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Determinants of Entry: A Study of Leading U.S. Supermarket Chain Entry Patterns

by
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Food Marketing Policy Center
Research Report No. 11
May, 1991

The University of Connecticut
Department of Agricultural and Resource Economics

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Acknowledgements

The authors wish to acknowledge the technical assistance of Andrew Franklin and typing by Mary Udal, Food Marketing Policy Center, University of Connecticut. This paper is Scientific Contribution No. 1373, Storrs Agricultural Experiment Station, Storrs, CT 06269.

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Table of Contents

List of Tables

Abstract

De novo entry by the top 20 U.S. supermarket chains into local markets is examined using Tobit analysis. We find that entry is related to potential entrants' proximity to the local market, market growth, concentration, the number of large chains that are incumbents in the local market, and the competency of potential entrants as measured by their recent internal expansion rate. With regard to competing theories that relate strategic entry barriers to entry patterns, different components of the analysis provide support for different hypotheses. However, the most general model provides little support for the contestability or Chicago efficiency rent hypotheses.

1. Introduction

A number of studies have analyzed the effect of entry barriers and the competencies of potential entrants upon entry patterns in manufacturing industries. In an early study, Orr [1974] reports that the net change in the number of firms (entry minus exits) in Canadian manufacturing industries is negatively and significantly related to measures of Bain's entry barriers, i.e., absolute cost barriers, scale economy barriers, and product differentiation barriers. He also reports that entry is negatively and significantly related to seller concentration, supporting the hypothesis that incumbent firms in highly concentrated industries engage in strategic conduct to forestall entry. In an early study of net entry in the U.S. manufacturing sector Duetsch [1975] reports that the presence of diversified firms in an SIC four-digit industry lowers entry rates. Duetsch concludes that the threat of retaliation financed by resources from other operations in a diversified firm seems sufficiently credible to deter entry. Subsequently, game theorists working on Selten's "chain store paradox" have developed this hypothesis within the context of finite and infinite period super games (Selten [1978], Milgrom and Roberts [1982]).

Other empirical studies, including Duetsch [1984], Masson and Shaanan [1982], Yip [1982], and Shapiro and Khemani [1987], have reported results for similar tests for the Canadian or U.S. manufacturing sectors. These studies generally find that entry barriers do exist. Some studies, including Duetsch [1975] and Yip [1982], however, find a significant positive relationship between entry and seller concentration, suggesting that the optimal profit rate for incumbents is above the entry forestalling profit rate in concentrated industries, as hypothesized by dynamic limit pricing models (Flaherty [1980]). Yip also emphasizes and finds considerable support for the hypothesis that entry patterns are significantly affected by the distinctive competencies of particular potential entrants. His work represents an important expansion of Bain's [1956] and Hines' [1957] work on the shape of the queue of potential entrants, and bridges the gap between business policy and industrial organization analysis of entry patterns. Similarly, Waterson states "empirical formulations... may only be able to achieve a low level of overall explanation... if barrier variables... are measured without regard to the potentially most favorably placed entrants for each particular industry." (Waterson [1981 p. 536]).

This paper continues work in this area. It analyzes determinants of entry, not net entry. Theoretical work by Harrigan [1980] and others suggests that entry and exit conduct should be analyzed separately, possibly testing for symmetry as Shapiro and Khemani [1987] did. We, moreover, analyze determinants of entry in a single distributive industry rather than a broad cross section of manufacturing industries. The retail distribution of food occurs in many geographically distinct local market areas; nonetheless, it is a single industry. Traditional absolute cost and economy of scale barriers to entry vary little across local markets or are possibly related to the size of a local market. Similarly, the nature of sunk costs including tangible and intangible assets such as physical plant and advertising goodwill, industry-specific human capital, and R&D expenditures are identical across local markets in this industry.[1] However, strategic behavior by incumbents to forestall or allow gradual entry to maximize profits over a time horizon may, as previous studies in manufacturing have documented, vary with other elements of market structure, most notably seller concentration and the presence of multi-market firms. In fact, we find this to be the case when we analyze the entry patterns of 20 leading U.S. supermarket chains between 1972 and 1981. We also find, consistent with Yip's [1982] work, that the competence of potential entrants interacts with entry barriers. Less competent entrants find it harder to enter markets with high strategic entry barriers.

In the next section, we present a model of the determinants of entry. The third section describes sample selection and defines the variables used. The fourth reports descriptive results and a Tobit analysis of the entry patterns of the top 20 chains. The final section contains conclusions.

2. Model Specification

A potential entrant's decision to enter a market is a complex function of expected profits and the ease of entry. One

[1] One should not confuse the nature and the level of sunk costs. The level of sunk costs may vary and is more likely associated with the magnitude of entry necessary to establish a viable position, which may, in turn, as Marion [1987] explains, be related to the size of the local market and other local market characteristics including market growth.

can illustrate the outline of a very general model with the following three equations:

(1)

ENTRY = F (EXPECTED PROFITS, EASE OF ENTRY)

(2)

EXPECTED PROFITS = H (INCUMBENT MARKET STRUCTURE, EASE OF ENTRY)

(3)

EASE OF ENTRY = G (MARKET GROWTH, BARRIERS, ENTRANT COMPETENCIES)

Equations (2) and (3) indicate that expected profits and ease of entry are endogenous. Expected profits are a function not only of incumbent firm market structure, but also potential competition as measured by ease of entry. Ease of entry is a function of market growth and barriers to entry as modeled by Orr [1974], Duetsch [1975], and Masson and Shaanan [1982]. Also, it is a function of entrant competencies as argued by Yip and other business policy researchers.

Operationalizing this general model is difficult and subject to the criticism that models of this sort are underidentified due to an insufficient number of exogenous variables (Schmalensee [1989]). Prior studies have addressed this problem in one of two ways. Many researchers, including Orr [1974], Masson and Shaanan [1982], and Shapiro and Khemani [1987], have used lagged actual profits as a measure of expected profits. If one deletes ease of entry in equation (2), as they do, this specification permits identification of the structural parameters of their models. Yet, if entrants look at current entry barriers, it seems equally plausible that they also employ current profits when deciding whether to enter a market. Moreover, in the wake of contestability theory it seems plausible to model current or expected profits as a function of ease of entry, as well as incumbent structure.

The second approach to the identification problem is, following Yip [1982], to estimate the reduced form equation for entry to determine the total effect of a set of exogenous variables upon entry. The resulting model is underidentified. Thus, the estimates of the reduced form parameters are not, by themselves, sufficient to identify the structural parameters. Nonetheless, they are useful for predicting entry patterns, and they do provide substantial insights into the structure of the entry problem.

We opt for the second approach because we do not have measures of incumbent profits in local market areas, and we wish to incorporate fully the effects of potential competition. Our model for analyzing the entry patterns of the top 20 supermarket chains is specified in equations (4) and (5). To obtain this two equation specification, we have substituted equation (3) into equations (2) and (1) to eliminate the latent variable, ease of entry.

(4)

$$\mathbf{ENTRY} = \alpha_1 \mathbf{PROFIT} + \alpha_2 \mathbf{PROX} + \alpha_3 \mathbf{MKTGROW} + \alpha_4 \mathbf{CONC} + \alpha_5 \mathbf{NCHAIN} + \alpha_6 \mathbf{MKTSIZE}$$

HYPOTHESES: $\alpha_1>0,\ \alpha_2>0,\ \alpha_3>0,\ \alpha_4<0,\ \alpha_5<0,\ \alpha_6<0$

(5)

$$\mathbf{PROFIT} = \beta_0 + (\beta_1+\beta_2)\mathbf{MKTGROW} + (\beta_3+\beta_4)\mathbf{CONC} + (\beta_5+\beta_6)\mathbf{MKTSIZE} + \beta_7\mathbf{PROX} + \beta_8\mathbf{NCHAIN}$$

HYPOTHESES: $\beta_1>0,\ \beta_2<0,\ \beta_3>0,\ \beta_4>0,\ \beta_5>0,\ \beta_6>0,\ \beta_7<0,\ \beta_8>0$

where:

ENTRY	=	the number of top 20 chains that enter the local market
PROFIT	=	current (*ex ante*) profit rate of incumbents in a local market
PROX	=	the geographical proximity of top 20 chains who are potential entrants to a local market
MKTGROW	=	the growth in grocery sales in a local market
CONC	=	the seller concentration in a local market
NCHAIN	=	the number of top 20 chains established in the local market
MKTSIZE	=	the total grocery sales in a local market.

In equation (4), current local market profits, ***PROFIT***, is a measure of expected profits. The other variables measure market growth, strategic entry barriers (***CONC*** and ***NCHAIN***) and exogenous barriers related to market size. Equation (5) models the current profit rate of incumbents as a function of incumbent market structure and ease of entry.[2] As will be explained below, market growth, seller concentration and market size are features of market structure that influence incumbents directly and indirectly via their influence on ease of entry. Thus, for discussion purposes each has two structural coefficients.

Note that this model contains no measure of entrant competence. As explained in footnote 2, the profitability of a leading chain is very strongly and positively related to its internal growth, as opposed to growth by acquisition. Marion et al. [1979] explain that internal firm growth is a proxy for the "caliber of management" and "the relative success of a chain

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[2] The particular structure-profit model specified here may not seem credible given the research documenting the shortcomings of such models estimated on cross section data for the manufacturing sector (Schmalensee [1989, pp. 970-981]). We, however, believe that it is credible for this industry because of specific research on this industry. Marion et al. [1979] conducted extensive analysis of the structure-profit relationship using firm level data for 12 leading food chains that are included in the top 20 chains analyzed here. That study was conducted for the Joint Economic Committee of Congress and made possible by JEC subpoena of firm profit data at the local market level. It analyzed annual and five year average pre-tax profit sales ratios for leading chains in local market areas for 1970-1974. A firm's profitability is positively and significantly related to market growth, concentration, its market share relative to leading competitors, and its recent rate of expansion by internal growth. These models, once corrected for heteroskedasticity, routinely explain over 80 percent of the variance in firm (not market) profit rates in local (SMA) markets. Moreover, firms that are recent entrants to a market have profit sales ratios that are significantly lower, *ceteris paribus*, than other firms and their profit-sales ratios are negative in many cases (Marion et al. [1979, p. 82]). This result indicates that the decision to enter does entail sunk costs. Firms that exit after a period cannot recoup lost profits and other expenses such as unamortized advertising outlays and specialized equipment/store design outlays.

(whether due to managerial superiority, successful product differentiation or good luck)" (Marion et al. [1979, p. 75]). Thus, we describe firms with rapid internal sales growth at the outset of the period in which we are examining entry as high competence firms. We will investigate the interaction of competence with other determinants of entry by analyzing the determinants of entry for three subsets of the top 20 chains: high, medium, and lower competence firms. One would expect that less competent firms would find a given set of entry barriers more difficult to surmount.

The hypothesized effects that are the components of each reduced form parameter are summarized in Table I. The sign above each group of structural parameters identifies its qualitative impact upon the sign of the reduced form coefficient. Absent prior information, each of the reduced form coefficients has an ambiguous sign.

The first variable in Table I is proximity. A nearby chain may find it easier to enter a market because it (1) may be able to service the new market from existing distribution centers, (2) may be relatively well known by potential customers, (3) may be able to use some of its knowledge about regional tastes and preferences or (4) may be able to hire or transfer managers to a nearby market more cost effectively. Therefore, the direct effect of proximity on entry is expected to be positive ($\alpha_2 > 0$). The indirect effect on entry is hypothesized to be negative because the threat of potential competition may, *ceteris paribus*, cause incumbents to be content with lower profits, thereby lowering the attractiveness of entry ($\alpha_1 \beta_7 < 0$). Whether, in fact, proximity influences the entry conduct of large chains can only be determined, it appears, by turning to the evidence. Do incumbent firms, in response to the threat of potential competition, limit profits to offset the ease of entry enjoyed by nearby chains and thereby discourage entry?

To measure proximity we will use two alternative variables. The Progressive Grocer Marketing Guidebook, an annual publication, defines wholesale food marketing areas. These areas are significantly smaller east of the Mississippi. Groceries can be transported roughly two hundred miles from a distribution center on a one-day run out and back; however, in the more densely populated east, a distribution center can only be competitive in a smaller geographic area. A distribution center located in Philadelphia, for example, cannot perform the wholesaling function for New York supermarkets as effectively

Table I Structural Components of the Reduced Form Coefficients for Determinants of Entry

Independent Variables	Profit Effect On Entry: Incumbent Structures	Profit Effect On Entry: Indirect Entry Effect	Direct Entry Effect
Proximity		$\overset{-}{\alpha_1 \beta_7}$	$\overset{+}{\alpha_2}$
Market Growth	$\overset{+}{\alpha_1 \beta_1}$	$\overset{-}{\alpha_1 \beta_2}$	$\overset{+}{\alpha_3}$
Concentration	$\overset{+}{\alpha_1 \beta_3}$	$\overset{+}{\alpha_1 \beta_4}$	$\overset{-}{\alpha_4}$
No. of Large Chains		$\overset{+}{\alpha_1 \beta_8}$	$\overset{-}{\alpha_5}$
Market Size	$\overset{+}{\alpha_1 \beta_5}$	$\overset{+}{\alpha_1 \beta_6}$	$\overset{-}{\alpha_6}$

as a metro New York distribution center can. Accordingly, we define the variable, ***PROX***, for the eastern half of the country to be the number of large chains currently not in a market but with a distribution center within 100 miles of that market. For the west the cutoff is 200 miles. An alternative measure used in this research is the binary variable, ***BPROX***, that has value zero if ***PROX*** is zero, and has value 1 if ***PROX*** is greater than zero.

The second variable in Table I, market growth, has a tripartite effect on entry conduct. With regard to incumbent structure, a more rapidly growing market may generate excess demand driving up the prices and profits of incumbent sellers ($\alpha_1\beta_1>0$). Yet, outside firms may find it easier to enter rapidly growing markets because entrants can gain sales in the market without displacing incumbents. This growth related increase in the ease of entry would, according to potential competition theory, moderate the profit taking of incumbents, thereby reducing the attractiveness of entry ($\alpha_1\beta_2<0$). Prior studies of the relationship between market growth and profitability in food retailing and other industries have generally found that the excess demand effect dominates the potential competition effect producing a positive relation between market growth and profitability. (Marion et al. [1979], Schmalensee [1989]). Thus, in rapidly growing markets the profit effect of market growth on entry as well as the direct entry effect of market growth are hypothesized to produce a positive relationship between entry and market growth in the reduced form model. Market growth (***MKTGROW***) is measured by the percent change in grocery store sales, deflated by the food at home component of the C.P.I., between 1967 and 1972.

The third variable in Table I is concentration (***CONC***). Different theories predict different relationships between concentration and profits and, thus, entry behavior. The traditional (Harvard school) hypothesis is illustrated in Table I. As seller concentration increases, the likelihood of collusion or dominant firm pricing and related higher profits among incumbents increases ($\beta_3>0$). Moreover, the ease of entry is hypothesized to decrease due to strategic entry barriers as documented by Orr [1974] and as suggested by recent theoretical research on strategic behavior (Carlton and Perloff [1990, pp. 410-421]). The indirect effect of increased entry barriers in more concentrated markets is to increase profits, possibly attracting entry ($\alpha_1\beta_4>0$). The direct effect is to reduce entry ($\alpha_4<0$). In the reduced form model, a negative relationship between seller concentration and entry would be evidence for the static limit pricing model's prediction, i.e., forestalled entry. A positive relationship between seller concentration and entry would be evidence for the dynamic limit pricing model's predicted entry in concentrated markets.

Either of these results would provide evidence against a competing hypothesis: that retail food markets are contestable. As Geroski and Masson note "either (a positive or negative) effect is at least plausible... It is worth mentioning that significant nonzero effects are evidence against contestability" (Geroski and Masson, [1987, p. 5]). In a contestable market, seller concentration would have no effect on entry patterns.

A third hypothesis, based upon Chicago School reasoning, also suggests that there is no relationship between concentration and entry. Large incumbents in highly concentrated markets may have high profits (rents) because they possess unique skills/resources and/or are more efficient than smaller established firms (Demsetz [1973]). There is no exercise of market power and no need for strategic actions by incumbent firms to exclude potential entrants (Gilbert [1989]). Since these rents are firm specific, they do not attract entry; i.e., potential entrants see no appropriable profits in the market.

Seller concentration was measured by the four firm supermarket sales concentration ratio (***CONC***) in 1972. At that time supermarkets were defined as grocery stores with sales of more than 1 million dollars annually.

The number of large chains in a local market(***NCHAIN***) is a second measure of the height of strategic barriers to entry. These barriers are associated with the size and multimarket operations of large food chains. Including this variable allows us to evaluate the chain store paradox hypothesis developed by Selten [1978], Kreps and Wilson [1982], and Milgrom and Roberts [1982]. Selten initially demonstrated that a chain store, faced with both the possible entrants in a variety of local markets and with the strategic option to fight or allow entry as each potential entrant appears cannot gain by fighting in a finite multiperiod game. Fighting early entrants to establish a reputation for toughness is not a credible strategy.[3] These authors, however,

[3] The reasoning behind this conclusion is as follows and is taken from Fisher [1989, p. 123]. It is assumed that fighting can keep a particular entrant out but that the costs of doing so are greater than the benefits of excluding that entrant. All players in the market know this. In this situation, the incumbent will not fight a single entrant. One might suppose, however, that with multiple entrants

demonstrate that if the entrants believe that there is a slight probability that the incumbent is irrational; i.e., will fight even when fighting does not maximize profits, in a finite game it may pay the incumbent to fight. Moreover, Milgrom and Roberts [1982] also demonstrate that the "paradox" disappears in an infinite horizon game. On this point Fisher writes:

> The reason the "paradox" arises in the first place is that it is assumed that there is a last potential entrant. Without that, it is easy to see that engaging in predatory behavior for the sake of reputation will make sense. Corporations in most contexts are assumed to have an infinite time horizon and surely cannot believe that any particular fight will be the last (Fisher [1989, p. 123]).

In fact, this type of behavior has been documented by case studies in food retailing (FTC [1969]). Using cash from other markets, large multi-market food chains cross-subsidize stepped up promotions and/or zone pricing schemes that lower prices in stores surrounding the entrant's stores. The indirect effect of this entry barrier via increased profits would attract entry ($\alpha_1 \beta_8 > 0$); however, the direct effect limits entry ($\alpha_5 < 0$). Given the game theoretic reasoning presented above, one would expect the direct effect to dominate; i.e., ***NCHAIN*** and entry are expected to be negatively related.

The final explanatory variable in Table I is market size (***MKTSIZE***). It influences incumbent profits directly, as well as indirectly via ease of entry. Very large Standard Metropolitan Areas (SMAs) may actually contain several smaller economic markets. To the extent that retail grocery firms hold stronger market positions in certain parts of an SMA and weaker positions (or are not present) in others, seller concentration will be understated in the aggregate SMA observation of these markets. This suggests a positive relationship between market size, profits and entry ($\alpha_1 \beta_5 > 0$). The indirect entry effect of market size on profits may also be positive if absolute cost and promotion-

the incumbents will fight early entrants to gain a reputation for toughness. Not so. Since the incumbent will certainly not fight the last entrant and the last entrant will know this, there is no point in fighting the next-to-last entrant or, by extension, by fighting anybody. Hence, there is no reputation for toughness to be gained.

related scale economy barriers are significant, as documented by Marion [1987], in larger markets ($\alpha_1 \beta_6 > 0$). The direct entry effect of these barriers in large cities would reduce entry ($\alpha_6 < 0$). No clear hypothesis emerges for the reduced form relationship between market size and entry. Market size is measured by the 1972 total grocery store sales in a local market.

3. Operationalization of the Model and Sample Selection

Unlike previous studies that have analyzed net changes in the number of firms in an industry or the total number of entries unadjusted for exits, this study examines the *ex ante* entry decisions of the top 20 supermarket chains.[4] These chains accounted for roughly 37 percent of U.S. grocery sales at the beginning of the 1972-1981 period analyzed in this study (Marion et al. [1979, p. 7]). Strategic group theory suggests that these leading supermarket firms are the most likely potential entrants into local markets that they currently do not serve. As Yip opines, firms in most markets can be classified into two major strategic groups, core and fringe. With regard to entry he states:

> Frequent entry of minor competitors does not indicate low barriers for firms wishing to become major competitors. Easy entry into an industry's fringe may have little effect on the forces of competition in the core of the industry (Yip [1982, p. 27]).

For the grocery industry, therefore, one cannot consider the opening of independent supermarkets or smaller food stores to be effective entry. As Shapiro and Khemani report for Canadian manufacturing, small operators have small and inconsequential impacts (Shapiro and Khemani [1987, p. 25]). Moreover, when entering the core of an industry, Berry and others have suggested that large firms are less deterred by entry barriers than small firms (Berry [1975, p. 25], Waterson [1981]).

[4] To determine the top 20 chains for this research, we did not include three chains that were in the top 20 in 1972. Two were acquired by other top 20 chains before 1981 (Arden Mayfair and Colonial) and a third, Allied Stores, tied its entry into new markets to the opening of supermarkets next to new K-Mart stores: a unique entry strategy that ultimately bankrupted Allied.

From the standpoint of cost efficiency each of the top 20 supermarket chains is large enough to attain size advantages in vertical distribution, commodity procurement, in-house manufacturing and private label programs (Cotterill [1977, p. 108]). Also, few other firms possess their combination of supermarket management skills, financial resources, and new store start-up ability (site procurement, new store design, and wholesaling support). These capabilities strongly suggest that large food chains are not only able to enter a market but also are able to become a competitive factor and influence the conduct of leading firms in the market.[5]

This study analyzes only *de novo* entry because entry by merger is complicated by multi-market acquisitions and by acquisitions of leading market share positions in some markets. We chose the ten year period between 1972 and 1981 because merger enforcement against market extension acquisition by leading grocery chains was considerably stronger during the 1970s than the 1980s, thus channeling any desires to expand geographically towards *de novo* entry. In fact, four of these chains were operating through the first half of the 1972-1981 period under consent decrees prohibiting market extension mergers (Marion et al. [1979, p. 144]).

The dependent variable, ***ENTRY***, is the number of entries by top 20 chains into a market during the 1972-1981 period. To analyze the interaction of the competence of potential entrants with entry barriers, ***ENTRY*** also is decomposed into three variables. The decomposition is based upon the 1970-1973 internal expansion rates [IER] of the top 20 chains. The IER for the top 20 chains is provided in column 3 of Table II. Its mean value is 39.4 percent and its standard deviation is 29.1. ***COMPENT1*** measures the number of entries in a local market made by the three firms whose IER was greater than the mean plus one standard deviation (high competence potential entrants). ***COMPENT2*** measures the number of entries in a local market made by the six firms whose IER was between the mean value and the mean plus one standard deviation (medium competence potential entrants). ***COMPENT3*** measures the number of entries in a local market made by the 10 firms below the mean value of

[5] Even if there are other firms in the queue of potential entrants, the entry conduct of the top 20 chains still may provide insight into the determinants of entry. A regional chain should, for example, also find it easier to enter a nearby rather than more distant market.

IER (lower competence potential entrants). One privately held chain is dropped from the decomposition due to the inability to compute an IER. The sum of the ***COMPENT*** variables plus the private chain equals the ***ENTRY*** variable.

Decomposing the dependent variable to examine the impact of competence upon entry is preferable to including a measure of the competence level of potential entrants on the right hand side of our model. Decomposition amounts to examining different firms in the queue of potential entrants and, thus, in keeping with Yip's [1982] and Waterson's [1981] critiques, allows us to explore the sensitivity of barrier effects for different types of potential entrants. Average competence, regardless of how it is measured, would not be a good predictor of a particular firm's competence. Moreover, construction of an average competence variable would require one to use the proximity variable described below to identify potential entrants for each local market. The decomposition approach allows entrant competence to be independent of proximity.

Prior research has demonstrated that standard metropolitan areas are reasonable approximations for local grocery markets except, as noted in the previous section, for very large SMAs (Marion et al. [1979], Lamm [1981], Hall, Schmitz and Cothern [1979], Parker [1986]). Both the U.S. Census of Retail Trade and major trade publications, including the annual editions of Metro Markets' Grocery Distribution Guide, used here to identify entry and other variables, report industry data for SMAs. Supermarket firms regularly use such data in their business planning process.

This study analyzes 129 of the 263 SMAs identified by the U.S. Census Bureau for 1972. The sample was selected as follows. The Metro Market Grocery Distribution Guide for 1972 covers only 152 local markets. Twelve of those are in New England and are excluded because of major differences in the definition of SMAs and Metro Market local marketing areas. Four Metro Market local market areas produced only two observations because Dallas-Ft.Worth and Scranton-Wilkes Barre are treated as single SMAs. Three other markets (Patterson-Clifton-Passaic, N.J.; Newburg, N.Y.; and New York, N.Y.) could

Table II Cross Tabulation of *DeNovo* Entries 1972-1981 by Chain and Distance from Closest Distribution Center: 129 Local Markets

CHAIN	Firm Sales Size Rank (1972)	1970-73[1] Internal Expansion Rate(%)	Miles from Closest Distribution Center: Less than 100	100-149	150-199	200-249	250-299	300-399	400-499	500-749	750-1000	More than 1000	TOTAL
Albertson's	14	78.1	4	2	1	0	3	1	1	3	0	4	19
Lucky	6	42.5	2	0	3	1	0	0	0	0	0	5	11
American	4	22.7	3	0	0	1	1	2	0	1	0	0	8
Kroger	3	14.7	3	0	1	2	0	0	0	0	0	0	6
Winn-Dixie	8	48.7	0	1	4	1	1	0	0	0	0	0	7
Safeway	2	42.1	1	2	2	0	1	0	0	0	0	0	6
G. Union	9	21.6	3	1	0	1	0	0	0	0	0	0	5
Fred Meyer	20	62.7	0	1	2	0	0	0	1	0	0	0	4
SGC	10	61.7	0	1	0	1	0	0	0	0	0	0	2
A&P	1	17.1	0	1	0	0	0	0	0	0	0	0	1
Food Fair	7	18.7	0	0	0	0	0	0	1	0	0	0	1
Publix	15	-	0	0	1	0	0	0	0	0	0	0	1
Fisher/Fazio	16	87.7	0	1	0	0	0	0	0	0	0	0	1
1st Nat'l.	12	10.2	0	1	0	0	0	0	0	0	0	0	1
Nat'l. Tea	11	-30.3	1	0	0	0	0	0	0	0	0	0	1
Jewel	5	36.3	0	0	0	0	0	0	0	0	0	0	0
Stop&Shop	13	37.1	0	0	0	0	0	0	0	0	0	0	0
Dillons	18	97.4	0	0	0	0	0	0	0	0	0	0	0
Giant Food	17	40.3	0	0	0	0	0	0	0	0	0	0	0
Waldbaums	19	37.2	0	0	0	0	0	0	0	0	0	0	0
TOTALS			17	11	14	7	6	3	3	4	0	9	74

[1] mean value = 39.4 percent, standard deviation = 29.1 percent

not be used because of major SMA definition changes during the period or because of incompatabilities between SMA and Metro Market geographic definitions. Six markets (Binghamton, N.Y.; Duluth, Minn.; Jackson, Miss.; Fayetteville, N.C.; Bristol, Tenn. and Appleton-Oshkosh, Wisc.) could not be used because of missing census data. We will evaluate the representativeness of this sample of 129 markets vis à vis the population of 263 markets when we present descriptive statistics in the next section.

4. Empirical Results

The reduced form model for entry was estimated using Tobit analysis. However, it initially may be useful to examine some descriptive results. Table II is a cross tabulation of *de novo* entries between 1972 and 1981 by entering chains and distance from a chain's closest distribution center. Albertson's, the no. 14 chain by sales size (column 2) but one of the three high competence firms as measured by its 1970-1973 internal expansion rate (column 3), was most active, entering 19 markets. Five of the chains entered none of the 129 markets in the sample. The other 15 chains tend to enter closer markets; however there is a clear correlation between the number of entries and entry of more distant markets. Possibly, experience lengthens the striking distance of potential entrants. The two most active chains, Albertson's and Lucky, entered markets in Texas and Florida that were more than a thousand miles from their nearest (West coast) wholesale distribution centers. These chains used locally based wholesalers for distribution services in distant markets, but eventually established their own warehouses. Use of independent wholesale distribution firms to enter distant markets, thus, appears to be a relatively uncommon strategy attempted only by the most expansion-minded firms in the industry.

The descriptive statistics for the variables used in the Tobit analysis are reported in Table III. The number of top 20 chain entries into local markets between 1972 and 1981 (***ENTRY***) varies from zero to four entries and averages 0.574 entries. Fifty markets have one entry and ten markets experienced multiple entry by the top 20 chains. The variable ***PROX*** indicates the number of top 20 chains not in the market but with distribution centers within 100 miles (East) or 200 miles (West) of the market. It ranges from zero to three and averages 0.736. The binary variable, ***BPROX***, has value zero if ***PROX*** is zero and value one

Table III. Descriptive Statistics for Variables Used in the Analysis of Entry by Large Grocery Chains in 129 Local (SMA) Markets: 1972-1981

Variable Name	Mean Value	Standard Deviation	Minimum Value	Maximum Value
ENTRY	0.574	0.748	0	4
PROX	0.736	0.923	0	3
BPROX	0.488	0.502	0	1
MKTGROW (%)	21.5	15.5	-10.6	87.7
CONC (%)	65.7	12.5	36.1	97.3
NCHAIN	3.15	1.29	0	7
MKTSIZE (Bil$)	0.314	0.395	0.062	2.63
COMPENT1	0.178	0.404	0	2
COMPENT2	0.233	0.508	0	3
COMPENT3	0.155	0.384	0	2
PROX1	0.132	0.340	0	1
PROX2	0.225	0.455	0	2
PROX3	0.364	0.612	0	3

if ***PROX*** is greater than zero. Its mean value is 0.488 indicating that 48.8 percent of the local markets have at least one top 20 chain as a potential entrant in close geographical proximity.

Growth in local (SMA) grocery sales (***MKTGROW***) is deflated by the food at home consumer price index, is from 1967 to 1972, and averages 21.5 percent. Local market seller concentration in 1972 (***CONC***) averages 65.7 percent when measured by the share of supermarket sales made by the top four supermarket firms. For the population of 263 SMAs, supermarket concentration averages 69.5 percent. Thus, the sample seems representative of the population. In the sample, ***CONC*** shows substantial variation, ranging from 36.1 to 97.3 percent. The number of top 20 chains in the market in 1972, ***NCHAIN***, averages 3.15 and varies from zero to seven. Market size (***MKTSIZE***), measured by 1972 grocery sales, averages 314 million dollars and ranges from 62 million to 2.63 billion dollars. The mean value for the population of 263 SMAs was 263 million dollars. Thus, the sample of 129 SMAs seems to represent somewhat larger SMAs than the population.

The variable ***COMPENT1*** measures the entry patterns of the three chains that have internal expansion rates for 1970-1973 greater than the mean internal expansion rate plus one standard deviation. The rapid growth rate of these three chains, Albertson's, Fisher/Fazio, and Dillons, is a proxy for their superior managerial competence. The mean value for ***COMPENT1*** is 0.178, and its value ranges from zero to two. From Table II one can see that 19 of the 20 entries measured by ***COMPENT1*** were made by Albertson's. Thus, ***COMPENT1*** primarily captures the conduct of one firm.[6] ***COMPENT2*** measures the number of entries made by the fourth through ninth chains when ranked by their 1970-1973 internal expansion rates. These six chains accounted for 30 entries in these 129 markets between 1972 and 1981. The mean value for ***COMPENT2*** is 0.233 and it ranges from zero to three.

COMPENT3 measures the number of entries made by the remaining chains, excluding Publix. These 10 lower competence firms entered 23 markets. The mean value for ***COMPENT3*** is 0.155 and it ranges from one to two.

[6] Throughout the 1970s, Albertson's was seen as "a standout in a so-so industry" (Forbes [1977, p. 146]). Rival firms frequently raided Albertson's for upper management talent, talent Albertson's seemed to have no trouble replacing from within (Forbes [1977, pp. 146-147]).

PROX1, ***PROX2***, and ***PROX3*** are the associated proximity variables for the three subsamples. ***PROX1***, for example, measures the number of ***COMPENT1*** firms (Albertson's, Fisher/Fazio, Dillons) that have a distribution center within 200 miles (West) or 100 miles (East) of a local market.

The Tobit estimation results for the model are reported in Table IV. In equation 1 the coefficient for the number of potential entrants (***PROX***) is positive and significant at the one percent level. Incumbents, *ceteris paribus*, are less able to forestall the entry of nearby large chains. Alternatively, in this industry with local geographic markets, more distant potential entrants are less likely to enter a market. Market Growth (***MKTGROW***) also has a positive coefficient that is significant at the one percent level. Entry is more likely in rapidly growing markets. Supermarket concentration (***CONC***) has a negative coefficient but is not statistically significant. This result suggests that the contestability or Chicago efficiency rent hypothesis holds in the concentration dimension.

A different conclusion, however, holds for the number of large chains. ***NCHAIN*** has a negative coefficient and is significant at the one percent level. Consistent with Duetsch's ([1975], [1984]) findings for the manufacturing sector, the more numerous large multimarket chains are in a market, the less likely is entry. Large diversified firms seem to be able to communicate credible entry deterring messages to potential entrants.[7] The evidence for ***NCHAIN***, therefore, supports the strategic entry forestalling theories of Milgrom and Roberts [1982] rather than contestability theory or the Chicago efficiency rent explanation. The last variable in equation 1, market size, has a negative coefficient; however, it is not statistically significant. Entry patterns do not seem to be affected by the size of an SMA.

Equation 2 introduces the binary measure for the presence of one or more nearby potential entrants (***BPROX***). The coefficient for ***BPROX*** is positive and more significant than the coefficient for ***PROX***. This suggests that it is the presence, and not the number, of potential entrants that is most important in predicting entry. The t-ratios for the other variables in the model increase; however, ***CONC*** and ***MKTSIZE*** remain insignificant.

[7] See Cotterill and Mueller [1980] for a related result. In their analysis of the changes in four-firm grocery concentration between 1967 and 1975, they report that the number of large chains is positively and significantly related to change in concentration.

Table IV Tobit Analysis of Entry by Large Food Chains in 129 SMAs: 1972-1981

Eq.	Dependent Variable	Intercept	# of Potential Entrants (PROX)[1]	Binary Proximity Variable (BPROX)	Market Growth (MKTGROW)	Four-Firm Concent. Ratio (CONC)	# of Chains (NCHAIN)	Market Size (MKTSIZE)	σ
1	***ENTRY***	0.994	0.480 (3.704)***		0.0267 (3.321)**	-0.0102 (1.047)*	-0.359 (3.463)***	-0.459 (0.948)	1.138
2	***ENTRY***	0.920		1.121 (4.657)***	0.0269 (3.455)**	-0.0107 (1.124)	-0.381 (3.805)**	-0.558 (1.147)	1.096
3	***COMPENT1***	-3.606	1.809 (3.590)**		0.0240 (1.913)**	0.0458 (2.540)***	-0.522 (2.729)***	-1.174 (0.861)	1.212
4	***COMPENT2***	1.874	1.742 (4.769)***		0.00838 (0.676)	-0.0407 (2.542)***	-0.355 (2.157)***	-0.131 (0.239)**	1.239
5	***COMPENT3***	0.530	0.939 (3.220)***		0.0347 (2.169)	-0.227 (1.469)**	-0.644 (0.715)	1.305	

NOTES: t - Statistics are in Parentheses
* Indicates significance at the 10 percent level
**Indicates significance at the 5 percent level
***Indicates significance at the 1 percent level

[1]The Proximity variable used in equation 3 is PROX1, in equation 4 is PROX2, and in equation 5, is PROX3.

The importance of the impact of proximity on entry for private and public policy decisions requires a more extensive analysis of the source of the significance of the reported relationships. Specifically, it is possible that ***PROX*** or ***BPROX*** are nonzero and entry occurs but it is by a chain from beyond the 100 (East) or 200 (West) mile boundary. Table V is a cross tabulation of ***BPROX*** with three possible entry situations: no entry, entry from inside the radius, entry from outside the radius. The cross tabulation does support the hypothesis that when there are no potential entrants nearby, entry is less likely. There are no potential entrants within the area for 66 markets (***BPROX*** = 0) and there is no entry in 47 of them. The remaining 19 have one or more entries from outside the radius. When ***BPROX*** is 1, there are 22 cases of no entry, 22 cases of entry by firms within the radius and 22 from outside the radius. Thus, when there is one or more entrants nearby, one half of the actual entries come from more distant firms. This suggests that the statistical results reported in Table IV for ***PROX*** and ***BPROX*** may be somewhat overstated and capture a different phenomenon. For some reason, distant chains seem to enter a market that has nearby potential entrants that have not moved into the market.[8]

Returning to Table IV, equations 3, 4, and 5 illustrate the impact of entrant competence upon the estimation results. Equation 3 analyzes the entry patterns of the high competence firms. ***COMPENT1*** includes Albertson's, Fisher/Fazio and Dillons. Proximity, as measured by ***PROX1***, continues to have a strong positive impact on entry. Market growth, the number of large chains, and market size also continue to perform as in the top 20 entry models; however market growth drops to the 10 percent significance level. A major change occurs in the performance of supermarket concentration (***CONC***). Its estimated coefficient is now positive and significant at the one percent level. Highly competent firms, essentially Albertson's in this sample, prefer to enter more concentrated markets. In fact, Albertson's strategy during the 1970s was to open supermarket-drug combination stores in areas such as Florida, where that format did not exist. The more entrenched structure implied by high concentration levels may make it more difficult for

[8] This result contradicts Sherman and Willet's [1967] supposition that the existence of other potential entrants may act as an entry deterrent for a particular entrant. Additional analysis of the presence of nearby potential entrants upon the behavior of more distant entrants also failed to confirm Sherman and Willet's hypothesis.

Table V Cross Tabulation of ***BPROX*** with the Occurrence and Striking Distance of Entry

	Occurrence and Striking Distance of Entry			
BPROX	No Entry	Entry from inside Proximity Radius	Entry from outside Regional Proximity Radius	Totals
0	47	-	19	66
1	22	22	22	66
Totals	69	22	41	132*

* The total numbers of cases adds to more than the 129 local markets observed, because entry from within and from beyond the proximity radius (100 miles in the east, 200 miles in the west) occurred in three markets.

incumbents to react to this new strategy, turning a barrier to entry into an advantage. Yip [1982] calls the ability of an entrant to exploit entrenched market characteristics with new strategies "gateways to entry".[9]

Equation 4 analyzes the entry conduct of six firms classified as moderate competence firms. ***COMPENT2*** includes Lucky, Winn Dixie, Safeway, Fred Meyer, Supermarkets General (SGC) and Giant Food. In this sample, supermarket concentration is now negatively related to entry and significant at the one percent level. These chains, *ceteris paribus,* are less likely to enter concentrated markets. Proximity, as measured by ***PROX2***, and the number of large chains continue to perform as in the top 20 ***ENTRY*** model. Market growth continues to have a positive impact but now is not statistically significant. The coefficient for market size remains insignificant but is now positive.

Equation 5 analyzes the entry patterns of the ten lower competence firms. ***COMPENT3*** includes American, Kroger, Grand Union, A&P, Food Fair, First National, National Tea, Jewel, Stop and Shop, and Waldbaums. Market growth regains significance. Concentration continues to be negatively related to entry and is significant at the 5 percent level. The number of chains continues to be negatively related to entry but loses significance, and the coefficient for market size is negative and insignificant.

The results for equations 3, 4, 5, in summary, show that the model generally does hold for firms with different competence levels. However, there appears to be a significant interaction between competence and the decision to enter more concentrated markets. Only the most competent firms are more likely to enter more concentrated markets. Other chains (16 of 19 in this sample) appear to be effectively forestalled from entering more concentrated markets. This result suggests that incumbents can establish a limit pricing regime in concentrated markets that excludes most but not all firms. Moreover, examining a large array of potential entrants may, as it does in this case, support the contestability and/or Chicago efficiency rent hypotheses, when a disaggregate examination of the queue of potential entrants does not.

The effects of changes in the explanatory variables on the

[9] Also see Waterson for a discussion of asymmetries between established firms and potential entrants [1981, pp. 532-535].

probability of entry are examined in Table VI. It employs selected equations reported in Table IV and selected values of the explanatory variables. Example 1 uses the estimation results from equation 1 of Table IV to predict that an average local market with no nearby potential entrant has a 0.389 probability of being entered by at least one large chain during the ten year (1972-1981) period. A unit increase in the number of nearby chains (an increase in ***PROX*** from 0 to 1) results in a 0.162 increase in the probability of entry. A ten percentage point increase in market growth raises the probability of entry by 0.09, and increasing the number of large competitors by one lowers the probability of entry by 0.12. We report the derivatives for concentration and market size. However, since the underlying parameter estimates are not significant, we will not discuss them.

Example 2, when compared with example 1, illustrates the interactive nature of the Tobit model. Both examples are computed from equation 1 of Table IV with identical values for the explanatory variables except now market growth is reduced one standard deviation from its mean value to a value of 6.04 percent. This reduction in the market growth rate reduces the probability of entry by approximately 16%, from 0.389 to 0.260. The probability derivatives for other explanatory variables whose values have not changed are also reduced by about 16%. This is intuitively plausible. Since the probability of entry is lower in low growth markets, there is less variation to be explained by the explanatory variables.

Example 3 employs equation 2 of Table IV to illustrate the impact of the binary potential entrant variable. When ***BPROX*** shifts from zero to one, the probability of entry increases by 0.36 to 0.677.

Examples 4, 5, and 6 employ equations 4, 5, and 6 of Table IV to illustrate the impact of the exogenous variables on the probability of entry of firms with different competences. Since there are different numbers of firms in the entry group and the three competence groups, the entry probabilities are not comparable across examples 4, 5, and 6 nor are the probabilities of these examples comparable to those in the first three examples.

The implications of this research for strategic planning and public policy are straightforward, provided two caveats are heeded. First, if there are other potential entrants in addition to the top 20 chains analyzed here, and even if they conform to this model, the probabilities of entry would be higher than those reported for the examples in Table VI. Second, the probabilities

Table VI Effects of Changes in Explanatory Variables on Probability of Entry

Ex.	Dep. Var.	*P(ENTRY)*	$\frac{\partial P}{\partial PROX}$	$\frac{\partial P}{\partial BPROX}$	$\frac{\partial P}{\partial MKTGROW}$	$\frac{\partial P}{\partial CONC}$	$\frac{\partial P}{\partial NCHAIN}$	$\frac{\partial P}{\partial MKTSIZE}$
1	***ENTRY***	0.389	0.162		0.0090	-0.0034	-0.121	-0.155
2	***ENTRY***	0.260	0.137		0.0076	-0.0029	-0.102	-0.131
3	***ENTRY***	0.314		0.363	0.0087	-0.0035	-0.123	-0.190
4	***COMPENT1***	0.048	0.149		0.0020	0.0038	-0.043	-0.097
5	***COMPENT2***	0.093	0.233		0.0011	-0.0055	-0.048	-0.018
6	***COMPENT3***	0.088	0.115		0.0049	-0.0042	-0.028	-0.079

NOTES: Examples 1, and 2 are computed from equation 1 of Table 4. Example 3 is from equation 3. Examples 4, 5, and 6 are from the corresponding equations in Table 4.

In examples 1, 3, 4, 5 and 6, ***MKTGROW***, ***CONC***, and ***MKTSIZE*** are set to their mean values, ***PROX*** or ***BPROX*** is set to 0, and ***NCHAIN*** is set to 3, the integer nearest its mean.

In example 2, all variables are set as above. However ***MKTGROW***, is set to 6.04%, one standard deviation below its mean, to illustrate the interactive properties of the Tobit model.

computed from the model are for entry during a ten year period. Federal merger guidelines seek to assess the probability of entry in two years. Assuming a uniform density function over time allows one to calculate a two year probability of entry. Even with one or more potential entrants nearby (10 year probability of entry around 0.677 as in example 3), the resulting 2 year probabilities are about 0.2 for the average SMA, thereby suggesting relatively slow response to any exercise of market power by incumbent firms.[10]

5. Conclusions

Our primary conclusion from these results is that entry by the top 20 chains into local food markets is clearly related to potential entrants' proximity to the local market, market growth, concentration, the number of large chains that are incumbents in the local market, and the competency of potential entrants as measured by their recent internal expansion rate. With regard to competing theories that relate strategic entry barriers to entry patterns, different components of the analysis provide support for different hypotheses. However, the most general model - one that controls for the influence of potential entrant competence - provides general support for strategic entry barrier theories developed by limit pricing and game theorists. It provides little support for the contestability or Chicago efficiency rent hypothesis.

The most competent potential entrants seem to behave as do other entrants, except they are more likely to enter more concentrated markets. This is consistent with Yip's "gateways to entry" hypothesis. Since incumbent firms have committed resources that are not easily reversed, an entrant with resource flexibility may be able to exploit changing consumer preferences or new technologies. It also suggests that incumbents in highly concentrated markets can limit price to exclude most but not all potential entrants. This conclusion does not imply that high competence firms can enter concentrated markets or any other type of market with ease. Different strategies work against

[10] Using example 3 of Table VI, the 10 year probability of one or more entries for an average SMA with one or more potential entrant is 0.677. This implies a probability of no entry of 0.323 for the 10 year period, or a probability of $(0.323)^{1/5}$ = 0.798 of no entry for two years. The probability of one or more entries during the two year period is 1 - 0.798 = 0.202.

different rivals.

With regard to future research on entry decisions, it would seem useful to continue to focus on the composition of the queue of potential entrants as well as barriers to entry when explaining entry decisions. As shown here, one way to do this is to employ strategic group theory to model the entry decisions for a specific set of firms that are identifiable as the most likely potential entrants rather than examine aggregate entry by any and all firms into an industry. This disaggregate approach enables a more refined empirical analysis of alternative theories of potential competition than has heretofore been conducted by industrial organization economists.

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