.35)
C	0.003	-0.0009	---	---	-0.006	-0.01**	---	---
	(0.29)	(0.10)			(0.89)	(1.74)		
CC	---	---	0.004	0.01	---	---	-0.007	0.002
			(0.25)	(0.84)			(0.49)	(0.16)
TB	-0.96*	-1.10*	-0.78	-0.64	-1.49***	-1.15***	-1.16**	-0.92*
	(1.42)	(1.55)	(1.17)	(0.94)	(2.58)	(3.00)	(1.97)	(1.56)
PR	-0.19	-0.09	-0.21**	-0.19**	0.03	0.15*	-0.06	-0.04
	(1.26)	(0.76)	(2.08)	(1.76)	(0.29)	(1.51)	(0.66)	(0.42)
N	40	27	40	27	40	27	40	27

1) The figures in parentheses are t-statistics.

2) Based on one-tailed tests: * 10% significance; ** 5% significance; *** 1% significance.

3) Equations (1-4) estimated by ordinary least squares; equations (1A-4A) estimated by instrumental variables technique.

4) The difference in number of observations results from incomplete excess data being available from McGraw-Hill.

rather than a sample of industries covering the entire spectrum of industries from competitive to and including oligopolies, 2) include a measure of trade barriers, and 3) indicate a statistically insignificant role for pre-entry profitability.[28]

The introduction of a scale variable (SC), which captures the slope of the entrant's prospective average total cost curve, results in a negative correlation between entry and pre-entry profitability. However in those equations which simultaneously use this refined scale variable and account for the endogeneity of advertising (eqs. 3A and 4A), the results are again quite comparable to those found by Harris.

Table 4.4 presents the first in a series of specifications in which the various combinations of the strategic barriers (EX, EXC, LQ, LIQ) are introduced. Because the discontinuous scale variable (SC) portrays most completely the effect economies of scale have on potential entrants, it is contended that equations utilizing this variable and the corresponding capital requirements variable (CC) represent the most accurate account of the entry condition and are, therefore, displayed first.

The main development of these regression results is that strategic barriers control the rate of entry over and beyond the deterrent capabilities of the traditional set of entry barriers. Indeed, the excess capacity and liquidity variables exhibited significant negative coefficients in every specification used, notwithstanding the variable LQ. By using actual entry data, these results show that the strategic investment decisions of existing firms do affect actual entry decisions of potential entrants. Accordingly, the theory of limit pricing can no longer adopt Sylos Postulate and be considered correct. The model

TABLE 4.4:	INSTRUMENTAL VARIABLES ESTIMATION OF TOTAL ENTRY UTILIZING SPECIFIC ENTRY BARRIERS (SCALE VARIABLE DISCONTINUOUS)			

| Independent Variables | Regressions | | | |
	(1)	(2)	(3)	(4)
Constant	5.30	7.18	7.17	7.13
G	-0.65 (1.04)	-0.54 (1.03)	-0.29 (0.68)	-0.56 (1.24)
A	-0.50*** (3.61)	-0.45*** (3.93)	-0.45*** (4.05)	-0.47*** (4.84)
SC	-0.11** (1.85)	-0.11** (2.19)	-0.08* (1.33)	-0.05 (1.10)
CC	0.01 (0.93)	0.01 (1.19)	0.002 (0.14)	-0.006 (0.49)
EX	-1.01** (2.42)	-0.84** (2.51)	---	---
EXC	---	---	-3.74*** (4.33)	-6.13*** (4.59)
LQ	10.42* (1.56)	---	-3.17 (0.58)	---
TB	-1.44** (2.45)	-1.36*** (2.59)	-1.44*** (2.83)	-1.68*** (3.60)
PR	-0.002 (0.02)	0.02 (0.26)	0.03 (0.39)	0.05 (0.58)
N	27	27	40	40

1) The figures in parentheses are t-statistics.

2) Based on one-tail tests: * indicates 10% significance;
   ** 5% significance; *** 1% significance.

must be expanded to explicitly account for other reactions by the established firms facing the threat of potential entry.

Including the strategic barriers in the equation has not altered the character of the coefficients of the other determinants of entry found in the estimations omitting the strategic barriers. Each of the significant variables (A, SC, TB) affect the rate of entry as suggested by the limit pricing model.[29]

To examine the sensitivity of the estimated coefficients to alternative specifications, we proceed by considering a specification utilizing the more common continuous scale variable.[30] The major problem with this measurement of scale economies is that it ignores the possibility that entry at a non-optimal scale may result in minimally increased production costs. Consequently, the use of this scale variable will exaggerate the economies of scale barrier in industries with relatively flat per unit cost curves. Table 4.5 displays the results using the respecification incorporating the scale variable (S) and the corresponding capital requirements variable (C).

Once again, excess capacity was found to reduce the rate of entry. These results support the premise that current producers may not rely solely on the traditional barriers to entry but are consciously investing resources into excess capacity. Acknowledging the potential of such investments, prospective entrants have been turned back.

Although excess capacity variables persistently repel potential entrants, liquidity variables portray a less distinct role. Absolute quantities of current assets (LIQ) continues to deter entry, but less significantly than in the initial specification. On the other hand,

TABLE 4.5: INSTRUMENTAL VARIABLES ESTIMATION OF TOTAL ENTRY
UTILIZING SPECIFIC ENTRY BARRIERS (SCALE VARIABLE
CONTINUOUS)

Independent Variables	Regressions			
	(1)	(2)	(3)	(4)
Constant	3.24	8.79	6.21	6.87
G	-0.65 (1.25)	-0.84* (1.37)	-0.51 (1.28)	-0.59 (1.24)
A	-0.72*** (5.98)	-0.38*** (3.30)	-0.45*** (3.79)	-0.44*** (4.04)
S	-0.10*** (3.11)	-0.14*** (4.08)	-0.09*** (2.31)	-0.06* (1.47)
C	-0.005 (0.61)	+0.04** (2.50)	0.02** (2.03)	0.01 (1.11)
EX	-0.67** (1.88)	-1.23*** (3.13)	---	---
EXC	---	---	-4.57*** (4.45)	-5.29*** (3.69)
LQ	14.84* (1.65)	---	2.49 (0.45)	---
LIQ	---	-0.003*** (3.59)	---	-0.0008 (0.71)
TB	-1.89*** (3.97)	-1.32*** (3.05)	-1.42*** (3.06)	-1.54*** (3.12)
PR	0.18** (1.97)	-0.02 (0.18)	0.04 (0.44)	0.04 (0.46)
N	27	27	40	40

1) The figures in parentheses are t-statistics.

2) Based on one-tail tests: * indicates 10% significance;
   ** 5% significance; *** 1% significance.

the ratio of current to total assets (LQ) appears to promote entry. This may occur because liquidity could possibly be an indicator of prospective profits since the profitable firms are most apt to be able to accumulate liquid assets.[31] More insight into the role of this variable will be realized once this study analyzes the separate effects of LQ on domestic and foreign entry.

The specific entry barriers of advertising intensity, economies of scale, and trade barriers consistently and significantly repel potential entrants. The capital requirements barrier, however, is shown to encourage entry.[32] This result confirms the anticipated measurement problems associated with this variable.

Continuing to check the sensitivity of the estimated coefficients to alternative variable specifications, estimates are made substituting aggregate barrier classifications for the specific barriers used in the prior specifications.[33] Table 4.6 presents those results.

Each of the strategic deterrents display negative coefficients but are only significant in the larger sample of 40 industries. Nevertheless, these results lend support to the hypothesis that strategic investments are relevant entry barriers.

The coefficients on the entry barrier aggregates displayed the correct signs; but inconsistencies remain. In half of the regressions the substantial barrier category restricted the rate of entry more than the very high barrier class did. These judgmental categories have tended to emerge as amalgams of specific influences which are not easy to formulate or measure. Correct composite variables are difficult to produce since individual barriers are each relevant to certain industries and

TABLE 4.6:	INSTRUMENTAL VARIABLES ESTIMATION OF TOTAL ENTRY UTILIZING AGGREGATE BARRIER CLASSIFICATIONS			

| Independent Variables | Regressions | | | |
	(1)	(2)	(3)	(4)
Constant	7.17	6.93	9.80	7.89
G	0.23 (0.26)	-0.08 (0.10)	0.14 (0.28)	-0.09 (0.19)
HB	-0.43 (0.40)	0.08 (0.08)	-0.92* (1.39)	-1.23** (1.72)
SB	-0.95 (1.03)	-0.87 (0.95)	-1.04* (1.48)	-1.06* (1.52)
EX	-0.40 (0.69)	-0.61 (1.12)	----	----
EXC	----	----	-3.53*** (3.47)	-6.67*** (3.95)
LQ	-4.78 (0.65)	----	-13.16*** (2.51)	----
LIQ	----	-0.0008 (0.98)	----	-0.003*** (2.57)
TB	-0.66 (0.77)	-0.77 (0.90)	-0.90* (1.53)	-1.08** (1.81)
PR	-0.21** (2.04)	-0.19** (1.91)	-0.17** (1.89)	-0.17** (2.00)
N	27	27	40	40

1) The figures in parentheses are t-statistics.

2) Based on one-tail tests: * indicates 10% significance;
   ** indicates 5% significance; *** indicates 1% significance.

it is difficult to judge which barrier(s) must be given the greatest weight.

The influence of profitability on the rate of entry runs counter to the theoretical role implied for it. Normally, one would expect domestic firms to invest resources in the most lucrative markets available and respond positively to profit conditions. However, reported empirical results indicate a negative correlation between the rate of entry and profitability. This result must be interpreted with caution because the simple correlation between profitability and the HB dummy is .71.[34] As a consequence, the negative coefficient on profitability is quite sensitive to model and sample specification.

This section has considered the hypothesis that strategic investments of established firms, such as excess capacity and liquidity, represent the tools used to retaliate against new competitors, and that potential entrants recognizing this capability are indeed deterred. The evidence assembled in this section is consistent with this hypothesis. Statistical tests demonstrated that excess capacity and liquidity reduce the rate of entry. These results imply that effective entry barriers are not only given industry conditions but also devices or strategies which attempt and are able to alter those conditions. Therefore, previous studies which have posited a static industry structure must clearly be extended to include the active role established firms pursue in order to shape an economic environment suitable to the firms' goals.

Domestic-Foreign Entry

Statistical studies investigating the determinants of entry have usually assumed entry to be a homogeneous process.[35] However, there

are reasons to believe that market characteristics and strategic deter-
rences will affect various types of entrants differently. If policy is
to be made to encourage entry, knowledge of entry inhibiting factors
must be gained. And, if different factors affect different types of
entrants, policy makers must take this into account and react
accordingly.

Using a unique approach to a determinants of entry study, this
section divides the extent of actual entry into two distinct classes:
1) actual domestic entry, and 2) actual foreign entry. In so doing,
this study is able to show that different factors are pertinent to the
entry decisions of the different classes of entrants.

The perennial focus of the entry literature is entry by a new firm.
Actual entry data indicates that new firm entrants play a very small
role in the process of entry. Rather, diversifying firms represent the
greatest number of cases. Firms previously established in other markets,
both foreign and domestic, may be less disadvantaged facing traditional
entry barriers and less vulnerable to strategic barriers than de novo
entrants. Existing firms may have ready-made productive facilities, and
in the case of foreign entrants, may only need an outlet for surplus pro-
duction rendering scale and capital requirement barriers inoperative.
Established firms may be able to transfer the goodwill of their other
brands into the entered market negating the advertising barrier. Final-
ly, established firms diversifying into new markets may be able to ef-
fectively finance and therefore compete in any price or advertising war.
Consequently, retaliatory capabilities of established firms become
impotent.

Not only may the effectiveness of any entry barrier or class of barriers be different for established firm entrants than new firms entrants, they may also deviate from one type of established firm entrant to another. A foreign firm may have a comparative advantage in the production of a good and thus be less threatened by scale economies than a domestic firm. On the other hand, a foreign entrant may lack expertise in promotional methods in this a new and strange market and consequently be more prone to be deterred by advertising intensity than the domestic firm. In addition, the foreign firm faces barriers other than the contingent faced by domestic firms. These include tariffs, quotas, and other trade barriers. When entrants are separated into two groups, domestic and foreign, contrasting relationships may be found. Consequently, significant relationships may be amplified, masked, or diluted when entry is considered to be a homegeneous process.

Independent domestic and foreign rate of entry equations are estimated so that the factors affecting the entry decisions of each may be discerned. Table 4.7 presents the results when the discontinuous scale variable (SC) is used; Table 4.8 presents the estimated coefficients when the less accurate scale variable (S) is used. As expected, the diversifying entrants are insensitive to particular entry barriers. Moreover, domestic and foreign entrants are able to overcome different barriers.

Foreign firm entrants are less likely to enter markets where products are highly promoted as opposed to markets with low advertising expenditures. This result was robust; continuing in all specifications of the model. A problem inherent in the advertising market for a foreign entity is the lack of knowledge of the best methods of promotion

TABLE 4.7: INSTRUMENTAL VARIABLES ESTIMATION OF DOMESTIC AND FOREIGN ENTRY UTILIZING A DISCONTINUOUS SCALE VARIABLE

Independent Variables	Regressions and Dependent Variable							
	ED(1)	EF(1)	ED(2)	EF(2)	ED(3)	EF(3)	ED(4)	EF(4)
Constant	4.97	-0.25	4.70	2.48	7.66	-0.48	4.77	2.35
G	0.18	-0.31	-0.92	0.39	-0.55	0.26	-0.95	0.38
	(0.30)	(0.38)	(1.04)	(0.44)	(1.26)	(0.49)	(1.27)	(0.68)
A	-0.13	-0.34**	-0.28*	-0.17**	-0.02	-0.46***	-0.12*	-0.35***
	(0.78)	(1.89)	(1.39)	(1.89)	(0.20)	(3.34)	(1.33)	(2.62)
SC	-0.09*	-0.11	-0.05**	-0.06	-0.34	-0.04	-0.06*	0.03
	(1.34)	(1.25)	(1.75)	(0.75)	(0.78)	(0.58)	(1.39)	(0.45)
CC	-0.03**	0.04**	-0.003	0.02	-0.13*	0.02	-0.006	0.002
	(1.86)	(2.07)	(0.16)	(0.63)	(1.34)	(0.91)	(0.72)	(0.12)
EX	0.25	-0.75*	-0.68*	-0.16	---	---	---	---
	(0.92)	(1.37)	(1.62)	(1.27)				
EXC	---	---	---	---	-3.82***	-0.08	-6.73***	0.60
					(5.62)	(0.07)	(5.57)	(0.32)
LQ	-14.76**	21.03**	---	---	-16.85***	13.67**	---	---
	(1.95)	(2.41)			(3.89)	(2.04)		
LIQ	---	---	-0.001**	0.0002	---	---	-0.002***	-0.0005
			(2.23)	(0.03)			(3.04)	(0.04)
TB	-0.75	-0.45	-1.07*	-0.28	-0.89**	-0.53	-1.10***	-0.59
	(1.14)	(0.56)	(1.63)	(0.33)	(2.34)	(0.89)	(2.62)	(0.89)
PR	-0.03	0.006	0.07	-0.05	0.008	0.02	0.05	-0.007
	(0.25)	(0.05)	(0.68)	(0.36)	(0.13)	(0.24)	(0.74)	(0.06)
N	27	27	27	27	40	40	40	40

1) The figures in parentheses are t-statistics.

2) Based on one-tail tests: * indicates 10% significance; ** 5% significance; *** 1% significance.

TABLE 4.8: INSTRUMENTAL VARIABLES ESTIMATION OF DOMESTIC AND FOREIGN ENTRY UTILIZING A CONTINUOUS SCALE VARIABLE

Independent Variables	Regressions and Dependent Variable							
	ED(1)	EF(1)	ED(2)	EF(2)	ED(3)	EF(3)	ED(4)	EF(4)
Constant	3.49	-0.24	6.12	2.61	7.35	1.14	4.57	2.30
G	-0.52	-0.14	-1.26*	0.42	-0.85	0.34	-1.02	0.43
	(0.73)	(0.17)	(1.67)	(0.45)	(1.15)	(0.69)	(1.27)	(0.76)
A	-0.32**	-0.41**	-0.18	-0.21**	0.08	-0.53***	-0.07	-0.37***
	(1.81)	(2.01)	(1.07)	(1.84)	(0.79)	(3.54)	(0.67)	(2.49)
S	0.003	-0.11**	-0.10**	-0.04	-0.02*	-0.07*	-0.04*	-0.02
	(0.05)	(1.92)	(2.03)	(0.55)	(1.48)	(1.52)	(1.62)	(0.38)
C	-0.02**	0.01	0.03*	0.007	0.02**	0.003	0.01	-0.0008
	(1.81)	(1.22)	(1.40)	(0.23)	(2.05)	(0.26)	(1.27)	(0.05)
EX	-0.67*	-0.61	-1.07**	-0.16	---	---	---	---
	(1.38)	(1.11)	(1.90)	(0.19)				
EXC	---	---	---	---	-5.05***	0.47	-6.27***	0.97
					(5.92)	(0.37)	(4.69)	(0.49)
LQ	-6.86	21.71**	---	---	-14.31***	16.80**	---	---
	(0.87)	(2.35)			(3.13)	(2.42)		
LIQ	---	---	-0.003**	-0.0001	---	---	-0.001*	-0.0006
			(2.41)	(0.06)			(1.34)	(0.39)
TB	-1.12*	-0.77	-0.90*	-0.42	-0.68**	-0.75	-0.91**	-0.63
	(1.61)	(0.98)	(1.45)	(0.46)	(1.75)	(1.27)	(1.98)	(0.93)
PR	0.15	0.02	0.03	0.04	-0.03	0.07	0.03	0.01
	(1.17)	(0.15)	(0.21)	(0.22)	(0.45)	(0.65)	(0.37)	(0.09)
N	27	27	27	27	40	40	40	40

1) The figures in parentheses are t-statistics.

2) Based on one-tail tests: * indicates 10% significance; ** 5% significance; *** 1% significance.

in a new market. When this ignorance is coupled with the fact that advertising is a risky investment apt to have little salvage value if unsuccessful, the derived indirect relationship between advertising and foreign entry seems quite reasonable.

No other entry barrier, structural or strategic, presented an insurmountable obstacle for the entering foreign firm.[36] This is not an unexpected result given that foreign firms: 1) may have many markets over which to spread their output thus aiding the firm in overcoming the scale barrier; 2) may have access to financial markets in their homeland which may provide provisions which enables the firm to counter the imperfections of the U.S. capital markets; and 3) may hold resources to meet head on any retaliatory programs of established firms.[37]

One variable, the liquidity ratio (LQ), fosters foreign entry rather than inhibiting it as expected. Earlier it was stated that a potential entrant could respond positively to the holdings of liquid assets if the entrant perceives these assets to be an optimistic sign of future profit expectations rather than a source of retaliatory capability. The existing firms in the industry may utilize their market power to accumulate rents in the form of liquid assets and as such can indicate to a prospective entrant the possible returns from entering that industry as a new firm accommodated by or accepted into the collusive group of established firms. There are risks to this perception, especially if the assets are accumulated for purposes of retaliation. However, the risks are less for the firm which is capable of countering such threats. An established foreign firm entering a domestic market is such a firm.

Although diversifying domestic entrants are less disadvantaged and more likely to become a viable new competitor relative to new firm domestic entrants, the data reveal that diversifying domestic entrants are not able to overcome entry barriers with the relative ease demonstrated by foreign entrants.[38] In contrast to the relative insensitivity of the foreign entrants to entry barriers, domestic entrants were deterred by both of the strategic barriers, and in every combination. It appears domestic entrants were repelled by the liquidity variables due to the retaliatory capabilities possessed by incumbent firms holding such assets. These include price warfare, advertising battles, brand proliferation, and so on. Excess capacity, representing potential precipitous intense intra-industry price competition, also motivated potential domestic entrants to withdraw or relocate their entry securing resources. The other primary determinants of domestic entry include scale economies, capital requirements, and trade barriers; all of which reduced the rate of domestic entry. Scale economies and capital requirements were expected to exhibit negative coefficients but the latter variable was predicted to enhance the rate of domestic entry. The relationship between domestic entry and trade barriers most likely can be attributed to the use of nominal tariffs in the creation of the trade barrier dummy. Nominal tariffs can, at times, be indicative of the protection afforded an industry, but a more precise measure would be the effective rate of protection.[39] However, the effective rate of protection was not available for these 4-digit SIC industries.

The empirical results of this section show marked contrasts in how foreign and domestic entrants respond to domestic entry conditions. To

analyze the statistical significance of these different behavioral patterns of foreign and domestic entrants, a Chow test is performed.[40] Utilizing the four pairs of equations in Table 4.7, it was found that the effects of the entry condition on the two groups of entrants are significantly different in the large sample regressions (3 and 4).[41] In particular, this result indicates that foreign entrants are able to overcome more of the entry restricting market conditions and strategies than domestic entrants.[42] Such a result is consistent with the hypothesis that there exists a heterogeneous pool of potential entrants. Moreover the evidence points out that the most favored potential entrants, in the pair of classes considered here, are the foreign entrants.

The determinants of the total rate of entry reflect the differing relative importance of these determinants to the foreign and domestic rate of entry. The robust deterrent capabilities of the strategic barriers arises from their strong impact on domestic entrants. Similarly, the negative coefficients of the scale economies barrier and the trade barrier reflect, primarily, their role in determining domestic entry. The appearance of advertising intensity as a major entry inhibitor is, on the other hand, due to its influence in repelling the market penetration of foreign entrants.

SUMMARY

In this chapter, it was hypothesized that established firms would not rely solely on current market conditions to repel potential entrants but that they would react aggressively to the threat of entry by accumulating resources which indicate and permit retaliation. Empirical evidence points out that these strategic investments or barriers did indeed

reduce the rate of total entry beyond that which would have occurred due to the traditional barriers alone. Consequently, it was concluded that strategic barriers are important elements to be considered in the entry decision-making process.

The chapter continued by hypothesizing that diversifying entrants, being less disadvantaged than new entrants, would be able to overcome or endure certain of the structural and strategic entry barriers. It was further hypothesized that the impact of entry barriers is not only likely to be weaker among established firm entrants but also differ in effectiveness according to the type of established firm entrant. Therefore, it was postulated that different classes of diversifying entrants, specifically foreign and domestic, would be able to surmount different entry barriers. Both hypotheses were supported by the empirical work presented in this chapter. Foreign and domestic entrants responded differently to various proposed entry deterrents. Domestic firm entrants were able to overcome the advertising barrier; foreign firm entrants were able to hurdle the scale and capital requirements barriers, and the strategic barriers. A Chow test confirmed the striking difference in entrant reactions to both structural and strategic entry barriers.

NOTES

CHAPTER FOUR

[1]Fortune Plant and Product Directory of the Largest 1000 U.S. Industrial Corporations (Fortune, 1961, 1964, 1967).

[2]Consulted were Standard and Poor's Register of Corporations, Directors, and Executives and Moody's Industrial Manuals.

[3]Census of Manufactures, Bureau of the Census (Washington, D.C.: U.S. Government Printing Office, 1963).

[4]These include the financial press, trade publications, and industry studies. For a complete list refer to Appendix 4A.

[5]U.S. Commodity Exports and Imports as Related to Output, 1959–1968, Department of Commerce.

[6]Most previous studies of foreign entry have used the absolute level of imports. However it is more appropriate to consider the supply of imports with respect to changes in domestic prices. This elasticity may not be represented by actual levels of imports. Rather a change in imports, as used here, is a better approximation. Note Phillip Turner, "Import Competition and the Profitability of United Kingdom Manufacturing Industries," Journal of Industrial Economics 29(December 1980): 155–166.

[7]Reference the listing of oligopolies in David Kamerschen, "An Empirical Test of Oligopoly Theories," Journal of Political Economy 76 (July/August 1968): 615–634. The appendix offers a list of the sample industries and selected data for each industry.

[8]The more mergers that arise, the more involved and probably the less precise is the search for entrants fitting the economic definition of entry. Moreover, as firms become more diversified and are classified only into their primary industry category, aggregate industry data will contain more and more irrelevant information for any specific industry.

[9]Marshall Hall and Leonard Weiss, "Firm Size and Profitability," Review of Economics and Statistics 49(November 1967): 310–319.

[10]The pre-entry period includes all years until the final case of entry was realized. If no entry occurred P and $\bar{P}$ were identical. Dominant firms were chosen on the basis of their sales within the industry; selected were the top four firms in each industry. The profitability data are derived primarily from the report of the Federal Trade Commission

101

on Rates of Return in Selected Manufacturing Industries, (Washington, D.C.: U.S. Government Printing Office, 1959-1968. Gaps are filled by the rates of return published in Standard and Poor's Compustat annual industrial tape (New York: Standard and Poor Corporation, 1979).

[11]R.J. Stonebraker, "Corporate Profits and Risk of Entry," Review of Economics and Statistics 58(February 1976): 33-39.

[12]Shipments were culled from the Census of Manufactures, 1958 and 1967.

[13]William Shepherd, Market Power and Economic Welfare (New York: Random House, 1970), appendix table 8, pp. 263-267.

[14]The output of a MOS plant was considered to be the average output per establishment of the largest plants comprising at least 50% of the total industry output as derived from the 1963 Census of Manufactures.

[15]R.E. Caves, J. Khalilzaden-Shiraz, and M.E. Porter in, "Scale Economies in Statistical Analyses of Market Power," Review of Economics and Statistics 57(May 1975): 133-140 introduced this measure to the literature. Another advantage of using this variable is the reduction in multi-collinearity between concentration and the static entry barriers.

[16]Assets were derived from the Annual Survey of Manufactures, Bureau of the Census (Washington, D.C.: U.S. Government Printing Office, 1963).

[17]Sourcebook of Income, 1959-1968, Internal Revenue Service.

[18]Shepherd, Market Power, appendix table 13, pp. 274-281.

[19]If the nominal tariff rate in an industry was greater than 10% and/or if the industry was protected by import quotas the dummy variable took the value 1. The nominal tariff rate was found by dividing the dollar value of duties collected by the dollar value of imports as reported in Commodity Exports and Imports as Related to Output. Non-tariff barriers were reported in Ingo Walter, "Non-Tariff Protection Among Industrial Countries: Some Preliminary Evidence," Economia Internazionale 25(May 1972): 333-354.

[20]The data for the strategic barriers is located on the Compustat tape unless otherwise noted.

[21]These figures were made available by H. Michael Mann. Previous use of the figures may be viewed in H. Michael Mann, James Meehan, and G.A. Ramsey, "Market Structure and Excess Capacity: A Look at Theory and Some Evidence," Review of Economics and Statistics 61(February 1978): 156-160.

[22]Caves and Porter, "Mobility Barriers," p. 242.

[23]A complete model was analyzed by Stephen Martin, "Advertising, Concentration, and Profitability: The Simultaneity Problem," The Bell Journal of Economics 10(Autumn 1979): 639-647.

[24]Martin, "Advertising, Concentration, and Profitability," pp. 641-642.

[25]Harry Kelejian, "Two-Stage Least Squares and Econometric Models Linear in Parameters but Non-Linear in the Endogenous Variables," Journal of the American Statistical Association 65(June 1971): 373-374.

[26]Lawrence Klein, A Textbook of Econometrics 2nd edition (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1974), p. 150.

[27]The analysis of the profitability equation (4.2) is deferred to the following chapter.

[28]Harris used the set of industries studied by Mann and, in so doing, found profitability to significantly and positively influence the market share of entrants. Harris' study, "Entry and Barriers to Entry," is used as the primary source for comparison since his study is the only previous work utilizing a correct measure of entry (note Chapter 2, p. 35). It should also be noted that Orr in "The Determinants of Entry," using a statistical facsimile for an entry variable, found profitability to have an insignificant impact on domestic entry.

[29]The estimated coefficients found using the instrumental variables technique (IV) differ little from the estimates derived using ordinary least squares (refer to Appendix 4B). This is somewhat surprising since the first stage advertising equations explained only about half of the variability of the actual advertising variable (R^2 for excess capacity and liquidity first stage regressions ranged from .74 - .83). The similarities between IV and OLS continue for subsequent variable definitions as well.

[30]Each of the entry studies described in Chapter 2 which use scale variables adopt an identical or very similar formulation.

[31]Deutsch, "Structure, Performance, and the Net Rate of Entry," p. 454 found mixed results for his measure of the "deep pocket" hypothesis. His measure was a proxy for diversification, that proxy being the primary product specialization ratio.

[32]Harris, "Entry and Entry Barriers," p. 170 also found a direct and statistically significant relationship to exist between actual entry and the capital requirements barrier. However, this result conflicts with the evidence reported by Orr, "The Determinants of Entry," and Mansfield, "Entry, Gibrat's Law."

[33]Bain made a personal assessment of inhibiting effects on entry in each particular industry, categorizing each industry as exhibiting

either very high barriers, substantial barriers, or moderate-to-low barriers. Mann subsequently expanded Bain's set of industries. See Bain, "Barriers to New Competition," and Mann, "Seller Concentration." Both Mann and Bain showed that profits rose as entry barriers rose, and concluded that higher entry barriers deter entry. However their evidence was highly sensitive to the entry barrier group into which an industry is classified.

[34]Farrar and Glauber suggest that to avoid serious multicollinearity no independent variable in an equation should have a R^2 with the other independent variables which exceeds the R^2 of the equation. D. Farrar and R. Glauber, "Multicollinearity in Regression Analysis," Review of Economics and Statistics 49(February 1967): 92-107.

[35]The two studies by Gorecki are the exceptions. See Appendix 2A.

[36]Similarities between IV and OLS estimations continue to exist even when entrants are divided into the two distinct groups. One difference worth noting, however, is that excess capacity does not deter foreign entry in the instrumental variable estimations but does deter foreign entry in the OLS equations, although its effect is in the latter case is barely significant.

[37]Louis Esposito and Frances Esposito, "Foreign Competition and Domestic Industry Profitability," Review of Economics and Statistics 53(November 1971): 343-353.

[38]For a study which anticipates this result refer to Richard Caves, "International Corporations: The Industrial Economics of Foreign Investment," Economica 38(February 1971), especially pp. 13-14.

[39]One can refer to any standard textbook on International Economics. For example, refer to: Mordechai Kreinin, International Economics 2nd edition (New York, New York: Harcourt Brace Janovich, Inc., 1975), p. 329.

[40]F.M. Fisher, "Test of Equality Between Sets of Coefficients in Two Linear Regressions," Econometrica 38(March 1970): 361-366.

[41]The F-test for equations 1-4 are, respectively: $F_{9,35}=1.27$; $F_{9,35}=0.60$; $F_{9,61}=3.08$***; $F_{9,61}=1.75$*. Although equations 1 and 2 did not display significant differences in all coefficients of the model, certain individual barriers were found to affect foreign and domestic entrants in significantly different ways. Equation 2 exhibited no differences, but equation 1 showed significant differences in the effect of capital requirements (t-stat=1.93**) and the liquidity ratio (t-stat =2.04**). Both deterred domestic entry and enhanced foreign entry.

[42]Although he ignores strategic barriers and uses a faulty entry measure, Gorecki finds foreign entrants to be less sensitive to the traditional set of entry barriers. Gorecki, "The Determinants of Entry by Domestic and Foreign Enterprises," p. 487.

APPENDIX 4A

SELECTED DATA FOR SAMPLE INDUSTRIES

29 SIC Industry		ED	EF	EX	EXC	LQ	LIQ
2011	Meat Packing	2.48	1.00	2.4	1	0.30	155
2033	Canned Fruit & Veg.	0.07	2.00	1.0	1	0.44	206
2043	Cereals	0.00	1.00	4.4	1	0.47	127
2046	Wet Corn Milling	0.70	0.00	4.4	1	0.64	525
2051	Bread	1.56	0.00	3.8	0	0.41	24
2052	Biscuits, Cookies	2.20	0.00	3.8	1	0.45	190
2062	Sugar Refining	1.25	0.00	2.3	0	0.29	40
2073	Chewing Gum	0.00	1.00	0.1	0	0.62	128
2082	Beer	0.00	0.00	2.6	1	0.26	81
2085	Liquors	0.00	5.00	2.6	0	0.53	291
2086	Soft Drinks	1.00	0.00	2.6	0	0.38	104
2111	Cigarettes	0.00	0.00	2.4	1	0.66	594
2771	Greeting Cards	0.00	1.00	NA*	0	0.62	27
2834	Drugs	0.01	0.00	1.4	1	0.86	257
2841	Soups & Detergents	1.84	-3.00	NA	0	0.46	452
2871	Fertilizers	0.30	0.00	NA	1	0.25	53
2911	Petroleum Refining	0.02	0.00	1.7	1	0.23	2512
3011	Tires, Tubes	0.00	2.00	-0.9	1	0.42	648
3141	Shoes	0.00	6.00	1.1	0	0.62	135
3211	Flat Glass	5.00	2.00	NA	0	0.28	88
3221	Glass Containers	2.44	0.00	NA	0	0.35	150
3241	Cement	6.90	0.00	1.3	0	0.15	39
3275	Gypsum	3.58	0.00	4.0	1	0.28	110
3312	Steel	0.00	5.00	3.4	1	0.20	951
3331	Copper	1.00	0.00	NA	0	0.34	306
3334	Aluminum	4.82	3.00	NA	0	0.22	404
3411	Metal Cans	3.20	-1.00	1.0	0	0.38	370
3522	Farm Machinery	2.46	0.00	3.2	1	0.77	444
3534	Elevators	0.00	1.00	3.4	0	0.71	84
3562	Ball & Roller Bearings	0.00	3.00	NA	0	0.55	78
3571	Computing & Related Machines	2.19	0.00	0.1	1	0.30	609
3572	Typewriters	0.00	2.00	0.1	0	0.26	451
3641	Electric Lamps	0.00	2.00	1.8	1	0.34	1711
3651	Radio-TV Receiving Sets	0.05	4.00	0.8	1	0.48	354
3717	Autos	0.00	3.00	NA	0	0.50	2255
3722	Aircraft Engines	0.09	0.00	2.2	1	0.22	372
3741	Locomotives	0.00	0.00	NA	0	0.42	78
3861	Photographic Equipment	1.06	1.00	NA	0	0.76	358
3871	Watches & Clocks	0.90	2.00	NA	0	0.45	45
3982	Hard Surface Floor Coverings	0.29	5.00	NA	1	0.62	76

* NA - data not available for that particular industry

Sources for Entry Data: New York Times, various issues
Wall Street Journal, various issues
Business Week, various issues

Sources for Entry Data (cont'd.)

Barrons, various issues
Annual Reports, various companies for various years
Industry Surveys, Standard and Poor
Pit and Quarry, Cement Maps, odd numbered years
Aluminum, Mineral Industry Survey, monthly reports
The Structure of American Industry, Walter Adams (ed.)
     1. "The Steel Industry," Walter Adams;
     2. "The Aluminum Industry," Robert Lanzillotti.
Federal Trade Commission Reports on:
     1. "Mergers and Vertical Integration in the Cement Industry,"
       April 1966;
     2. "Manufacture and Distribution of Automotive Tires,"
       March 1966;
     3. "The Baking Industry," November 1967;
     4. "Investigation of the Petroleum Industry," 1973;
     5. "The U.S. Sugar Industry," July 1975;
     6. "The U.S. Steel Industry and Its International Rivals,"
       November 1977;
     7. "The Brewing Industry," December 1978;
     8. "The Development and Structure of the U.S. Electric Lamp
       Industry," February 1980.
Fortune Plant and Product Directory, 1961, 1964, 1967

APPENDIX 4B

ORDINARY LEAST SQUARES ESTIMATION

TABLE 4.9: ORDINARY LEAST SQUARES REGRESSION ANALYSIS OF TOTAL ENTRY UTILIZING SPECIFIC ENTRY BARRIERS (SCALE VARIABLE DISCONTINUOUS

Independent Variables	Regressions			
	(1)	(2)	(3)	(4)
Constant	6.93	6.48	5.81	5.02
G	-0.20 (0.44)	-0.30 (0.65)	0.57 (0.93)	0.47 (0.78)
A	-0.09 (0.78)	-0.13 (1.26)	-0.16** (1.88)	-0.19** (2.24)
SC	-0.22** (2.27)	-0.19** (1.88)	-0.10 (1.21)	-0.12* (1.58)
CC	0.04 (1.08)	0.03 (0.64)	0.01 (0.31)	0.02 (0.88)
EX	-0.34* (1.33)	-0.38* (1.45)	---	---
EXC	---	---	-0.86* (1.37)	-0.70 (1.04)
LQ	-1.22 (0.44)	---	-4.04 (0.76)	---
LIQ	---	-.0005 (0.62)	---	-.0009* (1.38)
TB	-1.53* (1.62)	-1.14 (1.31)	-1.27* (1.54)	-0.94 (1.18)
PR	-0.19** (1.79)	-0.17* (1.57)	-0.13 (1.08)	-0.11 (0.92)
R^2	0.46	0.46	0.28	0.31
N	27	27	40	40

1) The figures in parentheses are t-statistics.

2) Based on one-tail tests: * indicates 10% significance; ** 5% significance; *** 1% significance.

TABLE 4.10: ORDINARY LEAST SQUARES REGRESSION ANALYSIS OF TOTAL ENTRY UTILIZING SPECIFIC ENTRY BARRIERS (SCALE VARIABLE CONTINUOUS)

Independent Variables	Regressions (1)	(2)	(3)	(4)
Constant	6.74	6.52	5.39	5.37
G	0.98 (1.32)	0.88* (1.34)	0.48 (0.85)	0.40 (0.78)
A	-0.10 (0.85)	-0.14* (1.34)	-0.17** (2.00)	-0.19** (2.43)
S	-0.10** (1.95)	-0.15*** (3.10)	-0.08* (1.50)	-0.14*** (2.65)
C	0.01 (0.94)	0.03** (2.26)	0.01 (0.86)	0.03** (2.27)
EX	-0.11 (0.35)	-0.32 (1.20)	---	---
EXC	---	---	-1.01* (1.45)	-1.03* (1.56)
LQ	-4.22 (0.69)	---	-2.62 (0.50)	---
LIQ	---	-.0018** (2.05)	---	-.0016** (2.36)
TB	-1.82** (1.86)	-1.46* (1.73)	-1.16* (1.54)	-0.99* (1.45)
PR	-0.24* (1.71)	-0.22* (1.72)	-0.11 (0.92)	-0.11 (1.06)
R^2	0.43	0.53	0.30	0.39
N	27	27	40	40

1) The figures in parentheses are t-statistics.

2) Based on one-tail tests: * indicates 10% significance; ** 5% significance; *** 1% significance.

TABLE 4.11: ORDINARY LEAST SQUARES REGRESSION ANALYSIS OF TOTAL ENTRY UTILIZING AGGREGATE BARRIER CLASSIFICATIONS

Independent Variables	Regressions			
	(1)	(2)	(3)	(4)
Constant	7.50	5.96	7.26	5.27
G	0.86	0.51	0.74	0.72
	(1.04)	(0.61)	(1.22)	(1.14)
HB	-0.47	-0.30	-1.54**	-1.21
	(0.47)	(0.28)	(1.76)	(1.27)
SB	-1.05	-1.16*	-1.29*	-1.11
	(1.27)	(1.35)	(1.53)	(1.26)
EX	-0.07	-0.21	---	---
	(0.22)	(0.72)		
EXC	---	---	-1.01*	-0.87
			(1.51)	(1.22)
LQ	-0.08	---	-8.11*	---
	(1.23)		(1.60)	
LIQ	---	-.0001	---	-.0002
		(0.16)		(0.34)
TB	-1.24	-0.59	-0.86	-0.43
	(1.29)	(0.62)	(1.13)	(0.55)
PR	-0.27**	-0.24**	-0.17*	-0.18*
	(2.31)	(1.93)	(1.53)	(1.50)
R^2	0.34	0.29	0.24	0.18
N	27	27	40	40

1) The figures in parentheses are t-statistics.

2) Based on one-tailed tests: * indicates 10% significance; ** 5% significance; *** 1% significance.

TABLE 4.12: ORDINARY LEAST SQUARES REGRESSION ANALYSIS DOMESTIC AND FOREIGN ENTRY UTILIZING A DISCONTINUOUS SCALE VARIABLE

Independent Variables	Regressions and Dependent Variable							
	ED(1)	EF(1)	ED(2)	EF(2)	ED(3)	EF(3)	ED(4)	EF(4)
Constant	6.93	1.58	3.34	3.39	5.46	0.35	3.48	1.53
G	1.40**	0.09	0.45	0.55	0.45	0.13	0.36	0.11
	(1.93)	(0.09)	(0.58)	(0.61)	(0.98)	(0.22)	(0.74)	(0.18)
A	0.04	-0.08	-0.07	-0.02	-0.01	-0.15**	-0.05	-0.15**
	(0.44)	(0.63)	(0.63)	(0.20)	(0.19)	(1.84)	(0.66)	(1.75)
SC	-0.11*	-0.12	-0.11*	-0.11	-0.08*	-0.02	-0.12**	-0.01
	(1.54)	(1.27)	(1.33)	(1.24)	(1.35)	(0.29)	(1.81)	(0.11)
CC	-0.03*	0.03	-.004	0.03*	-0.02	0.02	.002	0.01
	(1.60)	(1.81)	(0.23)	(1.39)	(0.85)	(1.00)	(0.12)	(0.80)
EX	0.40*	-0.48*	0.05	-0.30	---	---	---	---
	(1.51)	(1.36)	(0.19)	(0.94)				
EXC	---	---	---	---	-0.54	-0.32*	-0.43	-0.27*
					(1.07)	(1.50)	(0.79)	(1.41)
LQ	-14.91***	7.70	---	---	-9.44**	5.40	---	---
	(2.60)	(1.03)			(2.40)	(1.08)		
LIQ	---	---	-.0006**	.0002	---	---	-.0005	-.0003
			(1.86)	(0.26)			(1.02)	(0.57)
TB	-2.38***	-0.24	-0.95	-0.92	-1.54***	0.27	-1.09*	0.15
	(2.64)	(0.21)	(0.95)	(0.80)	(2.52)	(0.35)	(1.69)	(0.20)
PR	-0.28**	-0.07	-0.13	-0.14	-0.12*	-0.01	-0.12	0.01
	(2.35)	(0.45)	(0.93)	(0.84)	(1.44)	(0.01)	(1.25)	(0.09)
R^2	0.44	0.26	0.26	0.22	0.33	0.15	0.23	0.13
N	27	27	27	27	40	40	40	40

1) The figures in parentheses are t-statistics.

2) Based on one-tail tests: * indicates 10% significance; ** 5% significance; *** 1% significance.

			Regressions and Dependent Variable					
Independent Variables	ED(1)	EF(1)	ED(2)	EF(2)	ED(3)	EF(3)	ED(4)	EF(4)
Constant	4.09	2.65	2.69	3.82	4.69	0.70	3.40	1.97
G	0.39 (0.54)	0.59 (0.68)	0.12 (0.17)	0.75 (0.89)	0.16 (0.37)	0.31 (0.59)	0.14 (0.33)	0.26 (0.48)
A	-0.07 (0.67)	-0.02 (0.18)	-0.12 (1.22)	-0.01 (0.10)	-0.03 (0.47)	-0.14** (1.70)	-0.06 (0.84)	-0.14* (1.63)
S	-0.02 (0.48)	-0.06 (1.28)	-0.07* (1.35)	-0.08 (1.28)	-0.04 (0.99)	-0.04 (0.76)	-0.10** (2.26)	-0.04 (0.69)
C	-0.01 (0.68)	0.02* (1.37)	0.01 (0.50)	0.02* (1.34)	.001 (0.17)	.008 (0.75)	0.02* (1.60)	0.01 (0.86)
EX	0.27 (0.95)	-0.38 (1.08)	0.03 (0.10)	-0.34 (1.01)	---	---	---	---
EXC	---	---	---	---	-0.67* (1.34)	-0.34 (0.50)	-0.68 (1.25)	-0.32 (0.48)
LQ	-9.06* (1.53)	-4.83 (0.67)	---	---	-8.04** (1.96)	-5.42 (1.07)	---	---
LIQ	---	---	-.001 (1.18)	-.0007 (0.60)	---	---	-.001* (1.75)	-.0006 (0.83)
TB	-1.15 (1.23)	-0.67 (0.59)	-0.58 (0.64)	-0.87 (0.81)	-1.17** (2.00)	0.02 (0.02)	-0.91* (1.56)	0.72 (0.12)
PR	-0.08 (0.55)	-0.17 (1.01)	-0.04 (0.29)	-0.18 (1.10)	-0.08 (0.86)	-0.03 (0.26)	-0.09 (1.00)	0.11 (0.19)
R^2	0.29	0.19	0.26	0.19	0.28	0.14	0.27	0.13
N	27	27	27	27	40	40	40	40

TABLE 4.13: ORDINARY LEAST SQUARES REGRESSION ANALYSIS DOMESTIC AND FOREIGN ENTRY UTILIZING A CONTINUOUS SCALE VARIABLE

1) The figures in parentheses are t-statistics.

2) Based on one-tail tests: * indicates 10% significance; ** 5% significance; *** 1% significance.

CHAPTER FIVE

Profitability, Entry Barriers, and Entry

Whereas the preceding chapter was devoted to explaining how in-
dustry conditions affects the rate of entry, this chapter considers the
relationship between rates of entry, industry conditions and the per-
formance of dominant firms. The measure of performance used is profit-
ability. Although profitability and the elements determining profit-
ability have received extensive attention from economists, certain
methodological gaps remain. An important extension of this analysis is
the introduction of an entry variable in the profitability equation.
Such an extension is essential to capturing the dynamic component of in-
dustrial structure.

The influence of entry on dominant firm profitability will be ex-
amined with regard to the extent of entry and the type of entrant in-
volved. As was the case in Chapter 4, the treatment of specific classes
of entrants may provide insights into the profit-entry relationship that
would be hidden when only an aggregate measure of entry is used.

This chapter will also unravel precise relationships between speci-
fic entry barriers and profitability. Specifically, this analysis will
dissect the influences of entry barriers into 1) the indirect effects of
entry deterrence encountered through the rate of entry variable, and 2)
the direct effects realized independent of any impact on the rate of
entry. Separating these influences in this manner will resolve some of
the conflicting theories concerning the role of entry barriers.

DOMINANT FIRM PROFITABILITY AND ENTRY

Microeconomic theory has stressed the importance of entry as the enforcer of efficient allocation of resources. This section is an attempt to ascertain whether actual entry does alter behavior and performance of the dominant firms in the way that theory predicts.

The effectiveness of entry in encouraging good performance depends on the character of entry. In turn, the character of entry is a function of entry barriers. Given the evidence described in Chapter 4, entrants are deterred due to a lack of knowledge of technology and of the market, especially when advertising intensity and consequently brand loyalty is strong.[1] It follows that entry involves the introduction of the right product, promoted in the right way. Thus, many cases of entry involve established firms finding small niches, qualitative or geographic, within an industry.[2]

The character of entry is also influenced by the existence of strategic barriers. If potential entrants are able to capture all available economies of scale and add a substantial increment of output to an industry, dominant firms could be expected to counter by utilizing excess capacity and liquidity to generate intra-industry warfare. Cognizant of this, potential entrants adopt an entry strategy that best compromises the advantages of scale economies and the risks of aggressive reaction by incumbent firms.[3]

The influence of structural and strategic barriers is to decrease the penetration levels undertaken by new competitors. Consistent with this possibility is the entry data accumulated for this study; in the chosen oligopolistic industries actual entry occurs in small increments.

As a result, the competitive constraint inherent in the entry process may only become effective after small firm entrants have had a number of years over which to expand their operations. Market power would then be eroded, but the process of erosion would be slow.[4]

The analysis of total entry in Chapter 4 pointed out that both structural and strategic barriers did significantly deter entry. Furthermore, it is probable that these barriers reduced the size of the viable entrants, as just discussed. Combining these two effects of entry barriers on the extent of entry, it would appear that barriers may not only diminish but possibly render impotent the efficiency enforcing power of entry. Moreover it appears the competitive constraint exerted by entry, as brought out in Chapter 4, is most likely to originate in the measure of foreign entry.

Estimation

In an attempt to capture the relationship between market performance and entry, this study utilizes the profit equation constructed in Chapter 3 and stated in its estimating form in Chapter 4. Restating that profitability equation yields

$$(4.2) \qquad P = b_0 + b_1 G_t + b_2 (EB)_t + b_3 (CR)_t + b_4 (CE) + b_5 (E)_t + V_t$$

This equation is unique to the study of profit-market structure studies because it considers the effect of entry directly.[5]

The profitability equation is but one equation of a system of equations explaining the relationships between industry structure, conduct, and performance. Within a complete model of industrial organization,

advertising, excess capacity, and liquidity -- elements of market con-duct -- and entry should be considered endogenous.[6] Therefore, consis-tent estimation requires an instrumental variables technique.

To purge the estimation of the correlation between the explanatory entry variable and the residual of the equation, the estimated values of the entry variable $(\hat{E})$ were substituted for the true values in the structural profitability equation. In this regard, the specific values for the rate of total entry, domestic entry, and foreign entry were de-rived using equations 2 and 4 from Tables 4.4, 4.5, 4.7, and 4.8.

After invoking $\hat{E}$ as an instrument for E, the profitability equation was estimated using instrumental variables. Included in the set of in-struments were all exogenous and predetermined variables in the profit-ability equation plus the trade barrier dummy (TB) and pre-entry rate (Pr). Additional instruments were constructed using the squares of all non-dummy instruments.[7]

Empirical Results and Interpretation

Table 5.1 presents the multiple regression equations relating domi-nant firm profits to the trio of entry measures, seller concentration, and various combinations of other explanatory variables.[8]

The regression coefficients for the aggregate entry variable con-sistently displayed the expected negative sign. However, the degree to which entry depressed dominant firm profits was modest relative to the radical changes seen by some.[9] Indeed, the total rate of entry variable was slightly significant in only two specifications of the profitability equation. While this modest relationship runs counter to certain previous studies, the result is not unexpected. In the sample of oligopolistic

TABLE 5.1: INSTRUMENTAL VARIABLES ESTIMATION OF THE IMPACT OF ENTRY AND ENTRY BARRIERS ON DOMINANT FIRM PROFITABILITY

Independent Variables	Regressions[1]											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Constant	6.81	4.70	4.63	10.94	7.42	8.29	6.79	4.45	3.97	9.84	6.40	6.57
G	2.89*** (3.60)	2.85*** (3.46)	2.90*** (3.53)	2.87*** (3.37)	3.08*** (3.49)	3.07*** (3.54)	2.63*** (4.11)	2.63*** (4.07)	2.67*** (4.09)	2.36*** (3.71)	2.35*** (3.58)	2.38*** (3.63)
CR	0.06** (1.94)	0.09** (2.36)	0.09** (2.14)	0.03 (0.60)	0.08 (0.19)	-0.004 (0.10)	0.06** (1.80)	0.08*** (2.87)	0.09*** (2.70)	-0.02 (0.05)	0.04* (1.37)	0.04 (1.16)
A	0.31** (1.99)	0.30** (1.94)	0.30** (1.93)	0.37** (2.19)	0.37** (2.17)	0.37** (2.02)	0.23* (1.40)	0.23** (1.94)	0.22** (1.84)	0.22** (1.81)	0.22** (1.78)	0.21** (1.75)
S				0.02 (0.22)	-0.01 (0.13)	-0.005 (0.05)				0.01 (0.14)	0.002 (0.03)	0.004 (0.06)
SC	-0.26* (1.38)	-0.29 (1.22)	-0.29** (2.12)				-0.14 (0.84)	-0.17* (1.63)	-0.16* (1.56)			
C				0.02 (1.20)	0.03* (1.71)	0.03* (1.72)				0.02 (1.18)	0.02 (1.28)	0.02* (1.33)
CC	-0.02 (0.80)	-0.02 (0.80)	-0.02 (0.73)				-0.01 (0.48)	-0.03 (1.07)	-0.02 (1.00)			
CE	0.003 (0.14)	-0.008 (1.28)	-0.009* (1.63)	0.02 (0.81)	-0.008 (1.22)	-0.002 (0.36)	0.002 (0.04)	-0.003 (0.91)	-0.007** (1.97)	0.01 (0.96)	-0.004 (1.07)	-0.004 (1.11)
E	-0.81 (0.58)			-1.55 (1.09)			-0.65* (1.35)			-1.34* (1.34)		
ED		-0.15 (0.37)			0.37 (0.74)			-0.41 (1.18)			-0.10 (0.27)	
EF			0.05 (0.14)			-0.37 (0.96)			-0.21 (0.68)			-0.55 (0.17)
N	27	27	27	27	27	27	40	40	40	40	40	40

1) Regressions (1-6) are derived from equation (2), Tables 4.4, 4.5, 4.7 and 4.8; regressions (7-12) are derived from equation (4), same Tables.

2) The figures in parentheses are t-statistics.

3) Based on one-tail tests: * indicates 10% significance; ** 5% significance; *** 1% significance.

industries considered, it was shown that structural and strategic barriers effectively deterred total entry. This impact is now making its presence felt by limiting the ability of entry to reduce the market power of dominant firms.[10] On the other hand, this result does not imply that total entry need be impotent. Rather, total entry can effect the behavior and performance of the smaller firms within the industry -- a battle between the helpless and the hapless, relative to the secure position of the dominant firms in the industry. In conclusion, it can be said that total entry conditions behavior to some extent but that the structural and strategic elements of the economic environment are most important in delineating the profit opportunities of an industry's dominant firms.

The diluted competitive constraint exerted by total entry on dominant firm profitability, while most likely to originate from the measure of foreign entry, derives its nature from both foreign and domestic entry. It was found that foreign and domestic entry have identical direct effects on profitability.[11] Although this appears to conflict with the evidence presented in Chapter 4, foreign entry is more effective than domestic entry in reducing dominant firm profitability through its effect on concentration. In the most accurate specifications of the model -- those using the discontinuous scale variable (SC) -- the interaction between entry and concentration (CE) achieves a significant negative coefficient. Therefore, the first derivative of dominant firm profits with respect to foreign entry is negative in spite of the insignificance of the foreign entry variable alone.

PROFITABILITY AND ENTRY BARRIERS

As was discussed in Chapter 2, previous analyses of the profit-ability-entry relationship assumed that if profitability and static entry barriers displayed a significant positive correlation then the hypothesized static entry barriers were in fact deterring entry. However, it was further shown that direct relationships between profits and entry barriers could arise if the hypothesized barrier did not reduce the rate of entry but rather had an entry independent effect which increased profit rates. Therefore, profit-market structure studies to date have been unable to discern the precise role of these structural entry barriers.

By considering the interdependence between entry and profits explicitly, this analysis is able to identify each of the dual effects structural entry barriers may impose on profitability. The specific formulation needed to accomplish this task is the inclusion of the entry variable in the profit equation along with the structural barriers, as follows

(4.2) $P = b_0 + b_1 G_t + b_2 (EB)_t + b_3 (CR)_t + b_4 (CE) + b_5 (E)_t + V_t$

The entry deterring capabilities of entry barriers are expressed through the entry variable. In Chapter 4, the ability of individual barriers to deter entry was discovered by estimating the entry equation (4.1) and analyzing the coefficients of the equation. That estimated equation can be written as

(4.1') $\hat{E} = \hat{a}_0 + \hat{a}_1 PR + \hat{a}_2 G_t + \hat{a}_3 (EB)_t + \hat{a}_4 (SB)_t + \hat{a}_5 (TB) + \hat{U}_t$

where

$\hat{} $ = an estimated coefficient value.

Substituting (4.1') into the estimated profitability equation yields the following relationships:

(5.1') $\hat{P} = \hat{b}_0 + \hat{b}_1 G_t + \hat{b}_2 (EB)_t + \hat{b}_3 (CR)_t + \hat{b}_4 (CE) + \hat{b}_5 \; \hat{a}_0 + \hat{a}_1 PR + \hat{a}_2 G_t + \hat{a}_3 (EB)_t$

$\qquad + \hat{a}_4 (SB)_t + \hat{a}_5 (TB) + \hat{U}_t + \hat{V}_t$

The total effect of entry barriers on profitability is, therefore, equal to[12]

(5.2) $\hat{b}_2 + \hat{b}_5 \hat{a}_3$

such that

$\hat{b}_2$ = the entry independent effects of entry barriers on dominant firm profitability, and

$\hat{b}_5 \hat{a}_3$ = the entry deterring effects of entry barriers on dominant firm profitability.

A summary of the effects of specific structural entry barriers on dominant firm profitability is presented in Table 5.2.

Profitability is, to varying degrees, reduced by entry and entry, in turn, is reduced by advertising intensity and scale economies.[13] It follows that the entry deterring effects of these two structural entry barriers result in increased profit opportunities for the dominant firms -- $(\hat{b}_5 \cdot \hat{a}_3) > 0$. However, the same cannot be said for the capital requirements barriers. This variable did not deter entry. Thus, any positive relationship reported between capital requirements and profitability does not stem from this hypothesized barrier's entry retarding capabilities.[14]

The empirical results contained in Table 5.1 also point to the possibility that certain of these barriers have an entry independent effect on profitability. Advertising intensity displays an overwhelming

TABLE 5.2: THE EFFECT OF ENTRY BARRIERS ON PROFITABILITY

ENTRY BARRIER		(1) $\hat{b}_2$ [1]	$\hat{b}_5$	(2) $\hat{a}_3$ [2]	(3) $\hat{b}_2+\hat{b}_5\hat{a}_3$ [3]
ADVERTISING INTENSITY	(A')	0.23**	-0.65*	-0.45***	0.52***
	(A)	0.22**	-1.34*	-0.45***	0.82***
SCALE ECONOMIES	(SC)	-0.14	-0.65*	-0.08*	-0.09
	(S)	0.01	-1.34*	-0.09**	0.13*
CAPITAL REQUIREMENTS	(CC)	-0.01	-0.65*	0.002	-0.011
	(C)	0.02	-1.34*	0.02**	0.007

1) The figures for $\hat{b}_2$ are culled from equations (7) and (10) -- Table 5.1. A' corresponds to equations using discontinuous scale variables.

2) The figures for $\hat{b}_5$ are derived from the same source as above; figures for $\hat{a}_3$ are derived from equation (3), Tables 4.4 and 4.5.

3) The respective t-statistics are: 3.71; 3.84; 1.25; 1.34; 0.41; 0.53. The procedures for deriving asymptotic variances for functions of non-linear random variables can be seen in Arthur Goldberger, Econometric Theory (New York: John Wiley and Sons, 1964), pp. 122-126.

4) Based on one-tail t-tests: * indicates 10% significance; ** 5% significance; *** 1% significance.

propensity for increasing profitability directly. Profits increase as increases in advertising intensity expand the quantity of information disseminated to previous and prospective customers.[15] Conversely, the scale economies barrier has a negative entry independent effect on profits. The scale economies variable may be acting as an agent for firm size, noting that as firm size increases, management problems and inefficiencies may set in reducing the level of profits.

In the equations estimated using the continuous scale variable (S), profitability is directly affected by capital requirements. The coefficient for capital requirements is positive and significant. In the same equations, the concentration variable is consistently insignificant. The behavior of these two variables appears to be due to the multicollinearity among these two variables and the scale variable.[16] When profitability equations were estimated using structural variables less collinear (SC, CC), both the concentration and capital requirements take on their expected roles. Concentration exhibits a significant positive coefficeint; capital requirements becomes insignificant.

These results lend insight into the assumption, unabashedly used by analysts of profit-market structure studies, that a significant positive relationship between a hypothesized structural entry barrier and profitability is a sign that structural entry barriers do deter entry. This assumption ignores the possibility of these entry barriers having an entry independent and direct impact on profitability. In the case of the scale barrier-profitability relationship, positive coefficients do indicate the entry deterring propensities of the scale barrier since the barrier's entry independent effect on profits is negative. In contrast,

advertising intensity displayed a robust ability to increase profitability independent of its entry deterring capabilities. As a result, a positive relationship between advertising and profitability overstates the potential of advertising to deter entry.

In column 3 of Table 5.2, the entry deterring and the entry independent effects of the traditional entry barriers were combined to determine the total impact of each barrier on dominant firm profitability. The aggregate effect of advertising was to increase profitability; scale economies also significantly increased profitability in one of the cases considered; capital requirements never achieved a significant impact on profitability.

SUMMARY

Entry, or more accurately the probability of entry, has been relied on as a regulator of efficient economic performance, enforcing allocative and productive efficiency, encouraging innovation, and eliminating excess profits. The evidence presented in this study has cast some doubt as to the competitive constraint of entry. It has been shown that the profitability of dominant firms was not significantly reduced by entry; in fact, although foreign firms appeared to be in the most favorable position to enter an industry, neither foreign nor domestic firms were able to overcome most strategic and structural entry barriers. Strategic barriers, being effective in reducing the rate of entry and probably the size of the viable entrant, increased profitability. The empirical evidence presented in this study, also showed that structural barriers deter entry. Consequently, the traditionally assumed entry barrier-profitability relationship has been empirically justified. However, one significant qualification must be noted. Advertising intensity has a

prominent and direct effect on profitability independent of its entry

deterring capabilities.

NOTES

CHAPTER FIVE

[1]See especially Tables 4.4 and 4.5.

[2]For example refer to L.A. Guth, "Advertising and Market Struc-
ture Revisited," Journal of Industrial Economics 19(April 1971): 179-
198. This discussion implies that entry barriers dampen the effective-
ness of entry. However, studies have shown that entry can exert a pro-
competitive effect despite entry barriers. For such a study see Maury
Harris, "Entry and Long-Term Trends in Industry Performance," Antitrust
Bulletin 21(Summer 1976): 295-315. Harris also shows that industries
utilizing extensive advertising are more insulated from the effects of
entry than are industries with relatively low advertising levels.

[3]For a further discussion on the impetus of such compromises,
refer to Scherer, Industrial Market Structure 2nd edition, pp. 248-249.
Of course, such a threat dominates the thinking of domestic entrants
more than foreign entrants, as described in the previous chapter.

[4]A comparison of two studies analyzing the reduction in market
power over different lengths of time highlights this point. Harris,
"Entry and Long-Term Trends," utilized a 16-year period and found that
entry significantly reduced dominant firm profitability. In a related
study which examined the market share stability of 15 leading firms in
205 industries over the eight years from 1947-1954, Gort discovered
that 3/4 of the industries had firms which exhibited significant sta-
bility. In particular, 20 industries, including some of the best known
oligopolies, had dominant firms which exhibited what could be termed
total stability. Michael Gort, "Analysis of Stability and Change in
Market Shares," Journal of Political Economy 71(February 1963): 51-63;
especially Appendix Tables 9 and 13.

[5]Preliminary specifications included the strategic barriers in
the profitability equation. However, these variables never exhibited
statistical significance and were omitted from subsequent estimations.

[6]See discussion on pp. 69-70.

[7]Kelejian, "Two-Stage Least Squares."

[8]The results generated using ordinary least squares are very
similar to those found using instrumental variables (refer to Appendix
5A). The discussion in this chapter is, therefore, aimed simultaneously
towards both sets of results.

[9]Representative examples are: Esposito and Esposito, "Foreign Competition," and Harris, "Entry and Long-Term Trend."

[10]Berry, in an analysis of the effect of cross-industry entry (diversification), noticed that entry was weakest in tight oligopolies. Berry's source for entry data was identical to the primary source for the entry data accumulated in this study. Charles Berry, "Corporate Bigness and Diversification in Manufacturing," Ohio State University Law Journal 28(Summer 1967): 402-426.

[11]Imposing the restriction that foreign and domestic entrants affect dominant firm profitability in identical ways was found to be statistically valid. The highest F-statistic calculated for the equations in Table 5.1 was $F_{1,31}=1.97$ but $F_{.90}\approx 2.88$.

[12]These coefficients may be interpreted as the separate effects of each barrier -- scale economies, capital requirements, and advertising -- and/or the collective effect of the set of barriers of which these individual barriers are elements.

[13]See Table 4.4, p. 74. Strategic barriers also deterred entry but because initial estimations found these barriers never to have a statistically significant entry independent effect, they were subsequently omitted.

[14]Comanor and Wilson, "Advertising, Market Structure, and Performance," p. 435 imply that a positive relationship between profit rates and capital requirements arise because capital requirements is an effective barrier to entry.

[15]An example of this argument is contained in Phillip Nelson, "Advertising as Information," Journal of Political Economy 82(July/ August 1974): 729-754.

[16]When a collinear variable is introduced into an equation, one or more of the collinear variables may decrease in significance. This appears to be the case for the concentration variable. When the continuous scale (S) and capital requirements (C) variables are introduced, in contrast to the use of SC and CC, the regression coefficient on the concentration variable falls, its standard error increases, resulting in a drastic reduction in the t-statistic. Under certain circumstances, the insertion of a collinear variable may raise the absolute value of the regression coefficient of a related variable. If this effect is enough to offset the increase in the standard error, the t-statistic increases. This appears to be the situation for the capital requirements variable. G.S. Maddala, Econometrics (New York, New York: McGraw-Hill Book Co., 1977), p. 185 and H. Theil, Economic Forecasts and Policy (Amsterdam: North-Holland Publishing Co., 1961), p. 327.

APPENDIX 5A

ORDINARY LEAST SQUARES ESTIMATION

APPENDIX 5A - ORDINARY LEAST SQUARES ESTIMATION

TABLE 5.3: ORDINARY LEAST SQUARES REGRESSION ANALYSIS OF THE IMPACT OF ENTRY AND ENTRY BARRIERS ON DOMINANT FIRM PROFITABILITY

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Constant	2.73	2.05	1.62	5.42	4.00	4.99	4.89	3.24	2.46	5.43	4.65	5.66
G	2.37*** (2.71)	2.27*** (2.56)	2.30*** (2.61)	2.25*** (2.70)	2.34*** (2.76)	2.33*** (2.77)	2.52*** (3.70)	2.45*** (3.65)	2.48*** (3.66)	2.23*** (3.51)	2.19*** (3.44)	2.23*** (3.59)
CR	0.07 (1.16)	0.09*** (2.17)	0.09*** (2.08)	-0.01 (0.19)	0.004 (0.11)	-0.002 (0.05)	0.06 (1.20)	0.08*** (2.44)	0.08*** (2.45)	0.02 (0.49)	0.03 (1.02)	0.03 (0.89)
A	0.78*** (2.83)	0.80*** (2.95)	0.80*** (2.96)	0.96*** (3.54)	1.01*** (3.77)	0.99*** (3.73)	0.48** (2.14)	0.53*** (2.51)	0.54*** (2.53)	0.63*** (2.87)	0.66*** (3.19)	0.55*** (2.73)
S				0.03 (0.41)	0.02 (0.28)	0.03 (0.32)				0.01 (0.20)	0.009 (0.13)	0.007 (0.10)
SC	-0.25* (1.66)	-0.26** (1.87)	-0.26** (1.89)				-0.14 (1.25)	-0.16* (1.52)	-0.16* (1.47)			
C				0.03** (1.77)	0.03** (2.09)	0.03** (2.09)				0.03** (1.80)	0.03** (1.83)	0.02* (1.67)
CC	-0.005 (0.02)	-0.01 (0.36)	-0.009 (0.30)				-0.005 (0.21)	-0.009 (0.37)	-0.008 (0.35)			
CE	0.002 (0.08)	0.0007 (0.11)	-0.002 (0.34)	0.01 (0.69)	0.004 (0.59)	0.007 (1.07)	0.002 (0.18)	-0.001 (0.34)	-0.005* (1.44)	0.002 (0.15)	-0.0006 (0.15)	-0.002 (0.45)
B	-0.21 (0.15)			-0.60 (0.43)			-0.51 (0.47)			-0.28 (0.26)		
ED		-0.25 (0.55)			0.23 (0.53)			-0.42 (1.17)			-0.13 (0.36)	
EF			0.17 (0.43)			-0.21 (0.56)			-0.30 (0.91)			0.04 (0.13)
R²	0.66	0.66	0.66	0.69	0.69	0.69	0.54	0.56	0.56	0.58	0.58	0.55
N	27	27	27	27	27	27	40	40	40	40	40	40

1) The figures in parentheses are t-statistics.

2) Based on one-tail tests: *** indicates 1% significance; ** 5% significance; * 10% significance.

3) The residuals of the equations were typically related to the size of the industry. However, the Goldfeld-Quandt procedure failed to reject the hypothesis of homoscedasticity.

CHAPTER SIX

Conclusions and Policy Implications

The primary objective of this study was to extend the concept of entry barrier to include strategic barriers and in so doing empirically test if these investments made by established firms facing the threat of entry had the ability to influence entrants' expectations regarding their post-entry profit opportunities. Previous entry-entry barrier studies had considered only structural market conditions to be barriers to entry and consequently, implied that a given industry structure was fixed and that that structure determined the behavior and performance of the firms in the industry. Employing the concept strategic barriers in an analysis of entry conditions allows for the unique possibility that conduct may have a feedback effect on structure.

In order to determine whether strategic barriers did reduce the rate of entry, measures of excess capacity and liquidity were incorporated into equations seeking to explain inter-industry differences in the rate of entry for a set of 40 oligopolies over the period 1959-1968. By utilizing indices of excess capacity and liquidity as direct determinants of actual entry, the study was able to point out that strategic barriers did indeed reduce the rate of entry beyond that which would have occurred due to structural barriers alone. This evidence remained in spite of alternative definitions of the variables and sample.

Consequently, firms can no longer be considered to be passive agents within a given economic environment. Rather they can be expected to undertake an active role in an attempt to mold their environment so as to be more conducive to their particular long-run goals. In this case established firms did not remain idle depending on structural barriers to insulate them from entrants but instead appeared to take action, or were prepared to take action, against new competitors in order to preserve their market shares.

In the process of ascertaining the effectiveness of strategic barriers, this study also sought to identify whether or not different classes of entrants responded differently to both strategic and structural entry barriers. The statistical evidence showed conclusively that foreign and domestic entrants do engage in dissimilar reactions to the various barriers. Furthermore, foreign entrants appeared to be less disadvantaged vis-a-vis established firms than were the domestic entrants. This result signifies that there is a heterogenous supply of potential entrants, with foreign potential entrants less likely to be deterred than domestic potential entrants given a particular blend of strategic and structural barrier in the industry. Therefore both the extent of entry barriers and how they deviate in effectiveness with respect to different potential entrants are important in the formulation of an entry strategy by established firms.

A second major objective of this study was to determine whether the traditional entry barriers impact: 1) indirectly on profits through their direct effects on entry; 2) directly on profitability through an entry independent effect; or 3) both. By considering explicitly the

interdependence between entry and profitability, this study revealed

that advertising intensity and scale economies had a direct effect on

profitability in addition to their ability to deter entry. Noting the

direction of the direct effects, this study concludes that previous

positive correlations between profitability and scale economies under-

state the capacity of scale economies to deter entry whereas such positive

relationships between advertising intensity and profits overstate the

negative impact of advertising on entry. Therefore, conclusions arising

from profit-market structure analyses concerning the entry retarding

capabilities of specific entry barriers must be regarded with caution.

In accomplishing the objectives described above, this study was able

to focus on actual entry and its ability to alter the behavior and per-

formance of the dominant firms in a set of oligopolistic industries.

This study provides evidence which suggests that entry offers little

prospect for constraining oligopolistic behavior. Even the most favored

class of entrants, foreign entrants, were unable to overcome strategic

and structural barriers to a degree which enabled them to radically alter

the existing industry performance.

Public Policy

A series of public policy recommendations can be derived from the

results contained in this study. All of the policy implications are con-

cerned with the complex relationships between entry, entry barriers, and

industry performance.

In order to encourage entry and capture the pro-competitive effects

of entry on industry performance, antitrust enforcement agencies should

monitor the existence and use of strategic barriers, especially excess

capacity and liquidity, which were proven to be significant entry deter-
rents. Investments in excess capacity and liquid asset reserves by estab-
lished firms represent non-structural, and hence unnecessary, limitations
imposed on potential competitors. To determine whether strategic barriers
are being erected in particular industries, regulatory agencies must con-
sider the growth of the industry and the entrance of new firms into the
industry. If there exists excess productive capacity and/or substantial
liquid reserves, and if the number of firms in the industry remain un-
changed for long periods despite the growth of demand, one might suspect
that firms within the industry are guilty of utilizing their productive
and liquid asset reserves to discourage market penetration by potential
entrants.[1] Industries displaying these characteristics should be the
primary targets for intensive scrutiny.

The influence of liquidity in deterring entry suggests that antitrust
enforcement agencies should not only monitor the existence and use of
liquidity but should also disapprove, or be hesitant in approving, mergers
involving the acquisition of relatively non-liquid firms in currently
competitive industries by financially strong and highly liquid companies.
Such acquisitions would enable the relatively rich firm to devote portions
of its budget to the creation of liquid barriers in this new industry. As
a direct result, potential entrants would be more reluctant to enter the
industry than they would have been prior to the merger.[2] Consequently,
the competitive nature of the industry would be reduced.

Moreover, policy should be aimed at reducing or eliminating excess
capacity and liquidity independent of their anti-competitive features.
As firms attempt to create, protect, or extend their monopoly power by

investing in excess capacity and liquidity, society's resources are being wasted. Because no social utility is gained by these expenditures, regardless of whether strategic barriers are or are not effective in deterring entry, such investments represent a loss to society. This loss is over and above the traditional deadweight loss associated with non-competitive markets.[3]

A recent policy trend directed at improving industry performance is the policy of deregulation. The premise behind the application of a deregulation policy is that entry can substitute for regulation in encouraging and enforcing competitive behavior. For entry to fulfill this critical role, entry must bring about dramatic changes in industry organization. This study has empirically shown that entry in unregulated oligopolies was unable to affect the performance of the dominant firms in those industries.

It is the opinion of this study, however, that the role of entry could be improved by changes in current public policy. These policy alterations should include the directives of this study, namely that there should be a strict monitoring, if not elimination, of excess capacity and liquidity, and that there should be a denial of mergers involving acquisition by a highly liquid firm. In addition, these public policies may be supplemented by other policies including tax subsidization and purchase guarantees.[4] Furthermore, entry promoting policies must recognize the heterogeneous nature of potential entrants, as was brought to light in this study. In aggregate, these factors could change not only entry conditions but could alter also the character of entry. Although these policies may increase the power of entry as an

enforcer of efficient economic performance, entry should be viewed as skeptically as present regulatory procedures in determining whether deregulation is the specific policy most apt to enhance social welfare.

NOTES

CHAPTER SIX

[1]Such an interpretation is not without precedent. In U.S. v.
Aluminum Co. of America, 148 F.2d 430 431 (1945), Judge Learned Hand
stated that "we can think of no more effective exclusion" program
"than progressively to embrace each new opportunity as it opened,
and to face every newcomer with new capacity already geared into a
great organization..." Using excess capacity in this fashion pointed
out that "Alcoa meant to keep, and did keep, that complete and exclusive
hold upon the ingot market with which it started."

[2]The Proctor and Gamble case, which involved the attempted mer-
ger of the financially secure firm of Proctor and Gamble with the rela-
tively small bleach firm Clorox, indicates that the courts might be
receptive to such an argument.

[3]A generalization of this notion can be seen in Gordon Tullock,
"The Welfare Costs of Tariffs, Monopolies, and Theft," pp. 224-232. See
also Spence, "Entry Capacity, Investment, and Oligopolistic Pricing,"
pp. 543-544.

[4]Such policies were instrumental in maintaining the viability of
entrants in the aluminum industry and the aircraft engine industry,
respectively. It is important to note that the competitive benefits
occuring from any entry promotional campaign must always be weighed
against the costs incurred implementing such policies, and only if the
benefits exceed the costs should the program be adopted.

BIBLIOGRAPHY

BIBLIOGRAPHY

Books and Articles

Adams, Walter. "The Steel Industry." In The Structure of American
    Industry. Ed. Walter Adams. New York: MacMillan Publishing
    Co., Inc., 1977, pp/ 86-129

Bain, Joe S. Barriers to New Competition. Cambridge, Mass.: Harvard
    University Press, 1956.

Baron, David. "Limit Pricing, Potential Entry, and Barriers to Entry."
    American Economic Review, 63(September 1973), 666-674.

Baumol, William, Elizabeth Bailey, and R.D. Willig. "Weak Invisible
    Hand Theorems on Pricing and Entry in a Multiproduct Natural
    Monopoly." American Economic Review, 67(June 1977), 350-365.

Benham, Lee. "The Effect of Advertising on the Price of Eyeglasses."
    Journal of Law and Economics, 15(October 1972), 337-352.

Bergson, Abram. "On Monopoly Welfare Losses." American Economic Review,
    63(December 1973), 853-870.

Berry, Charles. "Corporate Bigness and Diversification in Manufacturing."
    Ohio State University Law Journal, 28(Summer 1967), 402-426.

----------. Corporate Growth and Diversification. Princeton: Princeton
    University Press, 1975.

Bhagwati, Jagdish. "Oligopoly Theory, Entry Prevention, and Growth."
    Oxford Economic Papers, 22(November 1970), 297-310.

Bishop, R.L. "Duopoly: Collusion or Warfare?" American Economic
    Review, 50(December 1960), 933-961.

Boyer, Kenneth D. "Informative and Goodwill Advertising." Review of
    Economics and Statistics, 56(November 1974), 541-548.

Brown, Randall. "Estimating Advantages to Large-Scale Advertising."
    Review of Economics and Statistics, 55(August 1978), 428-437.

Brozen, Yale. "Concentration and Structural and Market Disequilibria."
    Antitrust Bulletin, 16(Summer 1971), 241-248.

Caves, Richard, and Michael Porter. "From Entry Barriers to Mobility Barriers." Quarterly Journal of Economics, 91(May 1977), 241-261.

Caves, Richard. "International Corporations: The Industrial Economics of Foreign Investment." Economica, 38(February 1971), 1-27.

----------, J. Khalilzaden-Shiraz, and M.E. Porter. "Scale Economies in Statistical Analyses of Market Power." Review of Economics and Statistics, 57(May 1975), 133-140.

Clark, J.B. Essentials of Economic Theory. New York: MacMillan, 1907.

Comanor, William, and Thomas Wilson. "Advertising, Market Structure, and Performance." Review of Economics and Statistics, 49(August 1967), 423-440.

----------. "The Effect of Advertising on Competition: A Survey." Journal of Economic Literature, 17(June 1979), 453-476.

Comanor, William, and Robert Smiley. "Monopoly and the Distribution of Wealth." Quarterly Journal of Economics, 89(May 1971), 327-336.

Cowling, Keith, and Dennis Mueller. "The Social Costs of Monopoly Power." Economic Journal, 88(December 1978), 724-748.

DeBondt, Raymond. "On the Effects of Retarded Entry." European Economic Review, 8(August 1977), 361-371.

----------. "Limit Pricing, Uncertain Entry, and Entry Lag." Econometrica, 44(September 1976), 939-946.

Deutsch, Larry. "Structure, Performance, and the Net Rate of Entry into Manufacturing Industries." Southern Economic Journal, 41(January 1975), 450-465.

Edwards, Corwin. "Conglomerate Bigness as a Source of Power." In Business Concentration and Price Policy. National Bureau of Economic Research Conference Report. Princeton: Princeton University Press, 1955, pp. 351-359.

Esposito, Louis, and Frances Ferguson Esposito. "Foreign Competition and Domestic Industry Profitability." Review of Economics and Statistics, 53(November 1971), 343-353.

Farrar, D., and R. Glauber. "Multicollinearity in Regression Analysis." Review of Economics and Statistics, 49(February 1967), 92-107.

Fellner, William. "The Influence of Market Structure on Technological Progress." Quarterly Journal of Economics, 65(November 1951), 560-567.

Fisher, F.M. "Test of Equality Between Sets of Coefficients in Two Linear Regressions." Econometrica, 38(March 1970), 361-366.

Frederiksen, Peter C. "Prospects of Competition from Abroad in Major Manufacturing Oligopolies." Antitrust Bulletin, 20(Summer 1975), 339-371.

Galbraith, John Kenneth. Economics and the Public Purpose. Boston: Houghton Mifflin Co., 1973.

Gaskins, Darius. "Dynamic Limit Pricing: Optimal Pricing Under the Threat of Entry." Journal of Economic Theory, 3(September 1971), 306-322.

Goldberg, Lawrence. "The Effect of Conglomerate Mergers on Competition." Journal of Law and Economics, 16(April 1973), 137-158.

Gorecki, Paul. "The Determinants of Entry by Domestic and Foreign Enterprises in Canadian Manufacturing Industries." Review of Economics and Statistics, 58(November 1976), 485-488.

----------. "The Determinants of Entry by New and Diversifying Enterprises in the U.K. Manufacturing Sector, 1958-1963." Applied Economics, 7(June 1975), 139-147.

Gort, Michael. "Analysis of Stability and Change in Market Shares." Journal of Political Economy, 71(February 1963), 51-63.

----------. "An Economic Disturbance Theory of Mergers." Quarterly Journal of Economics, 83(November 1969), 624-637.

Guth, L.A. "Advertising and Market Structure Revisited." Journal of Industrial Economics, 19(April 1971), 179-198.

Hall, Marshall, and Leonard Weiss. "Firm Size and Profitability." Review of Economics and Statistics, 49(November 1967), 310-319.

Harberger, Arnold. "Monopoly and Resource Allocation." American Economic Review, 44(May 1954), 77-87.

Harris, Maury. "Entry and Barriers to Entry." Industrial Organization Review, 4, No. 3 (1976), 165-174.

----------. "Entry and Long-Term Trends in Industry Performance." Antitrust Bulletin, 21(Summer 1976), 295-315.

Hines, Howard. "Effectiveness of Entry by Already Established Firms." Quarterly Journal of Economics, 71(February 1957), 132-150.

Ireland, N.J. "Concentration and the Growth of Market Demand." Journal of Economic Theory, 5(October 1972), 303-305.

Jacquemin, Alex, and Jacques Thisse. "Strategy of the Firm and Market Structure." In Market Structure and Corporate Behavior. Ed. Keith Cowling. London: Gray-Mills, 1972, pp. 61-84.

Kaldor, Nicholas. "Market Imperfections and Excess Capacity." Economica, 2(February 1935), 33-50.

Kamerschen, David. "An Empirical Test of Oligopoly Theories." Journal of Political Economy, 76(July/August 1968), 615-634.

Kamien, Morton, and Nancy Schwartz. "Limit Pricing and Uncertain Entry." Econometrica, 39(May 1971), 441-454.

----------. "Potential Rivalry, Monopoly Profits, and the Pace of Inventive Activity." Review of Economics and Statistics, 45(October 1978), 547-557.

Kelejian, Harry. "Two-Stage Least Squares and Econometric Models Linear in Parameters but Non-Linear in the Endogenous Variables." Journal of the American Statistical Association, 65(June 1971), 373-374.

Klein, Lawrence. A Textbook of Econometrics. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1974.

Kottke, Frank. "Market Entry and the Character of Competition." Western Economic Journal, 5(December 1966), 24-43.

Kreinin, Mordechai. International Economics. New York: Harcourt Brace Janovich, Inc., 1975.

Lanzillotti, Robert. "The Aluminum Industry." In The Structure of American Industry. Ed. Walter Adams. New York: MacMillan Publishing Co., Inc., 1961, pp. 185-232.

Leibenstein, Harvey. "Allocative Efficiency vs. X-Efficiency." American Economic Review, 56(June 1966), 372-415.

----------. "Aspects of the X-Efficiency Theory of the Firm." The Bell Journal of Economics, 6(Autumn 1975), 580-606.

----------. Beyond Economic Man. Cambridge, Mass.: Harvard University Press, 1976.

Loury, Glenn. "Market Structure and Innovation." Quarterly Journal of Economics, 93(August 1979), 395-410.

Maddala, G.S. Econometrics. New York: McGraw-Hill Book Co., 1977.

Mann, H. Michael, James Meehan, and G.A. Ramsey. "Market Structure and Excess Capacity: A Look at Theory and Some Evidence." Review of Economics and Statistics, 61(February 1978), 156-160.

Mann, H. Michael. "Seller Concentration, Barriers to New Entry, and Rates of Return in Thirty Industries, 1950-1960." Review of Economics and Statistics, 48(August 1966), 296-307.

Mansfield, Edwin. "Entry, Gibrat's Law, Innovation, and the Growth of Firms." American Economic Review, 52(December 1962), 1023-1051.

----------. "Technological Change and the Rate of Imitation." Econometrica, 29(October 1961), 741-766.

Martin, Stephen. "Advertising, Concentration, and Profitability: The Simultaneity Problem." The Bell Journal of Economics, 10(Autumn 1979), 639-647.

----------. "Entry Barriers, Concentration, and Profits." Southern Economic Journal, 46(October 1979), 471-488.

Menge, J.A. "Style Change Costs as a Market Weapon." Quarterly Journal of Economics, 76(November 1972), 632-647.

Modigliani, Franco. "New Developments on the Oligopoly Front." Journal of Political Economy, 66(June 1958), 215-232.

Nakao, Takeo. "Demand Growth, Profitability, and Entry." Quarterly Journal of Economics, 94(March 1980), 397-411.

Nelson, Phillip. "Advertising as Information." Journal of Political Economy, 82(July/August 1974), 729-754.

Orr, Dale. "The Determinants of Entry: A Study of Canadian Manufacturing Industries." Review of Economics and Statistics, 56(February 1974), 58-66.

Phillips, Joseph. "Estimating the Economic Surplus." In Monopoly Capital. Paul Baran and Paul Sweezy. New York: Monthly Review Press, 1966, pp. 369-389.

Posner, Richard. "The Social Costs of Monopoly and Regulation." Journal of Political Economy, 83(August 1975), 807-827.

Primeaux, Walter J. "An Assessment of X-Efficiency Gained Through Competition." Review of Economics and Statistics, 59(February 1977), 105-108.

Romeo, Anthony. "Interindustry and Interfirm Differences in the Rate of Diffusion of an Innovation." Review of Economics and Statistics, 57(August 1975), 311-319.

Scherer, F.M. Industrial Market Structure and Economic Performance. Chicago: Rand McNally College Publishing Co., 1980.

----------. "Research and Development Resource Allocation Under Rivalry." Quarterly Journal of Economics, 81(August 1967), 359-374.

Schumpeter, Joseph. Capitalism, Socialism, and Democracy. New York: Harper, 1942.

Shepherd, William. The Economics of Industrial Organization. Englewood Cliffs, N.J.: Prentice-Hall, 1979.

----------. Market Power and Economic Welfare. New York: Random House, 1970.

----------. "Trends of Concentration in American Manufacturing Industries, 1947-1958." Review of Economics and Statistics, 46(May 1964), 200-212.

Siegfried, John, and Thomas Tiemann. "The Welfare Cost of Monopoly: An Inter-Industry Analysis." Economic Inquiry, 12(June 1974), 190-202.

Spence, Michael. "Entry, Capacity, Investment and Oligopolistic Pricing." Bell Journal of Economics, 8(Autumn 1977), 535-544.

Stigler, George. "The Statistics of Monopoly and Merger." Journal of Political Economy, 4(February 1956), 33-35.

----------. "A Theory of Oligopoly." Journal of Political Economy, 72(February 1967), 44-61.

Stonebraker, R.J. "Corporate Profits and Risk of Entry." Review of Economics and Statistics, 58(February 1976), 33-39.

Sylos-Labini, Paolo. Oligopoly and Technical Progress. Cambridge, Mass.: Harvard University Press, 1962.

Theil, H. Economic Forecasts and Policy. Amsterdam: North-Holland Publishing Co., 1961.

Tullock, Gordon. "The Welfare Costs of Tariffs, Monopolies, and Theft." Western Economic Journal, 5(June 1967), 224-232.

Turner, Phillip. "Import Competition and the Profitability of United Kingdom Manufacturing Industries." Journal of Industrial Economics, 29(December 1980), 155-166.

Walter, Ingo. "Non-Tariff Protection Among Industrial Countries: Some Preliminary Evidence." Economia Internazionale, 25(May 1972), 333-354.

Weiss, Leonard. "The Concentration-Profit Relationship and Antitrust." In Industrial Concentration: The New Learning. Ed. H. Goldschmid, et. al. Boston: Little, Brown, 1974, pp. 201-220.

Wenders, John. "Excess Capacity as a Barrier to Entry." Journal of Industrial Economics, 20(November 1971), 14-19.

Williamson, Oliver. Corporate Control and Business Behavior. Englewood Cliffs, N.J.: Prentice Hall, Inc., 1970.

----------. "Managerial Discretion and Business Behavior." American Economic Review, 53(December 1963), 1040-1047.

Winter, Sidney G. "Satisficing, Selection, and the Innovating Remnant." Quarterly Journal of Economics, 85(May 1971), 237-261.

United States Government Public Documents
(Washington, D.C.: Government Printing Office)

Bureau of the Census. Annual Survey of Manufactures. 1963.

----------. Census of Manufactures. 1958, 1963, 1967.

Bureau of Mines. Aluminum, Mineral Industry Survey. 1959-1968.

Department of Commerce. U.S. Commodity Exports and Imports as Related to Output. 1959-1968.

Federal Trade Commission. Economic Report on the Baking Industry. 1967.

----------. Economic Report on the Brewing Industry. 1978.

----------. Economic Report on the Development and Structure of the U.S. Electric Lamp Industry. 1980.

----------. Economic Report on the Investigation of the Petroleum Industry. 1973.

----------. Economic Report on the Manufacture and Distribution of Automotive Tires. 1966.

----------. Economic Report on Mergers and Vertical Integration in the Cement Industry. 1966.

----------. Economic Report on the U.S. Steel Industry and Its International Rivals. 1977.

----------. Economic Report on the U.S. Sugar Industry. 1975.

----------. Rates of Return in Selected Manufacturing Industries. 1959-1968.

----------. Staff Report of the Bureau of Economics on Cigarette Advertising and Output. 1964.

Internal Revenue Service. Sourcebook of Income. 1959-1968.

Other Material

Annual Reports of Corporations.

Barrons. 1959-1968.

Business Week. 1959-1968.

Fortune Plant and Product Directory of the Largest 1000 U.S. Industrial
    Corporations. 1961, 1964, 1967.

Moody's Industrial Manual. 1959-1968.

New York Times. 1959-1968.

Pit and Quarry. 1959, 1961, 1963, 1965, 1967, 1969.

Standard and Poor's Compustat annual industrial tape. 1959-1968.

----------. Industry Surveys. 1959-1968.

----------. Register of Corporations, Directors, and Executives. 1959-
    1968.

Wall Street Journal. 1959-1968.

Unpublished Sources

Brock, James. "The Photography Industry." Diss. Michigan State
    University 1981.

Martin, Stephen. "Gaskins Models of Entry Impedance." Econometrics
    Workshop Paper #7902. Michigan State University, April 1979.