Capital Structure and Product-Market Competition: Empirical Evidence from the Supermarket Industry

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By Judith A. Chevalier*

This paper establishes an empirical link between firm capital structure and product-market competition using data from local supermarket competition. First, an event-study analysis of supermarket leveraged buyouts (LBO's) suggests that an LBO announcement increases the market value of the LBO chain's local rivals. Second, I show that supermarket chains were more likely to enter and expand in a local market if a large share of the incumbent firms in the local market undertook LBO's. The study suggests that leverage increases in the late 1980's led to softer product-market competition in this industry. (JEL D43, G14, G32, G34, L13, L81)

During the late 1980's corporate debt rose dramatically, due in large part to an unprecedented wave of leveraged buyouts (LBO's). This large-scale experiment with firm capital structure refocused both popular and academic attention on the issue of how a firm's financing choices might affect its performance and behavior. Numerous recent theoretical works have examined one component of this issue—the question of how a firm's capital structure affects competition in the market for the firm's products. However, very little work has been done to determine empirically whether a real linkage exists between capital markets and product markets.[1]

In this paper, I test between two classes of theoretical models by examining the share price response of supermarket chains to the announcement of a rival chain's leveraged buyout and by examining the entry, exit, and expansion behavior of supermarket chains. The first class of models predicts that increases in firm leverage tend to "soften" product-market competition. The second class of models predicts that increases in firm leverage tend to "toughen" product-market competition.[2] A finding that *either* of these two hypotheses is true would be important in that it would suggest that financing decisions can have real product-market effects.

I examine the effect of debt on product-market competition by studying supermarket chains in local markets. The supermarket industry is a natural laboratory for testing these theoretical models for two reasons. First, many large supermarket chains undertook leveraged buyout transactions in the late 1980's. This allows examination of how product-market competition "shakes out" after competitors undertake sudden,

[1] The only empirical work of which I am aware is A. Michael Spence (1985), José C. Guedes and Tim C. Opler (1992), and Gordon M. Phillips (1992).

[2] The terms "tough" and "soft" price competition are used in the sense of John Sutton (1991). The "toughness" of price competition differs in two markets if, holding the concentration in the two markets constant, price–cost margins in the two markets differ.

dramatic increases in debt. Second, super-market competition takes place at the local level. This allows a comparison of super-market competition across markets.

The findings in this paper are consistent with the group of theoretical models of capital structure and product-market com-petition that suggest that product-market competition becomes "softer" when lever-age increases. These models include work by Drew Fudenberg and Jean Tirole (1986), Patrick Bolton and David S. Scharfstein (1990), and Phillips (1991). The results are inconsistent with other models, including James A. Brander and Tracy R. Lewis (1986), Vojislav Maksimovic (1988), and Julio J. Rotemberg and Scharfstein (1990), which predict that leverage changes man-agerial and shareholder incentives in a way that makes product-market competition "tougher."

The organization of the rest of the paper is as follows. Section I describes LBO activ-ity in the supermarket industry. Section II presents an event study examining the an-nouncement effects of supermarket lever-aged buyouts on rival supermarket chains. Section III describes the empirical predic-tions of the hypotheses of capital structure and product-market competition for entry, exit, and expansion. Section IV describes the data for the study of entry, exit, and expansion. Section V presents the results. Section VI examines an alternative explana-tion for the empirical results in Section V, and my conlcusions are presented in Sec-tion VII.

I. LBO Activity in the Supermarket Industry

A supermarket is defined by the publica-tion *Progressive Grocer* (1989) as a retail food store that has annual sales of more than $2 million and has greater than 9,000 square feet of selling space. Supermarkets account for 70 percent of retail food store sales but only 10 percent of retail food establishments. According to *Progressive Grocer* (1989), there were approximately 30,754 supermarkets in the United States in 1988, 55 percent of which belonged to chains of 11 or more stores.

At the national level, the supermarket industry appears to be relatively unconcen-trated. The four largest supermarket chains accounted for only 16 percent of U.S. gro-cery store sales in 1982 (Phillip K. Kaufman and Charles R. Handy, 1989). However, no supermarket chain in the United States is truly national. For example, the largest chain in the United States, American Stores, op-erated in only 18 states in 1990. Thus, while the industry is relatively unconcentrated on a national level, local markets can be highly concentrated. The average metropolitan statistical area in the United States had a four-firm supermarket concentration ratio of 58 percent in 1982.

Supermarket LBO's occurred primarily between 1985 and 1988.[3] The largest trans-actions were the $5.3 billion Safeway LBO, the $4.1 billion Kroger leveraged recapital-ization, the $1.8 billion Supermarkets Gen-eral LBO, and the $1.2 billion Stop & Shop LBO. These four companies alone owned nearly 4,000 U.S. supermarkets at the time of their LBO's. During this period, it was also common for smaller regional chains and divisions of larger chains to undertake LBO's. Altogether, 19 of the 50 biggest su-permarket chains in the United States have undertaken LBO's. They accounted for ap-proximately $72 billion of the $297 billion in supermarket sales in 1991.

LBO activity has not been concentrated in any single geographic region. In the sam-ple used in this study, LBO firms accounted for 16 percent of the stores in Midwestern markets, 17 percent of the stores in South-ern markets, 21 percent of the stores in Northeastern markets, and 42 percent of the stores in Western markets. Part of the large LBO concentration in the West is due to the enormous importance of Safeway on

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[3] There is also one instance of a leveraged recapital-ization in this industry, which was undertaken by Kroger. A leveraged recap is a transaction in which a firm borrows in order to pay a large dividend to share-holders of at least 50 percent of the former equity value of the firm. Because this recap resulted in debt levels for Kroger similar to typical LBO debt levels, it is included in this analysis as an LBO.

the West Coast. Safeway's 1985 market share in cities in the sample in the West totaled nearly 25 percent.

The vast majority of the leveraged buyouts were not the result of unconstrained decisions by management and shareholders. Instead, most of them were undertaken in response to unwanted takeover attempts. In fact, all four of the biggest deals (and many of the smaller ones) were undertaken to thwart the unwanted takeover attempts of the Haft family, which controls the Dart drugstore chain.

This description of LBO activity in the supermarket industry leaves unanswered the question of what caused the LBO's in this industry.[4] It has been suggested by Peter Magowan (1989), the CEO of Safeway stores, which undertook an LBO in 1986, that the main effect of the Safeway LBO was to force Safeway to sell or spin off divisions which were not profitable. Magowan suggests that Safeway excised the divisions in which it was not as strong a competitor as its rivals (see Magowan, 1989). This suggestion by Magowan is practically a restatement of the basic "empire-building" rationale for LBO's suggested by Michael C. Jensen (1989). If a good firm has a few bad divisions, then value can be gained by buying the firm and turning over the bad divisions to higher-valued users. These post-LBO asset sales were common among LBO chains. If this model of LBO's is correct, then, in the study of entry, exit, and expansion, by examining the local markets in which Safeway chose to remain an active

competitor, one examines those local markets where competition was not an important cause of the LBO.[5] The local-market nature of supermarket competition helps to "clean out" the endogeneity of the LBO in the study of entry, exit, and expansion. The issue of how the endogeneity of LBO's affects the results will be taken up in Section VI.

II. An Event Study of Supermarket LBO's

In this section, I examine the stock-return response of supermarket chains to the announcement that a rival chain is undertaking a leveraged buyout.[6] This approach of looking at the event responses of rival firms was pioneered by B. Espen Eckbo (1983) and Robert S. Stillman (1983) in the merger literature. If leveraged buyouts are expected to make product-market competition softer, rival supermarket chains should exhibit positive abnormal returns around the time of LBO announcements; if LBO's are expected to lead to tougher product-market competition, rival supermarket chains should exhibit negative abnormal returns around the time of LBO announcements.

A. Methodology and Data

I focus my analysis on a single industry in order to separate the hypothesis that the LBO leads to a change in product-market

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[4] Perhaps, given the importance of the Haft family in initiating takeover attempts in this industry, the better question to ask is: what factors contributed to the Haft family's choices of takeover targets? An examination of newspaper and magazine accounts of these takeovers reveals no statements by the Haft family indicating why it chose particular targets. One might hope to analyze the family's plan by examining the reforms that the family instituted at the supermarket chains that were actually taken over. However, the only supermarket chain that the Haft family actually took over was Shoppers Food Warehouse. It is difficult to try to infer what the Haft family would have done with Safeway or Kroger by examining what changes they effected at a chain with only 30 stores.

[5] The explanation suggested here for LBO's—that they serve to force firms to excise bad divisions, and to leave them only with divisions in which they are relatively efficient producers—is supported by the evidence. LBO firms are not statistically significantly more likely to be closing stores in unclosed divisions than non-LBO firms. At least in this regard, their behavior in the divisions not sold off seems unaffected by the LBO.

[6] I do not focus on the stock-return response of the leveraging firm itself. A leveraged buyout transaction occurs when the managers of the firm (or others) offer to pay a premium over the prevailing market price of the firm. The stock price rises to reflect this premium. The managers of the firm would not undertake a leveraged buyout if they did not believe that they could improve firm value.

competition from the alternative hypothesis that abnormal event returns are due to increased speculation that more LBO's will occur in the industry. I use information about local-market competition to separate firms in the industry that are directly competing with the leveraging firms from firms that are not directly competing with the leveraging firms.[7] If an LBO greatly improves the financial outlook of the firm undertaking the LBO and the LBO announcement increases speculation that other supermarket chains will also undertake an LBO, then one would expect all firms in the industry to experience a positive stock-return response to the LBO announcement. However, if the LBO is expected to soften product-market competition, then one would expect supermarket chains operating in the same local markets as the leveraging chain to exhibit a positive stock-return response to the LBO announcement. Supermarkets that do not compete directly with the leveraging chain should have no return response to the LBO announcement. Finally, if LBO's are expected to make product-market competition tougher, then direct competitors should experience a negative share price response, while noncompetitors should experience no significant share price response.

I examine the leveraged buyouts of Safeway, Supermarkets General, and Stop & Shop and the leveraged recapitalization of Kroger, the largest leveraged transactions undertaken in the industry. The event window begins 30 days prior to the first announcement suggestive that an LBO or leveraged recapitalization might occur and ends on the day of the firm's final announcement that it was undertaking an LBO or leveraged recapitalization.[8] Announce-

ments and announcement dates were obtained from the *Wall Street Journal Index*. Since all four of the transactions studied here were undertaken in response to takeover attempts, the event window begins prior to the first public announcement suggesting that a takeover might occur. Because the event window extends until the announcement of the LBO, it can be interpreted as reflecting the market's expectation of the change in the value of the rival firm due to the LBO, as long as no confounding information was released within the event window.

The first announcement leading up to each leverage transaction under study and its date are listed in Table 1. Table 1 also lists the date of the announcement that the leverage transaction would definitely occur. The daily stock returns of 13 supermarket rivals are studied. The rivals are listed in Table 2. These rivals represent all firms that derived at least 80 percent of their revenues from supermarket sales and traded continuously from January 1, 1985, through October 10, 1988, the date of the announcement of the Kroger leveraged recapitalization.

The event study was conducted using daily data on the stock-market returns of the supermarket chains. The equation to be estimated, a variant of the basic market model has the form following form:[9]

$$R_{it} = \alpha_i + \beta_i R_{mt} + \sum_j \delta_{ij} D_{jt} + e_{it}$$

where R_{it} = firm i's return at date t, R_{mt} = the return on the value-weighted NYSE/AMEX index at date t, j indexes the four events, α_i, β_i, and δ_{ij} are parameters to be estimated, e_{it} is an error term, and D_{jt} is a dummy variable which equals 1 during the event window for event j and 0 otherwise.

The stock return data used for estimation start on the first trading day of 1985 and extend through Kroger's announcement of

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[7]Michael D. Whinston and Scott C. Collins (1992) separate competing airlines from noncompeting airlines in their event study of the entry of People Express.

[8]This wide event window was chosen because convicted insider-trader Ivan Boesky was investigated by the Securities Exchange Commission for insider-trading in at least one of these transactions.

[9]For a discussion of the market model, see Eugene F. Fama (1976).

TABLE 1—EVENTS INCLUDED IN THE EVENT ANALYSIS

Event	First announcement	Date	Date final transaction announced
Safeway LBO	Dart Group announces that it has acquired a 6-percent stake in Safeway	6/13/86	7/29/86
Supermarkets General LBO	Dart Group proposes to buy Supermarkets General	3/10/87	4/23/87
Stop & Shop LBO	Dart Group announces that it seeks a major stake in Stop & Shop	1/15/88	3/1/88
Kroger leveraged recap	The Haft family (who control Dart Group) reveals that it has a major stake in Kroger	9/13/88	10/10/88

Note: The event window is from 30 days prior to the first announcement, through the announcement of the final transaction.

TABLE 2–RIVAL SUPERMARKET CHAINS INCLUDED IN THE EVENT STUDY

Albertsons
American Stores
Brunos
Delchamps
Food Lion
Foodarama
Giant Food Stores
Great Atlantic and Pacific Tea Company
Hannaford Brothers
Marsh Supermarkets
Ruddick
Weis Markets
Winn-Dixie

its leveraged recapitalization in October 1988. These data are obtained from the Center for Research in Security Prices.

The event response parameters are estimated using seemingly unrelated regressions (SUR). This methodology is employed because the error terms from the market-model equation for a supermarket chain should be contemporaneously correlated with the error terms for other supermarket chains. For each debt event, I calculate the average event coefficient of firms that compete directly with the leveraging firm, and I calculate the average event coefficient of firms that do not compete directly with the leveraging firm. The firms directly competing with the leveraging firm are constrained to have a single event response, and the firms not directly competing with the leveraging firm are constrained to have a single event response for each event. These constraints cannot be rejected at conventional significance levels.

For each event, volumes of the *Supermarket News*'s annual *Distribution Study of Grocery Store Sales* were used to determine which chains competed with the chain undertaking the LBO. This book lists the names of stores operating in each of the Metropolitan Statistical Areas (MSA's) in the United States. The *Supermarket News* guide lists store names, not parent firms. Information from annual 10K filings with the Securities and Exchange Commission and the 1988 *Retail Tenants Directory* were used to link store names to parent firms. Two supermarket chains were considered to be in direct competition with one another if there was any MSA in which both owned stores listed in the *Supermarket News* guide.

B. Results

Table 3 shows the results of an SUR estimation of return responses to the four events. The return responses for the competing firms are shown in column 1; the return responses for noncompeting firms are shown in column 2. The table shows that the return responses of the competing firms

TABLE 3—EVENT COEFFICIENTS

| Event | Event coefficient for other supermarket chains | |
	(1) Competing	(2) Not competing
Safeway LBO	0.003168** (0.000966)	0.001614 (0.001044)
Supermarkets General LBO	0.001782 (0.001141)	−0.000175 (0.000817)
Stop & Shop LBO	0.001573 (0.001381)	−0.000082 (0.000793)
Kroger leveraged recapitalization	0.001857* (0.000930)	0.000991 (0.001229)

Notes: Column 1 reports event coefficients for firms competing in some of the same MSA's as the "event" firm; column 2 reports event coefficients for firms competing in none of the same MSA's as the "event" firm. The coefficients were estimated using seemingly unrelated regressions. Standard errors are given in parentheses.

   *Statistically different from zero at the 5-percent level.

   **Statistically different from zero at the 1-percent level.

are positive for all four events, consistent with the hypothesis that competition is expected to become softer following the LBO. The return responses are statistically significant at the 5-percent level for the Safeway and Kroger events but statistically significant at only the 12-percent level for the Supermarkets General event and at the 25-percent level for the Stop & Shop event. The joint hypothesis that the event coefficients for all four events equal zero is rejected at the 1-percent significance level.

The return responses for the noncompeting firms are positive for two of the four events, but are not statistically different from zero at standard significance levels. The Safeway event is statistically different from zero at the 12-percent level. It is not surprising that this event is the one in which there is some response of the noncompeting firms since the Safeway LBO was the first large LBO in this industry, and thus, the speculation effect might have been important for this LBO. However, the joint hypothesis that the event coefficients for all four events equal zero cannot be rejected at even the 55-percent significance level.

The measured return responses for the competing firms, while statistically significant as a group, appear to be quite small. The Safeway event, for example, is estimated to lead to an abnormal increase in value for the competing firms of only 0.32 percent, and the other event coefficients are even smaller. However, this small event response may be due to the small amount that even the "direct competitors" compete with the firm undertaking the LBO. For example, at the time of the Kroger leveraged recapitalization, American Stores owned approximately 1,500 stores in 29 states; Kroger owned approximately 1,400 stores in 25 states. However, I could find records of the two firms competing in the same MSA in only seven states. Thus, the magnitudes of the coefficients estimated do not reflect the changes in the expected profitability of those operations of each supermarket rival that actually competes with the leveraging chain.[10]

The event-study results suggest that the present discounted value of the expected future profits of a supermarket chain rises when a rival supermarket chain announces that it is undertaking an LBO or leveraged recapitalization. These results are consistent with the hypothesis that product-market competition following the LBO is expected to become softer. In the next section, this hypothesis is tested further using data on the entry and exit of supermarket chains.

III. Empirical Predictions for Entry and Expansion

The theories of capital structure and product-market competition posit that changes in capital structure change the toughness of product-market competition. If an LBO changes the toughness of product-market competition, then, following the

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[10] R. Preston McAfee and Michael A. Williams (1988) make a similar point about the estimated magnitudes of the effects of mergers on rival firms.

LBO of a supermarket market chain in a local market, one should observe a change in the structure of the local market.[11] Specifically, if an LBO leads to an *increase* in the "toughness" of product-market competition, then rival firms would want to exit the local market or close stores in the local market. On the other hand, if a leverage increase leads to a *decrease* in the toughness of product-market competition, firms competing in the local market would want to add stores there, and firms not competing in the local market would want to enter.

In the analysis which follows, I will examine whether, controlling for local market conditions, supermarket chains tend to be adding or subtracting stores in markets dominated by LBO firms. I measure the percentage change in total supermarkets across cities in which LBO's were of differential importance. The analysis is complicated by the fact that the LBO episode is very recent. The empirical strategy undertaken here assumes that one should observe gradual movement toward a market structure with more firms and stores if competition is "softened" by LBO's; one should observe gradual movement toward a market structure with fewer firms and stores if competition is "toughened" by LBO's.

To address the problem that all post-LBO adjustments may not have occurred by the time the data were constructed, two additional tests are undertaken. I examine the decision by large supermarket chains to add or subtract stores in cities in which they were incumbents. I separately study whether local markets experience de novo entry by nonincumbent supermarket chains. This is done because one would expect that a chain operating in a local market is familiar with local real estate and conditions and has established supply channels and, therefore, can begin to respond quickly to a change in the competitive situation in the local market. Supermarket trade sources confirm that de novo entry into a city requires more time and planning.

Obviously, this empirical strategy assumes that the LBO changes capital structure and that these changes in capital structure impact subsequent product-market competition. If, on the other hand, the LBO were in some way endogenously determined by product-market competition, then any inference about the effect of LBO's on product-market competition would be spurious. This issue will be taken up in Section IV and Section VI.

IV. Data

The data consist of information on supermarket chains in 85 Metropolitan Statistical Areas (MSA's) in 1985 and 1991. The data are drawn from *Progressive Grocer*'s (1986, 1992) publication *Market Scope*.[12] This publication lists the supermarket chains and the number of stores operated by each chain in the most-populated 100 MSA's in the United States.[13] The book also lists the total number of supermarkets owned by independent firms in the MSA. The 85 MSA's studied consist of those MSA's which were among the largest 100 in both 1985 and 1991 and for which the official Census definition of the MSA borders remained un-

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[11]Sutton (1991) refers to the "toughness" of price competition as determining market structure. Here, I will refer to the "toughness" of product-market competition. I use this term because the competition takes place on both the price and quality dimensions. The methodology in this paper cannot separate changes in price competition from changes in quality competition.

[12]This is a different data source than the one used to determine supermarket locations for the event study. The *Progressive Grocer* data provide high-quality counts of the number of stores owned by each supermarket chain in an MSA. The *Supermarket News* data include counts, but they are obtained by surveying the local newspapers and are of lesser quality. For the event study, the *Supermarket News* data were used to determine whether firms competed in any of the same MSA's. For this reason, a source was needed which, unlike the *Progressive Grocer* data source, included all MSA's.

[13]Some of the *Progressive Grocer* data were checked against microfilm copies of old telephone books to confirm the quality of the data source.

changed between the two years.[14] The use of MSA-level data may be of concern, since there is no reason to assume that an MSA is the correct measure of the relevant market when considering supermarket competition. However, my examination of the *Progressive Grocer* data shows that the MSA's correspond closely to divisions of large supermarket chains. In general, all of the supermarkets that one chain has in a division are overseen by a single divisional manager and are served by a single division warehouse. Furthermore, one important way in which supermarkets compete is by distributing weekly circulars in the local newspapers that describe the sales in the supermarkets that week. A single flyer is generally issued for all of the supermarkets in a division or, approximately, all of the supermarkets in an MSA.

All of the firms in the 85 MSA's are classified by whether or not they have undertaken an LBO. I use this mechanism to divide firms into low-debt and high-debt firms because actual leverage ratios are unavailable for privately owned firms. The power of the test is weakened by the fact that many of the "low-leverage" firms may have reasonably high levels of debt although they did not undertake an LBO.[15]

The information on LBO's was obtained in two ways. First, quarterly editions of *Mergers and Acquisitions* contain all ownership transactions (including LBO's) of greater than $1 million. Second, all references to transactions involving the supermarket parent companies in the sample were searched using *Predicasts Funk and Scott Index, United States*, which indexes *Supermarket News*, *Supermarket Business*, and *Progressive Grocer*, the major industry trade

publications. From these sources, a definitive list of LBO's was assembled. A leveraged or LBO firm is defined as a firm that underwent an LBO (or leveraged recapitalization) any time between 1981 and 1990.

LBO firms typically exit several local markets following the LBO, usually by selling the local division to another chain or spinning it off to the division's managers soon after the LBO. In total, 633 of the 13,512 supermarkets in the study were sold in a post-LBO asset sale. Of these 633 supermarkets, 187 were sold to the division's management in a second LBO of the division.

My approach is to treat the assets as if they were always owned by the eventual purchaser.[16] I take this conservative approach because, otherwise, one would see increased entry into LBO markets simply because of these asset transfers, not because of a change in post-LBO product-market competition.

For example, Safeway sold its Southern California division to Vons shortly after the Safeway LBO in 1986. Here, I add the stores in my sample that were part of Safeway's Southern California division to Vons's store total for 1985. Thus, for a Southern California city, the change in stores for Vons equals the net total of Safeway and Vons stores opened or closed in that city between 1985 and 1991. The change in the number of Safeway stores in any Southern California city equals zero. In constructing independent variables such as the LBO share of a market, the same convention is used.

Mergers among non-LBO firms were handled in a similar way. The stores of two firms which merged were treated as if they were always owned by the same firm. The one exception to this rule is that information about the acquisitions of very small independent chains was not generally available. Purchases of small independent chains by chains in the sample are thus counted as entry or expansion.

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[14] Unfortunately, because the MSA's were redefined for most of New England, the Bridgeport, Connecticut, MSA is the only New England MSA appearing in the sample. This removes from consideration most of one LBO chain which was very successful (Stop & Shop) and most of another which was very unsuccessful (Supermarkets General).

[15] I have confirmed that the debt ratios of non-LBO firms with publicly traded debt or equity are in fact, much lower than the debt levels of LBO firms.

[16] This treatment is undertaken in constructing both the dependent and the independent variables that will be described later.

Information about asset sales was obtained by checking the *Wall Street Journal Index*, *Mergers and Acquisitions*, *Supermarket News*, *Supermarket Business*, and *Progressive Grocer*. Demographic data are obtained from Donnelly Marketing Information Services, a market research firm which provided the demographic data for the *Progressive Grocer* volume.

V. Methodology and Results

A. *Full-Market Regressions*

I first test the hypothesis that LBO's changed product-market competition by determining whether LBO's lead to more or fewer stores "fitting" in the local market. If a market can support more stores following an LBO than it could before (adjusting for other changes in the market), this supports the hypothesis that LBO's "soften" product-market competition. If fewer stores fit, this supports the hypothesis that LBO's "toughen" product-market competition.

The strategy employed here is to measure the percentage change in the number of stores in each MSA between 1985 and 1991 and to check whether this measure is related to the share of stores in each market in 1985 owned by chains that eventually undertook LBO's. This allows measurement of how market structure changed over the period in which the LBO's took place.

The specifications in this section control for several factors that might be expected to contribute to the growth of the number of supermarkets in a local market over this period: the growth in the number of households in the MSA and household growth adjusted for MSA area, the growth in median income and its square, and the change in the share of households that have an income of less than $10,000 were included. These variables are described in Table 4.

The use of these five market characteristics implicitly assumes that each market was in an equilibrium state in 1985: changes in the market structure between 1985 and 1991 should be due to changes in the market characteristics between 1985 and 1991. To adjust for the possibility that an MSA was

in an "over-stored" or "under-stored" equilibrium in 1985, I also include two characteristics of the market in 1985: a measurement of a city's deviation from the expected number of stores per household in 1985, and a measure of market concentration in 1985. These variables are also described in Table 4. The variable of interest, the share of LBO firms in the MSA, is the share of stores in the market in 1985 owned by a supermarket chain that would undertake an LBO by 1990.

Table 4 provides summary statistics for all of the variables used in this and subsequent specifications. Results for an ordinary least-squares (OLS) regression of the percentage change in the number of stores in a city between 1985 and 1991 on the LBO share of the market and the controls for market conditions described above are shown in column 1 of Table 5.

Table 5 shows that the LBO share of the market has a positive coefficient, but the coefficient is only statistically significant at the 22-percent level. The magnitude of the coefficient implies that, if a firm in an MSA owning 10 percent of the stores undertakes an LBO, the number of stores in the market is expected to grow by 1-percent more than it would otherwise. This insignificant effect may be due to there being, in fact, no effect of LBO's on the toughness of product-market competition or may be due to the fact that there simply may not have been enough time for market conditions to respond fully to the LBO's.

The second column of Table 5 makes a preliminary attempt to ascertain whether an effect might have been observed had more time elapsed since the LBO's. It repeats the regression specification of the first column but separates the LBO share of total stores into two groups: the share of stores that undertook LBO's prior to 1988 and the share of stores that undertook LBO's during or after 1988. This is done because, if it takes time for the market to adjust to changes in competition, one might not expect to see much response to the later LBO's. Indeed, Table 5 shows that the coefficient for the store share of LBO firms which took place prior to 1988 is positive

TABLE 4—SUMMARY STATISTICS

Variable	Description	Mean	Standard deviation
A. *Variables:*			
Change in households (10,000's) [percentage change households]	Change in the number of households in the MSA between 1985 and 1991	5.50 [12.0]	5.93 [10.1]
Change in households per square mile [percentage change households per square mile]	Change in households per square mile in the MSA between 1985 and 1991. This is included because the change in households may have a different impact if spread over a very large or very small area.	49.7 [0.01]	157 [0.03]
Change in median income ($10,000's) [percentage change in median income]	Change in median income in the MSA between 1985 and 1991	1.53 [64.2]	4.73 [16.5]
Change in median income squared (in $1 × 10^8) [percentage change in squared income]	Change in squared median income in the MSA between 1985 and 1991	9.95 [172]	4.66 [53.7]
Change in the share households with income less than $10,000	Change in the share of households with annual incomes of less than $10,000 in the MSA between 1985 and 1991	− 0.0534	− 0.0227
Deviation in mean stores per household [percentage deviation in mean stores per household]	MSA's deviation in 1985 from the number of stores that it would be predicted to have given the number of households in the MSA in 1985. I estimate that MSA's in 1985 have 40 stores plus $2.3 × 10^{-4}$ stores per household.	0.00 [− 7.11]	30.0 [24.8]
Share of LBO firms	Share of stores in the MSA in 1985 owned by firms that would undertake LBO's by 1991	0.220	0.191
Share of early-LBO firms	Share of stores in the MSA in 1985 owned by firms that would undertake LBO's prior to 1988	0.108	0.156
Share of late-LBO firms	Share of stores in the MSA in 1985 owned by firms that would undertake LBO's in 1988 or later	0.111	0.128
Herfindahl index	Sum of the squared market shares of the five firms with the largest market shares in the MSA, where a firm's market share is defined as its share of total stores in a market	0.120	0.020
B. *Incumbent Firm Variables:*			
Store share, non-LBO incumbents	Incumbent firm's share of the total stores in the MSA in 1985	0.116	0.098
Store share, LBO incumbents	Incumbent firm's share of the total stores in the MSA in 1985	0.143	0.108
Total stores in chain, non-LBO incumbents	Total stores in the sample of 100 MSA's owned by the incumbent in 1985	307	284
Total stores in chain, LBO incumbents	Total stores in the sample of 100 MSA's owned by the incumbent in 1985	283	227

TABLE 4—*Continued.*

B. *Incumbent Firm Variables: (Continued)*	
Number of firm-MSA observations in which non-LBO incumbents add stores:	79
Number of firm-MSA observations in which non-LBO incumbents neither add nor subtract stores:	20
Number of firm-MSA observations in which non-LBO incumbents subtract stores:	85
Number of firm-MSA observations in which LBO incumbents add stores:	47
Number of firm-MSA observations in which LBO incumbents neither add nor subtract stores:	19
Number of firm-MSA observations in which LBO incumbents subtract stores:	47
Number of MSA's in which de novo entry occurs:	39

TABLE 5—OLS SPECIFICATIONS

	Coefficients		
Variable	(1)	(2)	(3)
Constant	−0.0070	0.0075	−0.0006
	(0.1386)	(0.1380)	(0.1572)
Percentage change in households	0.6347**	0.5952**	0.5377**
	(0.1569)	(0.1581)	(0.1651)
Percentage change in income	−0.6731	−0.7661	−0.5778
	(1.1708)	(1.6374)	(1.1935)
Percentage change in income squared	0.1974	0.2282	0.1918
	(0.3558)	(0.3537)	(0.3630)
Change in share with income less than $10,000	−0.0071	−0.0076	−0.0044
	(0.0084)	(0.0084)	(0.0088)
Percentage change in households per square mile	58.7209	60.0863	52.8402
	(54.0745)	(53.6788)	(54.2677)
Percentage deviation from mean stores per household	−0.0866	−0.0831	−0.1194
	(0.0575)	(0.0571)	(0.0620)
Herfindahl index	−0.1079	−0.1171	−0.2920
	(0.2818)	(0.2798)	(0.3036)
Share LBO	0.0966	—	—
	(0.0775)		
Share early LBO	—	0.1736*	0.1438
		(0.0931)	(0.1369)
Share late LBO	—	−0.0175	0.0280
		(0.1094)	(0.1141)
Regional dummies included?	no	no	yes
R^2	0.30	0.32	0.34
N	85	85	85

Notes: The dependent variable is the percentage change in the total number of stores in the MSA between 1985 and 1991. Standard errors are in parentheses.

  *Significantly different from zero at the 5-percent level.

  **Significantly different from zero at the 1-percent level.

and significant at the 7-percent significance level. The coefficient for the share of later LBO's is insignificant at standard levels.

It has been suggested that regional dummy variables should be included in this regression to control for unmodeled city heterogeneity. The regression was reestimated using dummy variables for the Northeast, Midwest, and South (with the West as a base case). None of the dummy variables was statistically significant at even the 30-percent level. The inclusion of the dummies shrank the estimated coefficient of the share of early LBO's slightly, to 0.144 from 0.174, and decreased the statistical significance level of the coefficient to 30 percent. The coefficient for late LBO's became positive, but remained insignificant.

These results offer a preliminary suggestion that the presence of leveraged firms in the market does lead to a change in market structure. However, many hypotheses other than a change in the "toughness" of product-market competition could be put forth to explain these results. For example, if undertaking an LBO greatly decreased a firm's total costs, then LBO firms might find it profitable to expand. Markets populated by these firms might experience faster total store growth than other markets. In the following section, I introduce tests which will avoid these alternative hypotheses and which attempt to measure separately those changes in market structure which would be expected to occur relatively quickly following the LBO from those which might be expected to take more time to occur.

B. Expansion by Incumbent Firms

In this section, I examine the question of why large supermarket chains that are actively competing in a market might choose to add or subtract stores in that market on net. To do this, I identify the 50 chains with the largest number of stores in 1985 in the sample.[17] After adjusting for mergers and

acquisitions as described in Section III, 48 chains are left for study. It is the expansion decisions of these firms in each of the 85 markets in which they are incumbents that will be studied. These firms account for 6,068 of the 13,512 supermarkets in the MSA's in the study. There are a total of 297 firm-city pairs in which the firm is an incumbent in the city in 1985.

Because of the small, integer number of stores added or subtracted by a chain in a local market, one should not ignore the discreteness of the data when analyzing these decisions; in 36 percent of the observations for incumbent firms the incumbent adds or subtracts no more than one store. Thus, I adopt an ordered-probit methodology, estimating whether each large supermarket chain adds stores in a market, neither adds nor subtracts stores in a market, or subtracts stores in a market.[18] Because the determinants of these decisions may be very different for LBO and non-LBO incumbent firms, the specifications are estimated separately for the two sets of firms.

I measure the relationship between a firm's decision to add or subtract stores and the share of rival stores in the market in 1985 owned by firms that would eventually undertake LBO's. I control for demographic changes in the market and control for the possibility that the market was under- or over-stored in 1985. These control variables are described in Table 4.

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[17]One set of firms is left out of the sample of top firms. These firms are those involved in the only major

antitrust challenge to a supermarket merger during the period. After the federal antitrust supervisory bodies decided not to challenge the purchase of Lucky Stores by American Stores, the California Attorney General's Office decided to pursue a challenge of the merger under the California antitrust statutes. The case was tied up in the courts for over a year, during which time American Stores was not allowed to merge the operations of the two firms and was restricted from opening and closing new stores in California. The parties to this merger are left out of the specifications here, though results including them were checked and are extremely similar.

[18]The ordered-probit methodology was used in the context of measuring the determinants of how many firms compete in a city in Timothy F. Bresnahan and Peter C. Reiss (1987, 1990).

TABLE 6—MAXIMUM-LIKELIHOOD ESTIMATION RESULTS FOR INCUMBENT FIRMS

Variables	A. *Non-LBO incumbents*			B. *LBO incumbents*		
		Marginal effects			Marginal effects	
		$\dfrac{d\Pr[y=-1]}{dx}$	$\dfrac{d\Pr[y=1]}{dx}$		$\dfrac{d\Pr[y=-1]}{dx}$	$\dfrac{d\Pr[y=1]}{dx}$
	Coefficient			Coefficient		
Change in households	0.0339[a]	−0.0134	0.0129	−0.0262	0.0102	−0.0054
	(0.0198)			(0.0262)		
Change in income	−2.7210	1.0788	−1.0358	3.9310	−1.5337	0.8153
	(2.0230)			(2.6440)		
Change in income squared	0.2590	−0.1027	0.0986	−0.3690	0.1440	−0.0765
	(0.1850)			(0.2400)		
Change in share with income less than $10,000	−0.2128	0.0844	−0.0810	0.2154	−0.0840	0.0447
	(0.1435)			(0.1764)		
Change in households per square mile	−0.0008	0.0003	−0.0003	0.0005	−0.0002	0.0001
	(0.0006)			(0.0063)		
Deviation from mean stores per household	0.0010	−0.0004	0.0004	0.0032	−0.0012	0.0007
	(0.0038)			(0.0046)		
Total stores	−0.0012**	0.0005	−0.0004	0.0007	−0.0003	0.0001
	(0.0004)			(0.0006)		
Market share	2.1970*	−0.8711	0.8363	−2.7866[a]	1.0872	−0.5780
	(1.0566)			(1.5580)		
Herfindahl index	2.1396	−0.8483	0.8145	0.1315	−0.0513	0.0273
	(1.7995)			(3.6680)		
Share LBO	1.7016*	−0.6746	0.6477	1.7620	−0.6875	0.3655
	(0.7557)			(1.1292)		
Exit threshold	0.0996			0.8998		
	(0.6693)			(0.9534)		
Entry threshold	0.4173			1.3547		
	(0.6697)			(0.9561)		
Number of observations	184			113		

Notes: The dependent variable has the following values: $Y_{ij}=+1$ if firm i withdraws at least one store from market j, $Y_{ij}=0$ if firm i neither adds nor withdraws stores from market j, and $Y_{ij}=+1$ if firm i adds stores in market j. Standard errors are reported in parentheses.

[a]Significantly different from zero at the 10-percent level.
*Significantly different from zero at the 5-percent level.
**Significantly different from zero at the 1-percent level.

I also include variables to describe the rivalry faced by firm i in market j. These are a measure of concentration in the local market and firm i's share of total stores in market j. To control for chain size, I include a variable measuring the total number of stores that firm i has in the entire sample in 1985. These are described in Table 4 as well. The variable of most interest, Share LBO$_{ij}$, is the share of LBO firms among firm i's rivals in market j. Firm i's own stores are not counted when constructing either the numerator or the denominator of this share. Thus, the variable characterizes the rivalry facing firm i in market j.

Part A of Table 6 shows the results of this specification for non-LBO incumbents (a total of 184 firm-market pairs). The coeffi-

cients for the demographic variables, with the exception of the change in households per square mile, have the same sign as the corresponding variables in Table 5. Only the coefficient for the change in households is statistically significant. The coefficient for the firm's market share is positive and significant. This suggests that firms with large market shares in a market are the most likely to expand. The results also suggest that large chains are less likely to expand than smaller chains. This result should be interpreted with caution because the coefficients are only estimated for a sample of fairly large chains.

The coefficient for the share of firm i's rivals in market j which have undertaken LBO's is positive and significant at the 3-

percent level. The "marginal effects" show that, in a city in which all market characteristics are held at their mean, adding the LBO of a firm with a 10-percent market share would increase the probability that a given non-LBO firm will add stores in the market by approximately 6.5 percent. This result supports the results in Section I which suggest that LBO's lead to a decrease in the toughness of competition in the market; when a firm undertakes an LBO, rival non-LBO firms in the market find expansion attractive.

Part B of Table 6 repeats the specification of Part A, except the expansion decisions of LBO firms are used as the dependent variables. The coefficients for all of the demographic variables are statistically insignificant, and many have the opposite signs from the previous specifications. In contrast to the specification for non-LBO stores, the coefficient for total stores is positive, and the coefficient for the firm's own market share is negative.

The coefficient for the share of firm i's rivals in market j which are LBO firms is positive, as in the previous specification, but significant only at the 12-percent level. This result provides some evidence for the hypothesis that LBO's decrease the "toughness" of product-market competition, although the results are clearly weaker than for non-LBO firms.

As mentioned before, one reason for examining expansion by incumbent firms separately from new entry into local markets is that one would expect that incumbent firms would be able to begin to respond relatively quickly to local market conditions. Thus, one would expect that a firm adding stores in response to an LBO would have added at least one store by 1991, since the last LBO took place in early 1990. In Table 7, I divide LBO's into those that took place prior to 1988 (early LBO's) and those that took place during or after 1988 (late LBO's) and repeat the specifications of Tables 6. In both columns, the coefficient for the early-LBO share is only slightly larger than the coefficient for the late-LBO share. The hypothesis that the coefficient for early LBO's is

larger than the coefficient for late LBO's is not rejected at standard significance levels. This is consistent with the view that expansion by rival incumbents in response to LBO's should begin quickly.

Several tests were undertaken to test the robustness of the results. First, because these specifications use firm-level data, the concern arises that unmodeled firm heterogeneity may affect the basic results. These results were reestimated including firm dummy variables. Because of the number of firm dummy variables relative to the number of observations, it was necessary to pare down the specification in order to estimate this relationship. The basic specification was thus reestimated pooling data from LBO and non-LBO firms and including firm dummy variables. The coefficient for the LBO share of the market remains positive and is statistically significant at the 6-percent level.

Unfortunately, the results could not be reestimated with city or even state dummy variables because there are not enough observations per geographic area. However, the results for both LBO and non-LBO firms are robust to the inclusion of dummy variables for the Midwest, West, South, and East Coast. The coefficient for share LBO in the non-LBO firm regressions remains positive and significant at the 3-percent level; the coefficient for share LBO in the LBO firm regressions remains positive and significant at the 6-percent level.

Cross-firm within-city correlation of the error term might lead to the estimation of inflated significance levels. The regression results were checked for robustness to this possibility. Table 7 was reestimated using one observation per MSA. The dependent variable took the value of 1 if the supermarket chains in the sample in the MSA added stores on net; it took the value of 0 if they neither added nor subtracted stores, and it took the value of -1 if they subtracted stores on net. The right-hand-side variables took their mean value for the MSA. The specification was done separately for LBO firms and non-LBO firms, as before. In the specification for non-LBO firms, there were

TABLE 7—MAXIMUM-LIKELIHOOD ESTIMATION RESULTS FOR INCUMBENT FIRMS

Variables	A. Non-LBO incumbents			B. LBO incumbents		
		Marginal effects			Marginal effects	
	Coefficient	$\dfrac{d\Pr[y=-1]}{dx}$	$\dfrac{d\Pr[y=1]}{dx}$	Coefficient	$\dfrac{d\Pr[y=-1]}{dx}$	$\dfrac{d\Pr[y=1]}{dx}$
Change in households	0.0330[a] (0.0202)	−0.0131	0.0126	−0.0283 (0.0265)	0.0110	−0.0057
Change in income	−2.6630 (2.0190)	1.0553	−1.0152	4.2400 (2.6840)	−1.6511	0.8565
Change in income squared	0.2550 (0.1850)	−0.1010	0.0972	−0.3950 (0.2430)	0.1538	−0.0798
Change in share with income less than $10,000	−0.2125 (0.1438)	0.0842	−0.0810	0.2358 (0.1793)	−0.0918	0.0476
Change in households per square mile	−0.0008 (0.0006)	0.0003	−0.0003	0.0008 (0.0064)	−0.0003	0.0002
Deviation from mean stores per household	0.0012 (0.0038)	−0.0005	0.0004	0.0032 (0.0046)	−0.0013	0.0007
Total stores	−0.0012** (0.0004)	0.0005	−0.0004	0.0006 (0.0006)	−0.0002	0.0001
Market share	2.1043* (1.0503)	−0.8339	0.8022	−2.7507[a] (1.5434)	1.0712	−0.5557
Herfindahl index	2.0584 (1.8184)	−0.8157	0.7847	−0.2282 (3.6914)	0.0889	−0.0461
Share early LBO	1.7032[a] (0.9073)	−0.6749	0.6493	1.9126 (1.1192)	−0.7448	0.3864
Share late LBO	1.4087 (0.8865)	−0.5582	0.5370	1.13798 (1.3221)	−0.5373	0.2787
Exit threshold	0.0996 (0.6693)			0.9035 (0.9542)		
Entry threshold	0.4173 (0.6697)			1.3866 (0.9569)		
Number of observations	184			113		

Notes: The dependent variable has the following values: $Y_{ij} = -1$ if firm i withdraws at least one store from market j, $Y_{ij} = 0$ if firm i neither adds nor withdraws stores from market j, and $Y_{ij} = +1$ if firm i adds stores in market j. Standard errors are reported in parentheses.
[a]Significantly different from zero at the 10-percent level.
*Significantly different from zero at the 5-percent level.
**Significantly different from zero at the 1-percent level.

79 observations, and the coefficient for the average share of LBO rivals remained positive and was statistically significant at the 5-percent level. In the specification for LBO firms, the coefficient for the average share of LBO rivals remained positive but was statistically significant at only the 25-percent confidence level. The results for this LBO incumbent specification should be treated with extreme caution, however, as only 28 observations were available.

Finally, the importance of the use of the ordered-probit specification was investigated. Table 8 reestimates Table 7 using the actual change in the number of stores for each incumbent firm as the dependent vari-

able. Because the left-hand-side variable varies so much in scale, heteroscedasticity-robust standard errors are used, following the method of Halbert White (1980). The coefficient for the share of early-LBO firms remains positive and statistically significant at the 6-percent level in the regression for non-LBO incumbents. The coefficients for the share of late-LBO firms is approximately zero. This is not surprising. The ordered-probit methodology examines whether any response to the LBO has occurred, while this specification measures the magnitude of the response. It is not surprising that, by 1991, very few stores have been built "responding" to the later LBO's. The

TABLE 8—OLS ESTIMATION RESULTS
FOR INCUMBENT FIRMS

	Coefficients	
	(1)	(2)
	Non-LBO	LBO
Variables	incumbents	incumbents
Change in households	−0.0660	−0.2690
	(0.1170)	(0.2350)
Change in income	0.2860	14.0750
	(6.2420)	(14.1650)
Change in income squared	0.0900	−1.3100
	(0.5750)	(1.2500)
Change in share with income	−0.4167	0.5441
less than $10,000	(0.4084)	(0.9351)
Change in households per	−0.0033	0.0003
square mile	(0.0039)	(0.0352)
Deviation from mean stores	0.0575*	0.0268
per household	(0.0250)	(0.0435)
Total stores	−0.0055*	−0.0005
	(0.0022)	(0.0042)
Market share	7.0556	−28.1176**
	(5.4637)	(10.2838)
Herfindahl index	29.6984	30.6566
	(11.9950)	(27.0131)
Share, early LBO	7.9665[a]	0.7648
	(4.1466)	(5.7235)
Share, late LBO	−1.0105	−5.8049
	(3.9945)	(9.0537)
Constant	−6.4550*	−3.3238
	(3.1960)	(6.7199)
R^2	0.12	0.14
Number of observations	184	113

Notes: The dependent variable is the number of stores that firm i has added to market j. It is negative if the firm has subtracted stores from market j. White (1980) robust standard errors are in parentheses.

[a]Significantly different from zero at the 10-percent level.

*Significantly different from zero at the 5-percent level.

**Significantly different from zero at the 1-percent level.

cumbent firms would be the first detectable response to a change in conditions in a local market.

C. Entry

In this subsection, I examine de novo entry by a large supermarket chain into a local market.[19] I extended the data set to 1993 by searching the Nexis data base for announcements of new entry. This is done for the entry specifications and not for the expansion specifications above for two reasons. First, because one expects entry to lag changes in market conditions more than expansion, it is more important to have as recent data as possible for new entry. Second, the supermarket trade press does not, in general, announce that a supermarket chain is opening new stores in a city in which it already has stores, though it does report that a large supermarket chain is entering a new local market.

The specification for the entry model in column 1 of Table 9 is a simple probit. The dependent variable takes the value of 0 if no entry occurs in the city between 1985 and 1993. The dependent variable takes the value of 1 if entry occurs in that period. Entry is defined to occur when a large supermarket chain of more than 25 stores opens at least one store in an MSA in which it was not an incumbent in 1985. Also included as entry is the opening of a hypermarket by K Mart or WalMart.[20]

The variables included in the entry regressions are a subset of those included in

results in column 2 of Table 8 offer no support for the hypothesis that LBO firms respond to the LBO's of their rivals.

The results in this subsection suggest that non-LBO firms find expansion attractive in markets dominated by LBO firms. As expected, the results in this subsection are stronger than those which pool the store additions of incumbent firms and new entrants. This is consistent with the expectation that expansion or contraction by in-

[19]This is not the first paper to study de novo entry into local markets in the supermarket industry. Ronald W. Cotterill and Lawrence E. Haller (1992) study de novo entry into cities by supermarket chains. They do not consider the leverage characteristics of incumbent firms. They consider entry over a different time period using a different data set and methodology.

[20]A hypermarket is a full supermarket combined with a general merchandise store. While neither K Mart nor WalMart owned 25 supermarkets at the time that they opened hypermarkets, they are obviously large retailing chains and were thus included.

TABLE 9—RESULTS FOR NEW ENTRY

Variable	(1) Coefficient	(2) Marginal effects $\dfrac{d\Pr[\,y=1\,]}{dx}$	(3) Coefficient
Change in households	0.0841* (0.0395)	0.0126	2.23×10^{-6}* (1.13×10^{-6})
Change in income	4.6880 (2.9970)	0.7038	1.15×10^{-4} (7.0×10^{-5})
Change in income squared	-0.4950^{a} (0.2910)	-0.0743	$1.22\times10^{-9\text{a}}$ (6.75×10^{-10})
Change in share with income less than $10,000	0.2859 (0.1806)	0.0429	0.0702 (0.0388)
Change in households per square mile	-0.0025 (0.0032)	-0.0004	4.19×10^{-4} (3.97×10^{-4})
Deviation mean stores per household	0.0012 (0.0064)	0.0002	6.95×10^{-4} (0.0021)
Herfindahl index	0.0887 (2.9218)	0.0133	0.0147 (1.0290)
Share, early LBO's	2.4183^{a} (1.1330)	0.3630	0.7904^{a} (0.3835)
Share, late LBO's	0.6756 (1.2177)		0.2960 (0.4317)
Constant	-1.518 (1.0364)		0.0758 (0.3248)
R^2			0.2010

Notes: The first column shows probit results. The dependent variable has the following values: $Y_j = 0$ if no entry occurs in market j; $Y_j = 1$ if entry occurs. The second column shows the marginal effects implied by the coefficients in column 1. The third column shows the results of the linear probability specification. Entry occurs in 39 of the 85 markets. Standard errors are reported in parentheses.
   [a] Significantly different from zero at the 10-percent level.
   *Significantly different from zero at the 5-percent level.

the expansion regressions above. Since these regressions examine entry at the market level rather than the firm level, firm-specific characteristics must be excluded.

Table 9 shows that the coefficient for the early-LBO share is of a larger magnitude than the coefficient for the share of late-LBO firms. However, the hypothesis that the coefficient for the share of early LBO's is different from the coefficient for the share of late LBO's is rejected at only the 24-percent significance level. As expected, the share of early-LBO firms in the local market has a positive coefficient, statistically significant at the 3-percent level. The coefficient for the share of late-LBO firms is positive, but statistically significant at only the 58-percent level. This table thus sug-gests that large supermarket chains find entry into local markets dominated by firms that undertook LBO's prior to 1988 attractive. There is only very limited evidence, however, that entry has responded to LBO's that took place during or after 1988.[21] The results of a linear probability model, shown in column 3 of Table 9 are substantially the same as the probit results.

[21] Once again, the results are robust to the inclusion of regional dummy variables. The coefficient for the share of early LBO's is positive and statistically significant at the 10-percent level; the coefficient for the share of late LBO's is positive and significant at the 42-percent level.

TABLE 10—COMPARISON OF 1985 ACCOUNTING VALUES FOR FIRMS THAT WOULD
EVENTUALLY UNDERTAKE AN LBO AND FIRMS THAT WOULD NOT
EVENTUALLY UNDERTAKE AN LBO

| | Mean | | |
Accounting ratio	LBO firm	Non-LBO firm	t statistic of difference
Operating income/sales	0.0363	0.0395	0.48
Net income/sales	0.0040	0.0043	0.14
Market value/book value of assets	0.8316	0.8194	0.10
Capital expenditures/assets	0.1461	0.1300	0.80
Retained earnings/net income	0.3703	0.3266	0.76
Dividends/net income	0.2375	0.1896	0.39

VI. An Alternative Hypothesis

The results of Section V suggest that su-
permarket firms find entry and expansion
attractive in markets dominated by firms
that undertook LBO's. I have suggested that
entry and expansion are attractive because
competition becomes less "tough" following
an LBO. In this section, I briefly explore the
alternative hypothesis that LBO's did not
change the toughness of product-market
competition, but rather, that firms that un-
dertook LBO's were weak firms. If weak
firms undertook LBO's, then one might ex-
pect to see entry and expansion occur in
those markets dominated by LBO firms.

A. Asset Sales

Even if LBO firms were underperformers
on average prior to their LBO's, this would
not necessarily affect the results of Sec-
tion V if LBO firms sold off all underper-
forming divisions to non-LBO firms in post-
LBO asset sales. As discussed in Section IV,
the methodology used in Section V assigns
assets sold after LBO's to their eventual
owners. The sale of the division is not
counted as a loss of stores for the LBO firm,
nor is it counted as entry or expansion for
the purchaser. More importantly, the pres-
ence in a city of supermarkets that were
sold in a post-LBO asset sale is not counted
in calculating the store share of LBO firms
in the city. The asset-assignment procedure

helps to diminish the effect of these under-
performing divisions on the results.

B. Accounting Evidence

If the LBO event selects for firms that
were underperformers, then one might ex-
pect accounting data to reflect that LBO
firms were underperformers on average
prior to their LBO's. Table 10 contains ac-
counting data for all of the supermarket
chains that were publicly traded in 1985.[22]
Eleven of these firms undertook an LBO
after 1985, and 20 did not.

The table shows that, on average, LBO
and non-LBO firms do not differ signifi-
cantly. In particular, LBO firms do not gen-
erate significantly less operating income as a
share of sales or less net income as a share
of sales. Furthermore, the ratio of market
to book value of assets, a proxy for the
market's estimation of a firm's future
prospects, is slightly higher for LBO firms.
The ratio of capital expenditures to assets
and the ratio of retained earnings to net
income are somewhat higher for LBO firms,
although the difference is not statistically
significant.[23]

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[22] These data are from Compustat.
[23] Firms which undertook LBO's early do not differ
significantly from firms which undertook them later,
except that firms which undertook LBO's early have
higher ratios of capital expenditures to assets than do
firms that undertook LBO's later.

C. Event-Study Evidence

The event-study evidence presented in Section II does not support the alternative hypothesis. If it was common knowledge that LBO firms were underperformers and their behavior was unchanged by the LBO, then the LBO announcements would not contain positive information for rival firms, and there would be no share price response. On the other hand, if LBO's were expected to increase the toughness of product-market competition, then rivals would be expected to experience a negative share price response to the LBO announcement. Thus, the event-study finding of a positive share price response of firms to rivals' LBO's is consistent with the findings here that LBO's decrease the toughness of product-market competition. The event-study evidence is inconsistent with the hypothesis that LBO's were undertaken by firms that were known underperformers and that product-market competition did not change much following the LBO's.

D. Evidence from Early versus Late LBO's

If LBO's select for firms that were chronic underperformers, and the LBO did not change the LBO firm's behavior, then one would expect to find that the LBO firm attracted entry and expansion even prior to its LBO. The pattern of coefficients for early and late LBO's in Tables 7 and 9 do not lend support to this suggestion.

In particular, if LBO's select for firms that were chronic weak underperformers, then one would expect that new entry into a city (in Table 9) would have responded to late LBO's. It seems unlikely that these firms were chronically weak and yet did not attract entry. It might be suggested that this is because early-LBO firms were very poor firms, while late-LBO firms were good firms. The results in Table 7, however, run counter to this suggestion. These results show that non-LBO incumbents are almost as likely to have *expanded* in the presence of late LBO's as in the presence of early LBO's.

The grocery trade press and firm 10K's and prospectuses indicate that the time elapsed between the decision to build a new store in a city and the actual building of the store is much longer for firms that are not incumbents in the city. Thus, if the LBO's that took place during or after 1988 actually changed product-market competition, one would expect to see that expansion by incumbent firms had responded by 1992, but one would not necessarily expect to see much evidence that new entry had responded by 1993. However, if nothing changed at the time of the LBO, then one would expect to see either that *neither* entry nor expansion is correlated with these LBO's or that *both* entry and expansion are correlated with these LBO's. The findings in Tables 7 and 9 are consistent with the hypothesis that competition did *change* at the time of the LBO's.

VII. Summary and Conclusion

The principal results of this paper are that the announcement of an LBO increases the expected future profits of a firm's product-market rivals and that the presence of LBO firms encourages local entry and expansion by rivals. Both sets of results are suggestive that leverage makes product-market competition less "tough." The results lend empirical support to the theoretical models of Fudenberg and Tirole (1986), Bolton and Scharfstein (1990), and Phillips (1991).

The basic finding, that markets in which LBO's have occurred attract entry and expansion, is consistent with the alternative hypothesis that LBO firms were simply underperformers prior to their LBO's. Evidence against this hypothesis was presented.

The results of this paper strongly suggest that product-market competition changes when firms radically increase their leverage. However, it would be interesting to determine the dimensions on which competition in the product market changes. For example, neither the event-study evidence nor the evidence on entry, exit, and expansion can distinguish the hypothesis that price

competition becomes less vigorous following an LBO from the hypothesis that quality competition becomes less vigorous following an LBO. For example, it has been suggested in the trade literature that LBO firms compete less fiercely in the area of store quality, placing their stores on slower renovation and repair schedules. It has also been suggested that LBO firms refuse to become embroiled in price wars with rivals. This study cannot identify which, if any, of these mechanisms brings about the change in product-market competition. An examination of price competition by leveraged and unleveraged supermarket chains is the subject of future research.

Finally, while this paper does suggest that the nature of competition changes when firm leverage changes, the results do not necessarily make any contribution to the debate concerning whether or not leveraged buyouts were value-maximizing. Clearly, LBO firms would rather their rivals did not expand and enter their markets. However, it is impossible to know whether the amount that firms deterred this entry and expansion prior to LBO's was efficient or inefficient. Thus, while these results cannot prescribe an optimal capital structure based on product-market outcomes, the results make clear that product-market effects of capital-market decisions must be considered a component of the choice of optimal capital structure.

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