

**The Impact of Capital Structure on Advertising Competition:
An Empirical Study***

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Abstract

This paper examines the interaction between capital structure and advertising competition. Using a sample of firms that raise significant amounts of capital, we find that firms whose financial leverage has decreased as a result of their new funding increase their advertising significantly more than firms whose leverage has increased. We also find that these firms' industry rivals respond less aggressively with their own advertising when they have more debt in their capital structure. Overall, our results support the view that financial leverage has a "dampening" effect on the intensity with which a firm chooses to compete in the product market.

1. Introduction

The interaction between capital structure and the intensity of product market competition has remained an open issue in economics. While some theoretical models predict that a more levered capital structure motivates a firm to be a more aggressive competitor, others predict the opposite behavior. In this paper we examine this issue by studying how a change in the capital structure of a firm affects the intensity of its advertising competition, as well as how the capital structure of its industry rivals affects their responses. These are important questions because economists have long recognized that advertising can affect the interaction among firms in the product market [see Bagwell (2001) for a comprehensive literature review on the economics of advertising].

Our results indicate that firms that raise significant amounts of capital step up the intensity of their advertising competition against industry rivals. But more importantly, after controlling for other factors, we find that the sub-sample of these firms whose financial leverage has decreased as a result of the new funding competes more vigorously than the sub-sample of firms whose leverage has increased. Similarly, leverage affects the reaction of the sample firms' industry rivals.¹ We find that these firms respond to the greater advertising competition of the capital-raising sample firms in their industries by increasing their own advertising more (less) aggressively than their industry peers if their own capital structure is relatively less (more) levered than that of their industry peers. Therefore, we find that for both the capital-raising sample firms that initiate the more intense advertising competition and for their industry rivals that respond, a firm's greater use of debt motivates it to undertake "softer" advertising competition.

¹ The reaction by rivals to a firm's advertising competition has been shown, for example by Roberts and Samuelson (1988); however, there has been no study that links this response to financial leverage.

We hypothesize that such softening of competition from the use of debt in our study is due to the intangible and non-transferable nature of the assets created through advertising.² That is, because leverage increases the probability of financial distress, firms that choose high levels of debt are less aggressive in their advertising expenditures out of concern about losing the value of their investments. This may explain why we find that leverage affects the behavior of the firms in our sample even though they are not financially constrained at the time of the event. We provide some empirical evidence supporting this explanation.

Our study complements existing empirical work on the impact of capital structure on product market competition and contributes to it in several important ways. First, we focus on advertising, one of the key components of inter-firm rivalry in product markets. The study of advertising competition has until now been limited to product market interactions. However, whether and how the financial characteristics of competing firms influence the intensity of such competition remains an issue that has not yet been explored. And second, in contrast with earlier work that has looked at the impact of LBOs and cases of extreme recapitalization towards high leverage, we study both the firms that increased leverage and those that decreased it, neither change being extreme.

The rest of the paper is organized as follows. The next section briefly reviews the literature on the relation between financial leverage and competition and on advertising competition. Section 3 describes the sample selection procedure, defines the variables, and provides summary statistics. Section 4 presents the empirical results. Section 5 examines a potential explanation of our results, and Section 6 concludes the article with a discussion of the implications of our findings.

2. Review of the Literature

² This aspect of advertising is well-known in the literature (see, for example Landes and Rosenfield (1994)).

2.1 Financial Leverage and Competition

The prediction that leverage motivates more aggressive product market competition is generally associated with the pioneering study of Brander and Lewis (1986) who focus on shareholders' incentives due to their limited liability and to their option-like payoff structure. Other papers have also made important contributions to this approach. For example, Riordan (1985) shows that if competition is Bertrand rather than Cournot, the effect of leverage is the reverse of the Brander and Lewis (1986) result, while Showalter (1995) shows that the effect of leverage may depend on whether there is cost or demand uncertainty.

A different line of research is based on the "long purse" argument [Telser (1966)] that a highly levered firm is vulnerable to a rival's aggressive competition. This argument suggests that having a long purse --- i.e., access to capital --- allows the rival to sustain losses until it succeeds in eliminating its competition. Of course, this strategy only works if the highly levered firm is unable to reduce its leverage or to raise capital. Alternate formulations of this basic theme of levered firms being vulnerable to predation focus on how or why such firms face financial constraints and the strategic decisions of their rivals. For example, in Fudenberg and Tirole (1986), and Bolton and Scharfstein (1990), debt financing provides an opportunity for rival firms to take advantage of the debt-laden firm's periodic need for refinancing by making the firm appear unprofitable, thereby motivating its investors to deny it refinancing. A basic result from this line of research is that it is the higher levered firms that behave passively, or at least less aggressively, while the aggressive competitors are the firms that have lower leverage. This prediction is the opposite of that in Brander and Lewis (1986).

Although there has been a relatively large and still growing theoretical literature on the topic, it is the recent work by Chevalier (1995a, b), Kovenock and Phillips (1995, 1997), and Phillips (1995), that provides the first important empirical results on this issue. Chevalier

(1995a) finds that supermarkets that have undertaken extreme leverage --- through a leveraged buyout (LBO) --- face a greater threat of entry, of price competition, and of market expansion by rivals while they themselves compete less aggressively. Consistent with these results are those of Kovenock and Phillips (1997) who find that firms that significantly increase their use of debt, either through an LBO or by a recapitalization, are more likely to close plants and reduce investment while their rivals are less likely to do so. These general results are consistent with the findings in our paper, although firms in our study have quite different characteristics from those in the prior studies and our focus is solely on non-price, advertising, competition.

If the greater use of leverage by a firm is indeed associated with its being a less aggressive competitor while its rivals become more aggressive, the question remains as to why debt has this effect.³ A common element of much of the existing research is that the firms studied have increased their leverage very substantially, suggesting that after their LBO or recapitalization, they may have limited ability to raise additional finance. That is, such firms become financially constrained --- they may be unable to support additional debt and their insiders may be unwilling to or incapable of themselves providing equity financing or obtaining it from outsiders. Consequently, it may be that extreme leverage acts to soften competition because it limits the firm's ability to raise additional capital.⁴ Our study therefore provides important complementary evidence --- firms in our study incur only moderate changes in leverage; yet we too find that the use of debt softens competition. Therefore, it

³ Phillips (1995) also raises this question and provides an interesting possible explanation based on managerial agency issues, incentive compensation, and the use of debt to reduce manager's choice of output (or capacity) in particular circumstances.

⁴ See Chevalier and Scharfstein (1996) for evidence that financial constraints may affect how firms compete on the basis of price.

seems that the conclusion that debt has a dampening effect on product market competition does not depend on relatively high leverage, at least, not for competition through advertising.

Two other recent studies provide additional evidence. Zingales (1998) finds that highly levered trucking firms were less likely to survive the deregulation of the industry in the late 1970s. A possible explanation comes from his observation that the levels of investment of these firms in the years following deregulation were negatively related to their financial leverage --- the under-investment problem from debt overhang --- with this relation being most significant among firms that eventually failed. The other study, Khanna and Tice (2000), examines the entry of WalMart into local markets and finds that incumbent firms that have relatively greater financial leverage are less aggressive in resisting WalMart's entry.

2.2 Advertising Competition

There have been numerous studies in the economics literature attempting to understand the role of advertising in product market competition [see for example, Kaldor (1950)]. One well-known view is that advertising provides important information to consumers, thereby increasing the rivalry among firms and generally making the market more competitive. Early work that focuses on this information role of advertising is Telser (1966), and Nelson (1974). More recent studies [Kihlstrom and Riordan (1984) and Milgrom and Roberts (1986)] focus on the role of advertising in conveying information through signaling.⁵

An alternative view is that advertising enhances a firm's market power by helping differentiate the firm's products, creating brand loyalty, and strengthening the barriers to entry; the pioneering work is Robinson (1933). Stigler and Becker (1977) are attributed the view of advertising as an input in consumers' utility functions, with a more recent contribution being Becker and Murphy (1993).

⁵ There are many other contributions. For example, see Stegeman (1991) and Bagwell and Ramey (1994).

Empirical tests have taken many forms, with support found for some of the predictions of both views.⁶ Nevertheless, regardless of the validity of either of these hypotheses, increased advertising can be seen as an aggressive competitive action by the firm.⁷ That is, a firm's increased advertising may promote a general increase or decrease in market concentration and overall pricing power, but should be viewed as heightened non-price competition. Not surprisingly, advertising is one of the major components of inter-firm rivalry [Roberts and Samuelson (1988)] and, in many markets, is thought to be the preferred means of competing [Nevo (2001)].

In the marketing literature as well, advertising is at the core of numerous studies on product market competition. These studies show that a firm's own advertising, as well as that of its rivals, impacts its sales.⁸ Advertising competition is shown to be dynamic, with firms adjusting their own advertising to react to changes in the advertising expenditures of their rivals [Erickson (1985), Seldon, Bannerjee, and Boyd (1993)]. Models have been developed to study the equilibrium time paths of advertising expenditures of product market rivals [e.g., Erickson (1985), Chintagunta and Vilcassim (1992)], the competition between early and late market entrants [Shankar (1997)], and between national brands and private labels [Parker and Kim (1997)]. While the durability of the impact of advertising remains a somewhat contentious issue,⁹ the assumption of a relatively short-term effect from advertising has been found to satisfactorily model these dynamics of advertising competition [Chintagunta and Vilcassim (1992)].

⁶ The review by Scherer (1980, ch.14) of the two hypotheses and evidence is now dated but nevertheless useful in identifying the issues.

⁷ This is consistent with Roberts and Samuelson (1988).

⁸ See for example, Lambin (1970), Horsky (1977), Erickson (1985), Carpenter, et al. (1988).

⁹ For example, see Landes and Rosenfield (1994) and the references cited. The evidence appears to suggest a relatively short "life" for the effects of advertising.

While both the economics and the marketing literature suggests that advertising is a critical aspect of non-price competition, the study of advertising competition has generally been limited to product market interactions [e.g., Chintagunta and Vilcassim (1992), Erickson and Jacobson (1992), Roberts and Samuelson (1988)]. Whether, and how, the financial characteristics of competing firms influence the intensity of such competition remains an issue that has yet to be explored. Conversely, advertising expenditures provide an effective measure for studying the impact of capital structure on product market competition. They are measurable and are reported in financial statements. They are known to affect market shares, and their effects are of limited duration. Finally, it is known that rivals engage in competitive behavior by responding to changes in each other's advertising expenditures. Advertising competition therefore provides us with a well-established method of studying the relationship between capital structure and product-market competition.

3. Sample Selection, Variable Definitions and Summary Statistics

3.1 Sample Selection

We begin our sample selection process by identifying a set of firms that significantly increased their net financing by raising a large amount of capital compared to their existing assets. This procedure has two benefits. First, it helps ensure that our sample firms have the ability to raise finance in the capital markets at the time of the event and do have the resources to compete in the product market independent of their capital structure. And second, because capital can be raised as equity and as debt, the sample selection procedure allows us to test the effect of both increasing leverage and reducing leverage on the intensity of advertising competition.

Our source of data is the Industrial COMPUSTAT files (Full-Coverage, Primary, Secondary, Tertiary, and Research Files) with the initial sample consisting of all the

companies that appear on the files for at least one year over the period 1973-2002. Consistent with the literature on capital structure, we exclude financial firms (SIC codes 6000 through 6999) and utilities (SIC codes 4900 through 4999). We then identify the firms in this initial sample that raise capital --- to do so, we calculate the level of net financing in Year t relative to the level of assets in Year $t-1$ for each firm in our initial sample. Specifically, we calculate the following measure:

$$\text{Net Financing}_t = (\text{EISSUES}_t + \text{DISSUES}_t) / \text{ASSET}_{t-1} \quad (1)$$

where EISSUES denotes equity issues (COMPUSTAT item # 108) net of equity repurchases (COMPUSTAT item # 115), DISSUES is debt issues (COMPUSTAT item # 111) net of debt retirements (COMPUSTAT item # 114), and ASSET is total assets (COMPUSTAT item # 6). Since our objective is to create a sample of firms that undertake significant funding, we include in our final sample only those firms whose level of net financing in Year t is at least 20% of the total assets in Year $t-1$.¹⁰ To reduce the potential effects of outliers, we eliminate all firms whose level of net financing in Year t is greater than 200% of the total assets in Year $t-1$.

Because we focus on product market competition, we restrict our sample to those firms that meet the following criteria: a) they belong to an industry with at least two firms;¹¹ b) their market share is at least 1%; c) their advertising expenditures are available on the COMPUSTAT files during Year 0, when capital is raised, and Year -1; d) the total amount spent on acquisitions by the sample firm in Year 0 is equal to zero; e) the firm was not involved in a merger; f) no other firm in its industry undertakes significant funding (Net Financing > 20%) and meets the previous criteria in the two years prior to the event. This

¹⁰ We replicate all our tests using different cutoff rates and the main results are unaffected.

¹¹ We check the importance of this restriction by also studying a sample of firms that belong to industries with a larger number of firms and find that the results are qualitatively the same.

process generates a final sample of 577 “events” of a firm raising significant capital over the period 1974-2002. Notably, because of the constraints imposed during the sample selection procedure, each event has at least a prior two-year event-free window. Therefore, the observed effect on product market competition at the time of the event and during the two succeeding years can be attributed to the chosen event rather than to potentially that of a previous event.

Finally, for each firm in our final sample, we identify close industry rivals (firms with the same four-digit SIC code as the sample firm) during the year of the event (Kumar 1999). We use these firms in our calculations of industry-adjusted measures for the sample firms and in the analysis of the behavior of the rival firms. We do not try to match the sample and rival firms according to their specific lines of business --- that is, the sample firms (that raise capital) and their industry rivals are in the same 4-digit SIC code, but could differ somewhat in the number and types of lines of business that each is engaged in. This limitation is unimportant, however, because it serves to bias our tests against finding any advertising response by the industry rival firms; nevertheless, we will see that we do indeed find a significant response.

3.2 Variable Definitions

We obtain data on advertising expenditures (item # 45) from COMPUSTAT. This variable is defined as the cost of advertising media (radio, television, newspapers, periodicals, etc.) and promotional expenses. Empirical studies of advertising sometimes focus on advertising *intensity*, defined as advertising expenditures per dollar of sales revenue. This measure, however, is inappropriate for our purposes because it normalizes our measure of the aggressiveness of product market competition by the intended consequences of such competition. For example, large increases in advertising expenditures that were also

successful in increasing sales would be considered a “passive” rather than an “aggressive” action by this measure. Conversely, large increases in advertising that failed to commensurately increase sales would be considered “aggressive.” Instead, we use the change in advertising in Year t, defined as the difference between the advertising expenditure in Year t, $ADVER_t$, and the Year t-1 advertising expenditure benchmark, $ADVER_{t-1}$, scaled by the firm’s asset size in Year t-1, $ASSET_{t-1}$, as the dependent variable:

$$\Delta \text{ in } ADVER_t = (ADVER_t - ADVER_{t-1}) / ASSET_{t-1} \quad (2)$$

We scale the change in advertising by the asset size in Year t-1 to normalize the data across the cross-section of firms and to also ensure that any increased assets generated by either the capital issue or by the advertising (through retained earnings and/or increases in working capital) will not dilute our measure of advertising competition. We do not scale the advertising expenditure by the contemporaneous level of assets because we do not hypothesize that advertising will grow disproportionately as compared to other expenditures (e.g., capital expenditures, R&D expenditures, working capital, etc.) after the financing. However, we do control in the regression analyses for possible effects of firm size by including a variable that captures the growth in assets of the firm.

Most importantly, we also compute the *industry*-adjusted change in advertising expenditures in order to measure the non-price competition of the sample firms *relative* to their industry peers. This variable is defined as the difference between the change in advertising of a sample firm in Year t, scaled by its assets in Year t-1, and the mean of the changes in the advertising of the remaining firms in the same 4-digit SIC code, again scaled by their respective assets in Year t-1.

Undertaking the capital issue (at Year 0) changes the leverage of the sample firms. The change in leverage at time 0, *due directly to the capital issue* in Year 0, is defined as:

$$\Delta \text{ in LEVERAGE}_0 = [\text{DEBT}_{-1} + \text{DISSUE}_0] / [\text{ASSET}_{-1} + \text{DISSUES}_0 + \text{EISSUES}_0] - [\text{DEBT}_{-1} / \text{ASSET}_{-1}] \quad (3)$$

where DEBT_{-1} and ASSET_{-1} are total debt and total assets, respectively, in the year preceding the capital issue, EISSUES_0 is equity issues net of equity repurchases and DISSUES_0 is debt issues net of debt retirements, both in the year of the event. We use this variable to determine the effect on leverage of the change in net financing. We classify firms as leverage-increasing (decreasing) if this variable is positive (non-positive).

3.3 Summary Statistics

Table 1 shows the distribution of the sample firms by calendar year. The mean (median) net financing is equal to 49.1% (35.9%). This indicates that the firms in our sample, on average, have the ability to undertake significant funding from the capital markets, at least during the year in which they raise capital. Table 1 also shows that the observations in our sample are evenly distributed over time.

We report the characteristics of the sample firms in Table 2. We notice from Panel A of Table 2 that the sample firms raising capital and their industry rivals have about the same leverage, (Debt/Assets), in the year preceding the funding (Year -1), and that the average (median) change in leverage for the sample firms --- due solely to the funding --- is 7.1% (9.6%). We also note from the market share numbers and the Herfindahl Index that the sample firms belong to fairly concentrated industries.¹² Panel B shows that the sample firms whose leverage increased from their funding had a mean leverage of 21.7% (median of 17.1%) in the year prior to the capital issue, as compared to their rivals' mean of 22.2%

¹² We use a similar approach to the one in Graham (2000) to calculate the Herfindahl Index.

(median of 20.1%). These sample firms increased their mean leverage by 16.6% (median by 15.9%) solely through their net financing, to a level considerably above that of their rivals. Similarly, Panel C shows that those sample firms that decreased their leverage with their funding had somewhat higher prior leverage than their rivals, with a mean of 22.2% (median of 16.4%) in Year -1 compared to the rivals' mean of 19.5% (median of 17.7%). These sample firms reduced their leverage by an average of 10.2% (median of 5.7%), to a level considerably below that of their rivals.

4. Empirical Results

4.1 Advertising Expenditures of the Sample Firms

We begin by discussing the results of the changes in the advertising expenditures of the sample firms during the period of the study. As noted earlier, we scale these expenditures by the assets of the firms in Year -1 to standardize the changes in advertising across firms. The results of the analysis are reported in the two panels of Table 3. While the focus of our discussion are the industry-adjusted values of these expenditures reported in Panel B of the table, we also report the corresponding unadjusted values in Panel A to provide a backdrop to the discussion. Throughout, we refer to the year in which the sample firms increased their net financing as Year 0.

The trend in the unadjusted advertising expenditures of the sample firms reported in Table 3 is striking. Notice that the mean advertising expenditure of the sample firms increases by 1.84% (of assets) in Year 0 ($p < 0.01$) relative to Year -1. The trend continues in the following two years as well. The average difference between the advertising expenditures in Year 1 and Year -1 is 3.87% ($p < 0.01$) and between Year 2 and Year -1 is 5.77% ($p < 0.01$). These changes are large and economically important if we note the fact that the mean initial level of advertising expenditures of the sample firms in Year -1 --- that is, before the event ---

is 5.57% of assets. Our results suggest that the advertising expenditures of the sample firms continue to increase for at least two years after they raise capital.

However, of greater interest is a comparison of the changes in the advertising expenditures of the sample firms with those of their industry peers. The results of these industry-adjusted changes in advertising expenditures are reported in Panel B of Table 3. We note that in Year -1, the year prior to the capital-raising event, the median initial level of advertising expenditures of the sample firms is statistically no different from the industry mean ($p > 0.10$), while their mean is 1.18% ($p < 0.01$) somewhat higher. However, in Year 0, the mean industry-adjusted change in advertising expenditures of these firms is 1.04% ($p < 0.01$). This trend continues for the next two years as well. The mean industry adjusted advertising expenditure of the sample firms in these two years is 2.19% ($p < 0.01$) and 2.50% ($p < 0.01$), respectively. Overall, these results suggest that during the year of the event and in each of the following two years, the advertising expenditures of the sample firms outpaced those of their industry peers.

Becoming a more aggressive competitor upon raising significant capital is interesting but perhaps not altogether surprising. The more important issue for our analysis is whether the potential change in the sample firms' capital structure associated with their funding had an impact on their advertising expenditures. Therefore, we divide the sample firms into two sets, one consisting of firms that increased their leverage in the process of increasing their financing, and the other consisting of firms that decreased their leverage. We then separately analyze the advertising expenditures of the two sets of firms. The results of these analyses are presented in Tables 4 and 5.

Once again, the unadjusted changes in the advertising expenditures of leverage-increasing sample firms are reported in Panel A of Table 4 and the industry-adjusted values of

these expenditures are reported in Panel B. As with the full sample, we do find that there is a significant increase of 1.26% ($p < 0.01$) in the advertising expenditures of the leverage-increasing sample firms from Year -1 to Year 0. In addition, the advertising expenditure in the following two years is also significantly higher than that in Year -1 by 2.79% ($p < 0.01$) and 3.99% ($p < 0.01$), respectively. The results in Panel B show that, as was the case with the full sample, the median initial level of advertising expenditures of the leverage-increasing sample firms in Year -1 is statistically no different from the industry mean ($p > 0.10$), while the mean is marginally higher at 0.90% ($p < 0.05$). However, the industry-adjusted difference in the advertising expenditures of these sample firms between Year 0 and Year -1 is 0.43% ($p < 0.05$). In other words, in the year of the event, the leverage-increasing sample firms on average increase their advertising expenditures to a level higher than that of their industry rivals even though they start in Year -1 at about the same level of advertising. The difference in the industry-adjusted advertising expenditures of the leverage-increasing sample firms between Year 1 and Year -1 is positive and significant at 1.09% ($p < 0.01$) but falls to 0.69% ($p > 0.10$) in the following year. These results show that during and following the large increase in financing, the leverage-increasing sample firms were on average more aggressive in increasing their advertising expenditures than were their industry peers.

We next repeat the same analysis for the leverage-decreasing sample firms and report the results in the two panels of Table 5. As with the leverage-increasing sample firms, we find that there is a large, positive, and statistically significant change of 2.91% ($p < 0.01$) in the advertising expenditures of the leverage-decreasing sample firms between Year -1 and Year 0. The mean advertising expenditure in Year 1 and Year 2 is also significantly higher than that in Year -1 by 5.87% ($p < 0.01$) and 9.08% ($p < 0.01$), respectively. The results in Panel B show that, in Year -1, the median initial level of advertising expenditures of the leverage-

decreasing sample firms is statistically no different from the industry average ($p > 0.10$), while the mean is higher by 1.71% ($p < 0.01$). However, once again, the industry-adjusted difference in the advertising expenditures of these sample firms between Year 0 and Year -1 is positive and significant at 2.15% ($p < 0.01$). The trend continues during the following two years and the difference in the advertising expenditures between Year 1 and Year -1 is 4.25% ($p < 0.01$), and between Year 2 and Year -1 is 5.97% ($p < 0.01$). In other words, during the year of the event and in the two years following it, the leverage-decreasing sample firms, much like their leverage-increasing counterparts are, on average, more aggressive in increasing their advertising expenditures than are their industry rivals.

Tables 4 and 5 show that among the capital-raising firms, those that reduced their leverage seem to have increased their advertising expenditures by more (relative to their industries) than their leverage-increasing counterparts. These differences in advertising expenditures between the leverage-decreasing and leverage-increasing firms are economically significant. For example, by the end of Year 2, the mean industry-adjusted change in advertising for the leverage-decreasing firms is almost 9 times larger than the mean industry-adjusted change in advertising for the leverage-increasing firms (5.97% vs. 0.69%). This evidence suggests that the effect of leverage on advertising competition is not trivial. However, in order to ascertain whether the change in the capital structure of these firms had an impact on their advertising expenditures, we need to control for the growth in assets, the initial level of advertising in Year -1, as well as other variables such as market share and industry structure that have been observed to affect non-price competition [Maksimovic (1988), Roberts and Samuelson (1988)].

We therefore specify the following linear regression and estimate it for each of the post-event years (Year 0 through Year 2):

$$\begin{aligned} \Delta ADVER_{it} = & \beta_{0t} + \beta_{1t} DUMDEBT_i + \beta_{2t} \text{Log(Herfindahl Index)}_i + \beta_{3t} \text{Number of Firms}_i \\ & + \beta_{4t} \text{Market Share}_i + \beta_{5t} \text{Industry-Adjusted Level of Advertising in Year -1}_i \\ & + \beta_{6t} \text{Industry-Adjusted Growth Rate of Assets from Year -1 to Year } t_i + \varepsilon_{it} \end{aligned} \quad (4)$$

where the dependent variable is the industry-adjusted advertising expenditure of the sample firm from Year -1 to Year t, DUMDEBT is a dummy variable that takes the value 1 if the sample firm increased its leverage during the event and is 0 otherwise, “Log (Herfindahl Index)” is the logarithm of the Herfindahl Index, “Number of Firms” is the total number of firms in the industry, and “Market Share” is the market share of the sample firm in Year 0. The last two terms are the industry-adjusted level of advertising in Year –1 and the industry-adjusted growth rate in the assets of the sample firm between Year t and Year –1. The industry-adjusted level of advertising in Year –1 controls for the cross-sectional differences in the pre-event level of advertising intensity. The industry-adjusted growth rate in the assets of the sample firm between Year t and Year –1 controls for the cross-sectional differences in the growth rates of assets and also accounts for the change in assets because of the capital raising event.¹³

The results of the regressions are reported in Table 6. As expected, we find that the coefficients for the industry adjusted level of advertising in Year –1 is positive and significant ($p < 0.01$). In other words, the advertising growth rates during Years 0 through 2 depend on the relative advertising level of the sample firm with respect to its peer group. Further, we find that the industry-adjusted growth rate of assets has a positive and significant impact of the advertising growth rate of the sample firms ($p < 0.01$). This shows that the sample firms increased advertising, in part, because of increases in the size of their operations. However, even after controlling for the prior advertising levels and the changes in the assets of the

¹³ We also control for the level of net financing in Year 0 and find that the main results are unaffected. This variable becomes insignificant in our main regressions after controlling for the growth of assets.

firms, we find that the coefficient of DUMDEBT is negative and significant in all three regressions ($p < 0.01$). This result is consistent with our earlier observations in Tables 4 and 5 and shows that sample firms that increase their leverage in the process of increasing their net financing tend to be *less* aggressive with respect to their industry peers than firms that decreased their leverage. Interestingly, we find that neither the log of the Herfindahl index, nor the market share of the sample firm are important in explaining the change in the advertising expenditures of the sample firms between Year -1 and each of the years from Year 0 through Year 2. However, we find that the number of firms has a positive and significant impact in Years 1 and 2 ($p < 0.01$ and $p < 0.05$ respectively). Overall, the results in Table 6 show that the sub-sample of firms whose financial leverage has *decreased* compete more vigorously than the sub-sample of firms whose leverage has increased, even after controlling for other factors.

4.2 Endogeneity Test: Instrumental Variable Approach

Our results relate leverage to advertising competition. However, both its advertising expenditure and its capital structure are choices made by the firm. Therefore, an issue that needs to be addressed is whether the observed non-price competition is affected by the change in capital structure, or rather, whether the capital structure change is motivated by the intended level of advertising competition.

One way to examine this issue is to focus on the impact of some exogenous events that are not under the firm's discretion or control but that result in large capital inflows or outflows that change the capital structure of the firm relative to the industry. However, this approach would raise two issues. First, because these events would need to affect only one firm within the industry, they will be rare and non-comparable. It would be difficult to assess whether any post-event change in product market behavior is the result of the change in the

capital structure or from the exogenous event. Second, we would not be assured that the firm was financially unconstrained around the time of the event.

An alternative approach is to replace the firm's capital structure decision by an estimate based on exogenous factors (e.g., instrumental variables) that are not specific to the firm. If our results are robust to this change, they would provide strong evidence in support of the hypothesis that changes in capital structure lead to changes in the level of product market competition. In order to implement this approach, we first identify instruments that are not firm-specific but are related to the propensity to raise capital using debt versus equity. In this regard, the literature suggests that firms' capital structure decisions are heavily influenced by the capital structure of industry peers because firms in the same industry tend to exhibit commonalities in the factors that influence their capital structure [see Bradley, Jarrell and Kim (1984) for a discussion of this issue]. Thus, the average industry leverage should be a reasonably good predictor of the direction of a change in leverage for a particular firm.¹⁴ Second, it has been argued that the Tax Reform Act of 1986 decreased the tax benefit from debt because it reduced the statutory corporate tax rates. Therefore, the intrinsic attractiveness of debt relative to equity as alternative means of raising capital should be different before and after this change in the tax code.

The discussion above provides us with a set of instrumental variables that are exogenous to the firm and represent the relative attractiveness of debt and equity issues in the capital markets. Using these instrumental variables, we model the sample firm's decision to change its leverage as follows:

$$\text{DUMDEBT}_i = \beta_0 + \beta_1 \text{ Average Industry Leverage in Year } 0_i + \beta_2 \text{ TAXREFORM} + \varepsilon_i \quad (5)$$

¹⁴ Because we are interested in instruments that are not firm-specific, we do not use the capital structure of the firm relative to the industry average as an instrument. We expect that on a cross-sectional basis firms in highly levered industries will be more likely to raise capital through debt.

where DUMDEBT is a dummy variable that takes the value of 1 for positive changes in leverage and 0 otherwise, “Average Industry Leverage” is the average industry leverage, which excludes the leverage of the sample firm, and TAXREFORM is a dummy that takes the value of 1 for years after 1986 and is 0 otherwise.

We next follow a two-step approach to estimate the impact of a change in leverage on advertising expenditures. In the first step, we use Logit regressions to estimate the parameters of Equation 5 using data from the sample firms. We then use the estimated model parameters to calculate the predicted probability of increasing leverage for each sample firm. In the second step, we re-estimate Equation 4 but with one change: we substitute the predicted probability of increasing leverage calculated from the estimated parameters of equation 5 for DUMDEBT, the observed choice of the firm between debt and equity. This two-step approach removes firm-specific idiosyncratic factors from the capital structure decision and allows us to model it only as a function of exogenous factors that capture the relevant characteristics of the capital markets and the capital structure of the industry peers.

As expected, we find that all the parameter estimates for Equation 5 in the first stage have the correct signs. The average industry leverage has a positive and significant effect on the probability to increase leverage ($p < 0.01$). We also find that the coefficient of TAXREFORM is negative and significant ($p < 0.01$), which is consistent with the idea that the Tax Reform Act of 1986 reduced the tax shield of debt.

The results in Table 7 show that the parameter estimates for the new variable, the predicted probability to increase leverage, are negative and significant in all three years. Recall that the estimated value of this variable that we use in this regression is independent of managerial discretion or any firm-specific factors. These results are consistent with those reported in Table 6 and show that even when we remove the potential for the capital structure

change to be affected by any managerial discretion, including perhaps the intensity of product market competition, the interplay between capital structure and advertising competition reported earlier persists. These are important results and provide strong evidence in support of the contention that the capital structure effects observed in Table 6 are unlikely to be driven by management's discretionary choice to concurrently adjust the firm's capital structure in order to be consistent with the level of advertising competition in which they intend to engage.¹⁵

4.3 The Rivals' Response

We next examine the rival firms' response to the increased advertising competition of the sample firms. Specifically, we investigate which firms within an industry are more likely to respond to the increased advertising competition of the sample firms that follows the change in their capital structure. Since this is fundamentally a "within-industry" question, we divide the firms in each rival set into two groups: those firms whose change in advertising expenditures from Year -1 to Year t is above the industry average, and those whose change is below the industry average. The former set of firms may be characterized as responding relatively aggressively to the sample firms, and the latter firms as responding relatively passively. We then examine if the capital structure of these firms --- relative to their industry peers --- affects whether these rival firms are aggressive or passive.

We estimate the following Logit model for a rival firm to examine the impact of its leverage on the growth rate of its advertising expenditures:

¹⁵ We also conduct an auxiliary analysis of the endogeneity issue by examining whether large changes in advertising expenditures lead to changes in capital structure. To do this, we construct a new sample of firms that significantly changed their advertising expenditure from Year -1 to Year 0 and examined the change in their capital structure over the same period and the next period. We find that while the mean (median) change in their scaled advertising expenditure is large and statistically significant, both the mean and median change in the leverage of these firms is statistically no different from zero. Second, we find that the correlation between the change in advertising and the change in capital structure of these firms is no different from zero.

$$\begin{aligned}
\text{Aggressive}_{it} = & \beta_{0t} + \beta_{1t} \text{ Industry-Adjusted Leverage}_{i,t} + \beta_{2t} \text{ Market Share}_{i,t} \\
& + \beta_{3t} \text{ Industry-Adjusted Level of Advertising in Year } -1_{i,t} \\
& + \beta_{4t} \text{ Industry-Adjusted Growth Rate of Assets from Year } -1 \text{ to Year } t_{i,t} + \varepsilon_{it} \quad (6)
\end{aligned}$$

where the dependent variable takes a value “1” if the change in the advertising expenditure of the rival firm is above the industry average, and is “0” otherwise. Industry-adjusted leverage is the difference between the leverage of the rival firm and the mean leverage of the industry. All other variables are defined analogous to those in Equation 4.

We estimate Equation 6 using data from the set of rival firms. The rival set consists of all firms that are in the same 4-digit SIC code as the sample firm, excluding the sample firm. Because we want to analyze the rival’s reaction to the actions of a particular firm, we exclude those events in which two or more sample firms increase their net financing during the same year.¹⁶ The results from the estimation of the Logit model are presented in Table 8. They show that the industry-adjusted leverage of the rival firms has a negative and statistically significant effect on the level of its aggression for each of the three periods. Firms with relatively lower leverage have a higher probability --- than firms with relatively higher leverage --- of responding aggressively with increases in their own advertising expenditures. The effects of initial levels of advertising expenditures and the growth rates of assets are once again positive and significant ($p < 0.01$). Overall, the results in Table 8 parallel those of the sample firms, where we found a negative impact of leverage on the growth rate of advertising expenditures.

5. Interpretation of Results

Overall, our empirical findings suggest that leverage has a dampening effect on the level of advertising competition in product markets. However, if the firms in our sample are

¹⁶ However, we have also verified that including these events does not affect any of the main results.

not financially constrained, as may be the highly levered firms in other studies that find evidence that leverage weakens competition, what explains our results? A potential explanation relates to the intangible nature of advertising-based assets. It is well-established that advertising expenditures create an intangible asset --- but it is an asset that is not readily transferable, and one that would be greatly dissipated in the event of firm bankruptcy. Under such circumstances, one would expect that a firm that chooses relatively higher leverage would also choose to be more cautious with regard to investing in intangible assets such as those created by advertising.¹⁷ Thus, the capital raising sample firms in our study first decide on their desired leverage as well as the magnitude of their advertising, while their industry peers react to this initiative either aggressively by increasing their advertising assets if they are relatively less levered, or passively with less advertising assets if they are more debt-laden.

If the intangibility of advertising-based assets is an explanation for our findings regarding the dampening effects of leverage on advertising competition, then this effect should increase with the level of intangibility in the assets of the firm. To test this prediction, we examine how the level of asset tangibility affects the relation between leverage and advertising expenditures by dividing the sample firms into terciles based on the level of asset tangibility. Following the capital structure literature, we use a firm's net property, plant, and equipment scaled in Year -1 by its assets in Year -1 as a measure of tangibility (PP&E). We then separately estimate Equation 4 for each subset of sample firms.

The results from this additional analysis are reported in Table 9. We find that the coefficients for DUMDEBT are negative and statistically significant for firms with high intangibility (low PP&E). The coefficients for DUMDEBT are negative, but not significant

¹⁷ Similarly, firms with more (non-transferable) growth options are expected to use less debt.

for firms with medium level of intangibility (medium PP&E), and are statistically indistinguishable from zero for firms with low levels of intangibility (high PP&E). These results are consistent with our explanation that the intangibility of advertising-based assets leads to the interaction between capital structure and advertising competition observed in our data.

It is important to mention that the previous analysis depends on the assumption that advertising-based assets cannot be easily transferred to another firm without significant devaluation. However, firms can use advertising to build firm-level corporate brands or market-specific product brands, and it can be argued that the latter approach would perhaps create more transferable assets. While such a difference might potentially exist, the brand management literature suggests that the two extreme or pure forms of brand architectures rarely exist [e.g., Aaker and Joachimsthaler (2000)] and a continuum of architectures has evolved where a combination of the corporate and the product brands are jointly presented to the consumer.¹⁸ Some examples of these alternative intermediate architectures include token endorsement (Grape Nuts from Post), linked names (Nestea), strong endorsements (Courtyard by Marriott), and co-drivers (Dupont Stainmaster, Intel Pentium).

The pervasive usage of a continuum of brand architectures has an important implication for the interpretation of our results. Because a product (or divisional) brand is generally tied with a firm brand and the two brands are jointly promoted in the product market, a transfer or sale of even the product brand is likely to lead to its significant devaluation. For example, while Pentium is a product brand, its transfer to a new firm will break its linkage with its existing corporate brand (Intel), alter its architecture, and devalue it.

¹⁸In the marketing literature, brand architecture refers to the relationships among brands in a portfolio such as those between product brands, and between product brands and firm brands.

The widespread adoption of intermediate rather than extreme forms of brand architectures suggests that, because most product brands are likely to be connected to their respective firm brands, it is unlikely that they can be transferred without significant devaluation.

Consequently, the transferability of assets explanation for our findings applies fairly generally across a wide cross-section of firms.

6. Conclusion

Despite considerable interest among financial economists, the question of how capital structure affects product market competition has remained an open empirical issue. One strand of the literature predicts that greater leverage is associated with more aggressive or “harder” competition, while another associates it with less aggressive or “softer” competition. We provide empirical evidence in support of the latter view. We find that following an increase in funding, firms increase significantly their advertising expenditures relative to others in their industries. But more importantly, the size of this increase depends on firms’ capital structures. Firms whose leverage has decreased by the infusion of capital increase their advertising by more than those firms whose leverage has increased. This is the first paper to find a link between capital structure and advertising competition.

Our results on the reaction of the industry rivals parallel those for the capital-raising sample firms. We find that a rival firm is likely to respond more (less) aggressively than its industry peers to heightened advertising competition by the sample firm in its industry if the sample firm makes relatively greater use of debt than does its industry. Therefore, as in the case of the sample firms, we find that a rival’s financial leverage “softens” the intensity with which it competes; in other words, having greater financial leverage seems to weaken a firm’s response to competitive initiatives within its industry. Furthermore, our general result that the use of debt seems to soften non-price (advertising) competition seems to be unrelated to

constraints on the firm's ability to raise capital and does not require extreme leverage. But we do find evidence that suggests that it is the intangible and non-transferable nature of advertising assets in our study that may explain this behavior. Our results therefore complement those from earlier studies that have investigated the impact of capital structure on pricing, plant closings, and store opening and closings. Like these studies, we find that it is the more levered firms that behave passively while those with lower leverage are more aggressive competitors.

References

- Aaker, David A., and Erich A. Joachimsthaler. 2000. The brand relationship spectrum: The key to the brand architecture challenge. *California Management Review* 40:8-23.
- Bagwell, Kyle. 2001. The economic analysis of advertising. In *The economics of advertising*, ed. Kyle Bagwell. Cheltenham, U.K.: Edward Elgar Press.
- Bagwell, Kyle, and Garey Ramey. 1994. Advertising and coordination. *The Review of Economic Studies* 61:153-71.
- Becker, Gary S., and Kevin M. Murphy. 1993. A simple theory of advertising as a good or a bad. *Quarterly Journal of Economics* 108:941-64.
- Bolton, Patrick, and David S. Scharfstein. 1990. A theory of predation based on agency problems in financial contracting. *American Economic Review* 80:93-106.
- Bradley, Michael, Gregg A. Jarrell, and E. Han Kim. 1984. On the existence of an optimal capital structure: Theory and evidence. *Journal of Finance* 39:857-78.
- Brander, James A., and Tracy R. Lewis. 1986. Oligopoly and financial structure: The limited liability effect. *American Economic Review* 76:956-70.
- Carpenter, Gregory S., Lee G. Cooper, Dominique M. Hanssens, and David F. Midgley. 1988. Modeling asymmetric competition. *Marketing Science* 7:393-412.
- Chevalier, Judith A. 1995a. Do LBO supermarkets charge more? An empirical analysis of the effects of LBOs on supermarket pricing. *Journal of Finance* 50:1095-1112.
- Chevalier, Judith A. 1995b. Capital structure and product-market competition: Empirical evidence from the supermarket industry. *American Economic Review* 85:415-35.
- Chevalier, Judith A., and David S. Scharfstein. 1996. Capital market imperfections and countercyclical markups: Theory and evidence. *American Economic Review* 86:703-25.
- Chintagunta, Pradeep K., and Naufel J. Vilcassim. 1992. An empirical investigation of advertising strategies in a dynamic duopoly. *Management Science* 38:1230-44.
- Erickson, Gary M. 1985. A model of advertising competition. *Journal of Marketing Research* 22:297-304.
- Erickson, Gary, and Robert Jacobson. 1992. Gaining comparative advantage through discretionary expenditures: The returns to R&D and advertising. *Management Science* 38:1264-79.

- Fudenberg, Drew, and Jean Tirole. 1986. A 'signal-jamming' theory of predation. *Rand Journal of Economics* 17:366-76.
- Graham, John R. 2000. How big are the tax benefits of debt? *Journal of Finance* 55:1901-41.
- Horsky, Dan. 1977. An empirical analysis of optimal advertising policy. *Management Science* 23:1037-49.
- Kaldor, Nicholas. 1950. The economic aspects of advertising. *Review of Economic Studies* 18:1-27.
- Khanna, Naveen, and Sheri Tice. 2000. Strategic responses of incumbents to new entry: The effect of ownership structure, capital structure, and focus. *Review of Financial Studies* 13: 749-79.
- Kihlstrom, Richard E., and Michael H. Riordan. 1984. Advertising as a signal. *Journal of Political Economy* 92:427-50.
- Kovenock, Dan, and Gordon M. Phillips. 1995. Capital structure and product market rivalry: How do we reconcile theory and evidence? *American Economic Review* 85:403-8.
- Kovenock, Dan, and Gordon M. Phillips. 1997. Capital structure and product market behavior: An examination of plant exit and investment decisions. *Review of Financial Studies* 10:767-803.
- Kumar, Piyush. 1999. The impact of long-term client relationships on the performance of business service firms. *Journal of Service Research* 2:4-18.
- Lambin, Jean-Jacques. 1970. Optimal allocation of competitive marketing efforts: An empirical study. *Journal of Business* 43:231-51.
- Landes, Elizabeth M., and Andrew M. Rosenfield. 1994. The durability of advertising revisited. *Journal of Industrial Economics* 42:263-76.
- Maksimovic, Vojislav. 1988. Capital structure in repeated oligopolies. *Rand Journal of Economics* 19:389-407.
- Milgrom, Paul, and John Roberts. 1986. Price and advertising signals of product quality. *Journal of Political Economy* 94:796-821.
- Nelson, Philip. 1974. Advertising as information. *Journal of Political Economy* 82:729-54.
- Nevo, Aviv. 2001. Measuring market power in the ready-to-eat cereal industry. *Econometrica* 69:307-42.

- Parker, Philip M., and Namwoon Kim. 1997. National brands versus private labels: An empirical study of competition, advertising, and collusion. *European Management Journal* 15:220-35.
- Phillips, Gordon M. 1995. Increased debt and industry product markets: An empirical analysis. *Journal of Financial Economics* 37:189-238.
- Riordan, Michael H. 1985. Imperfect information and dynamic conjectural variations. *Rand Journal of Economics* 16:41-50.
- Roberts, Mark J., and Larry Samuelson. 1988. An empirical analysis of dynamic, nonprice competition in an oligopolistic industry. *Rand Journal of Economics* 19:200-20.
- Robinson, Joan. 1933. *The economics of imperfect competition*. London: MacMillan.
- Scherer, Frederic M. 1980. *Industrial market structure and economic performance*. 2d ed. Boston: Houghton Mifflin.
- Seldon, Barry J., Sudip Banerjee, and Roy G. Boyd. 1993. Advertising conjectures and the nature of advertising competition in an oligopoly. *Managerial and Decision Economics* 14:489-98.
- Shankar, Venkatesh. 1997. Pioneers' marketing mix reactions to entry in different competitive game structures: Theoretical analysis and empirical illustration. *Marketing Science* 16:271-93.
- Showalter, Dean M. 1995. Oligopoly and financial structure: Comment. *American Economic Review* 85:647-653.
- Stegeman, Mark. 1991. Advertising in competitive markets. *American Economic Review* 81:210-23.
- Stigler, George J. and Gary S. Becker. 1977. De gustibus non est disputandum. *The American Economic Review* 67:76-90.
- Telser, Lester G. 1966. Cutthroat competition and the long purse. *Journal of Law and Economics* 9:259-77.
- White, Halbert. 1980. A heteroscedasticity-consistent covariance matrix estimator and a direct test for heteroscedasticity. *Econometrica* 48:817-38.
- Zingales, Luigi. 1998. Survival of the fittest or the fattest? Exit and financing in the trucking industry. *Journal of Finance* 53:905-38.

Table 1
Distribution of Sample Firms by Calendar Year

This table reports the distribution by calendar year for the sample firms. To be included in the sample, each firm-year observation must satisfy the following criteria: i) the firm has available information on the COMPUSTAT files for at least one year over the period 1973-2002, ii) the level of net financing in Year t is at least 20% of the total assets in Year t-1, iii) the firm is not a financial firm (SIC codes 6000 through 6999) or an utility (SIC codes 4900 through 4999), iv) the firm belongs to an industry with at least two firms; v) its market share is at least 1%; vi) its advertising expenditures are available on the COMPUSTAT files during Year 0 and Year -1 (Year 0 is when capital is raised); vii) no other firm in its industry meets the previous criteria in the two years prior to the event; viii) the total amount spent on acquisitions in Year t is equal to zero; ix) the firm was not involved in a merger.

<u>Year</u>	<u>Number of Observations</u>	<u>Net Financing</u>	
		<u>Mean</u>	<u>Median</u>
1974	21	37.7%	27.3%
1975	23	34.2%	28.1%
1976	18	25.5%	23.1%
1977	24	47.7%	36.0%
1978	28	32.9%	29.8%
1979	25	39.9%	31.2%
1980	30	43.5%	32.1%
1981	21	68.2%	52.4%
1982	16	56.1%	47.4%
1983	43	62.9%	45.1%
1984	29	52.5%	38.0%
1985	21	54.1%	46.4%
1986	36	50.2%	39.0%
1987	34	47.8%	36.6%
1988	18	66.5%	53.5%
1989	20	56.7%	33.7%
1990	10	37.8%	29.6%
1991	17	49.6%	47.5%
1992	22	51.4%	40.1%
1993	21	55.4%	44.7%
1994	7	39.0%	34.2%
1995	12	45.2%	30.6%
1996	16	55.2%	49.6%
1997	16	50.1%	42.9%
1998	9	44.5%	27.1%
1999	10	80.5%	63.9%
2000	11	42.4%	37.3%
2001	10	46.3%	29.8%
2002	9	39.5%	37.7%
Entire Sample	577	49.1%	35.9%

Table 2
Summary Statistics

This table reports the summary statistics for the sample firms. To be included in the sample, each firm-year observation must satisfy the following criteria: i) the firm has available information on the COMPUSTAT files for at least one year over the period 1973-2002, ii) the level of net financing in Year t is at least 20% of the total assets in Year t-1, iii) the firm is not a financial firm (SIC codes 6000 through 6999) or an utility (SIC codes 4900 through 4999), iv) the firm belongs to an industry with at least two firms; v) its market share is at least 1%; vi) its advertising expenditures are available on the COMPUSTAT files during Year 0 and Year -1 (Year 0 is when capital is raised); vii) no other firm in its industry meets the previous criteria in the two years prior to the event; viii) the total amount spent on acquisitions in Year t is equal to zero; ix) the firm was not involved in a merger.

Panel A: Entire Sample				
	<u>Mean</u>	<u>Median</u>	<u>Std. Dev.</u>	<u>N</u>
Net Financing	49.1%	35.9%	34.0%	577
Δ in Leverage	7.1%	9.6%	16.7%	577
Debt/ Assets (Year -1)	21.8%	16.7%	21.1%	577
Debt/ Assets (Year 0)	28.1%	27.1%	22.0%	565
Mean Debt/ Assets (Year -1) of Rival Firms	21.2%	19.1%	10.7%	571
Mean Debt/ Assets (Year 0) of Rival Firms	21.0%	19.3%	10.6%	576
Number of Firms in the Industry	21.2	14.0	25.1	577
Herfindahl Index	3,094.0	2,565.1	1,946.0	577
Market Share of Sample Firm	8.2%	3.1%	14.5%	577
Panel B: Leverage-Increasing Firms				
	<u>Mean</u>	<u>Median</u>	<u>Std. Dev.</u>	<u>N</u>
Net Financing	41.7%	30.9%	28.1%	374
Δ in Leverage	16.6%	15.9%	9.7%	374
Debt/ Assets (Year -1)	21.7%	17.1%	20.5%	374
Debt/ Assets (Year 0)	37.7%	34.9%	19.2%	374
Mean Debt/ Assets (Year -1) of Rival Firms	22.2%	20.1%	11.4%	369
Mean Debt/ Assets (Year 0) of Rival Firms	22.6%	20.7%	11.3%	373
Number of Firms in the Industry	21.0	13.0	26.8	374
Herfindahl Index	3,151.8	2,683.1	1,941.0	374
Market Share of Sample Firm	9.5%	3.7%	16.0%	374
Panel C: Leverage-Decreasing Firms				
	<u>Mean</u>	<u>Median</u>	<u>Std. Dev.</u>	<u>N</u>
Net Financing	63.0%	53.0%	39.3%	203
Δ in Leverage	-10.2%	-5.7%	12.1%	203
Debt/ Assets (Year -1)	22.2%	16.4%	22.1%	203
Debt/ Assets (Year 0)	10.9%	4.1%	15.1%	201
Mean Debt/ Assets (Year -1) of Rival Firms	19.5%	17.7%	9.0%	202
Mean Debt/ Assets (Year 0) of Rival Firms	18.1%	16.3%	8.3%	203
Number of Firms in the Industry	21.6	15.0	21.8	203
Herfindahl Index	2,987.4	2,428.8	1,955.0	203
Market Share of Sample Firm	5.9%	2.3%	11.0%	203

Table 3
Changes in Advertising Expenditures (All Sample Firms)

This table reports changes in advertising expenditures for all sample firms. The unadjusted change refers to the change in advertising expenditures (COMPUSTAT item # 45) from Year -1 to Year t scaled by the firm's asset in Year -1. The industry-adjusted change refers to the difference between the unadjusted change of the sample firm and the mean of the unadjusted change of the remaining firms in the same 4-digit SIC code. The mean and median levels are calculated using observations that have been winsorized at the first and the 99th percentiles. The significance levels of the means (medians) are based on a two-tailed t-test (two-tailed Wilcoxon rank test). All numbers are in percentages.

Panel A: Unadjusted Values				
	Initial Level	Changes in Advertising		
	Adver. ₋₁ /Asset. ₋₁	Year -1 to Year 0	Year -1 to Year 1	Year -1 to Year 2
Mean	5.57 ^a	1.84 ^a	3.87 ^a	5.77 ^a
Median	2.71 ^a	0.58 ^a	1.15 ^a	1.94 ^a
Sample Size	577	577	498	428

Panel B: Industry-Adjusted Values				
	Initial Level	Changes in Advertising		
	Adver. ₋₁ /Asset. ₋₁	Year -1 to Year 0	Year -1 to Year 1	Year -1 to Year 2
Mean	1.18 ^a	1.04 ^a	2.19 ^a	2.50 ^a
Median	-0.19	0.16 ^a	0.44 ^a	0.50 ^a
Sample Size	540	525	448	375

^aSignificantly different from 0 at 1-percent level.

^bSignificantly different from 0 at 5-percent level.

^cSignificantly different from 0 at 10-percent level.

Table 4
Changes in Advertising Expenditures (Leverage-Increasing Sample Firms)

This table reports changes in advertising expenditures for the leverage-increasing sample firms. The unadjusted change refers to the change in advertising expenditures (COMPUSTAT item # 45) from Year -1 to Year t scaled by the firm's asset in Year -1. The industry-adjusted change refers to the difference between the unadjusted change of the sample firm and the mean of the unadjusted change of the remaining firms in the same 4-digit SIC code. The mean and median levels are calculated using observations that have been winsorized at the first and the 99th percentiles. The significance levels of the means (medians) are based on a two-tailed t-test (two-tailed Wilcoxon rank test). All numbers are in percentages.

Panel A: Unadjusted Values				
	Initial Level	Changes in Advertising		
	Adver. ₋₁ /Asset. ₋₁	Year -1 to Year 0	Year -1 to Year 1	Year -1 to Year 2
Mean	5.10 ^a	1.26 ^a	2.79 ^a	3.99 ^a
Median	2.59 ^a	0.36 ^a	0.76 ^a	1.07 ^a
Sample Size	374	374	324	278
Panel B: Industry-Adjusted Values				
	Initial Level	Changes in Advertising		
	Adver. ₋₁ /Asset. ₋₁	Year -1 to Year 0	Year -1 to Year 1	Year -1 to Year 2
Mean	0.90 ^b	0.43 ^b	1.09 ^a	0.69
Median	-0.18	-0.01	0.16	-0.26
Sample Size	351	340	291	246

^aSignificantly different from 0 at 1-percent level.

^bSignificantly different from 0 at 5-percent level.

^cSignificantly different from 0 at 10-percent level.

Table 5
Changes in Advertising Expenditures (Leverage-Decreasing Sample Firms)

This table reports changes in advertising expenditures for the leverage-decreasing sample firms. The unadjusted change refers to the change in advertising expenditures (COMPUSTAT item # 45) from Year -1 to Year t scaled by the firm's asset in Year -1. The industry-adjusted change refers to the difference between the unadjusted change of the sample firm and the mean of the unadjusted change of the remaining firms in the same 4-digit SIC code. The mean and median levels are calculated using observations that have been winsorized at the first and the 99th percentiles. The significance levels of the means (medians) are based on a two-tailed t-test (two-tailed Wilcoxon rank test). All numbers are in percentages.

Panel A: Unadjusted Values				
	Initial Level	Changes in Advertising		
	Adver. ₋₁ /Asset. ₋₁	Year -1 to Year 0	Year -1 to Year 1	Year -1 to Year 2
Mean	6.41 ^a	2.91 ^a	5.87 ^a	9.08 ^a
Median	3.06 ^a	1.19 ^a	2.12 ^a	3.71 ^a
Sample Size	203	203	174	150

Panel B: Industry-Adjusted Values				
	Initial Level	Changes in Advertising		
	Adver. ₋₁ /Asset. ₋₁	Year -1 to Year 0	Year -1 to Year 1	Year -1 to Year 2
Mean	1.71 ^a	2.15 ^a	4.25 ^a	5.97 ^a
Median	-0.26	0.73 ^a	1.95 ^a	2.37 ^a
Sample Size	189	185	157	129

^aSignificantly different from 0 at 1-percent level.

^bSignificantly different from 0 at 5-percent level.

^cSignificantly different from 0 at 10-percent level.

Table 6
Regression Analysis: Changes in Advertising (All Sample Firms)

This table reports regressions relating changes in advertising expenditures to several factors. The unadjusted change refers to the change in advertising expenditures (COMPUSTAT item # 45) from Year -1 to Year t scaled by the firm's asset in Year -1. The industry-adjusted change refers to the difference between the unadjusted change of the sample firm and the mean of the unadjusted change of the remaining firms in the same 4-digit SIC code. DUMDEBT is a dummy variable that takes the value of 1 for positive changes in leverage and 0 otherwise. The standard errors of the coefficients have been adjusted for heteroskedasticity using White's (1980) procedure. Numbers within parentheses are p-values.

	Dependent Variable: Industry-Adjusted Changes in Advertising		
	<u>Year -1 to Year 0</u>	<u>Year -1 to Year 1</u>	<u>Year -1 to Year 2</u>
Constant	-0.0299 (0.2678)	-0.0493 (0.2718)	-0.0715 (0.3775)
DUMDEBT	-0.0123 (0.0028)	-0.0202 (0.0078)	-0.0343 (0.0103)
Log (Herfindahl Index)	0.0049 (0.1427)	0.0075 (0.1825)	0.0104 (0.3100)
Number of Firms in the Industry	0.0001 (0.2991)	0.0003 (0.0070)	0.0004 (0.0280)
Market Share of Sample Firm	-0.0053 (0.7246)	0.0119 (0.6284)	0.0528 (0.3441)
Industry-Adjusted Level of Advertising in Year -1	0.1553 (0.0005)	0.3240 (0.0004)	0.4269 (0.0012)
Industry-Adjusted Growth Rate of Assets from Year -1 to Year t	0.0244 (0.0001)	0.0324 (0.0001)	0.0328 (0.0001)
Adj. R ²	22.5%	36.9%	37.3%
Sample Size	525	448	375

Table 7
Instrumental Variables Analysis

This table reports regressions relating changes in advertising expenditures to several factors. The unadjusted change refers to the change in advertising expenditures (COMPUSTAT item # 45) from Year -1 to Year t scaled by the firm's asset in Year -1. The industry-adjusted change refers to the difference between the unadjusted change of the sample firm and the mean of the unadjusted change of the remaining firms in the same 4-digit SIC code. The predicted probability of increasing leverage is equal to the estimated predicted probability from the following Logit model:

$$\text{DUMDEBT}_i = \beta_0 + \beta_1 \text{ Average Industry Leverage in Year } 0_i + \beta_2 \text{ TAXREFORM} + \varepsilon_i$$

DUMDEBT is a dummy variable that takes the value of 1 for positive changes in leverage and 0 otherwise. Average Industry Leverage is the average industry leverage, which excludes the leverage of the sample firm. TAXREFORM is a dummy that takes the value of 1 for years posterior to 1986 and 0 otherwise. The standard errors of the coefficients have been adjusted for heteroskedasticity using White's (1980) procedure. Numbers within parentheses are p-values.

	Dependent Variable: Industry-Adjusted Changes in Advertising		
	<u>Year -1 to Year 0</u>	<u>Year -1 to Year 1</u>	<u>Year -1 to Year 2</u>
Constant	-0.0138 (0.6340)	-0.0197 (0.6994)	-0.0100 (0.9045)
Predicted Probability of Increasing Leverage	-0.0323 (0.0082)	-0.0586 (0.0249)	-0.1072 (0.0036)
Log (Herfindahl Index)	0.0046 (0.1692)	0.0070 (0.2172)	0.0089 (0.3729)
Number of Firms in the Industry	0.0000 (0.5237)	0.0002 (0.0298)	0.0003 (0.0958)
Market Share of Sample Firm	-0.0094 (0.5471)	0.0068 (0.7868)	0.0383 (0.4932)
Industry-Adjusted Level of Advertising in Year -1	0.1545 (0.0005)	0.3207 (0.0011)	0.4181 (0.0041)
Industry-Adjusted Growth Rate of Assets from Year -1 to Year t	0.0255 (0.0001)	0.0331 (0.0001)	0.0335 (0.0001)
Adj. R ²	21.7%	36.5%	37.0%
Sample Size	525	448	375

Table 8
Logit Equations for Probability of a Rival Firm Becoming Aggressive

This table examines how firm characteristics affect the probability of a rival firm becoming more aggressive than their industry peers. The dependent variable is a dummy variable that takes the value of 1 when the change in advertising expenditures of a rival firm is greater than the average industry change in advertising expenditures and 0 otherwise. A rival firm is a firm with the same 4-digit SIC code as the sample firm. Industry-adjusted refers to the difference between the unadjusted level and the mean of the unadjusted level of the industry. Numbers within parentheses are p-values.

Dependent Variable: $Y_i = \begin{cases} 1 & \text{if } \Delta \text{ in Advertising} > \text{Average Industry } \Delta \text{ in Advertising} \\ 0 & \text{otherwise} \end{cases}$

	<u>Year -1 to Year 0</u>	<u>Year -1 to Year 1</u>	<u>Year -1 to Year 2</u>
Constant	-0.2483 (0.0001)	-0.2492 (0.0001)	-0.3043 (0.0001)
Industry-Adjusted Leverage in Year -1	-0.4600 (0.0317)	-0.6377 (0.0090)	-0.6616 (0.0138)
Market Share	0.2675 (0.3800)	0.2644 (0.4229)	0.7148 (0.0422)
Industry-Adjusted Level of Advertising in Year -1	2.6046 (0.0002)	2.5337 (0.0014)	2.5353 (0.0041)
Industry-Adjusted Growth Rate of Assets from Year -1 to Year t	0.8194 (0.0001)	0.8477 (0.0001)	0.7125 (0.0001)
Sample Size	2,990	2,570	2,230

Table 9
The Effect of Intangibility on the Relation between Leverage and Advertising Expenditures

This table reports regressions relating changes in advertising expenditures to several factors estimated on sub-samples partitioned based on the level of net property, plant, and equipment scaled by total assets. The unadjusted change refers to the change in advertising expenditures (COMPUSTAT item # 45) from Year -1 to Year t scaled by the firm's asset in Year -1. The industry-adjusted change refers to the difference between the unadjusted change of the sample firm and the mean of the unadjusted change of the remaining firms in the same 4-digit SIC code. DUMDEBT is a dummy variable that takes the value of 1 for positive changes in leverage and 0 otherwise. PP&E is net property, plant, and equipment in Year -1 scaled by total assets in Year -1. The standard errors of the coefficients have been adjusted for heteroskedasticity using White's (1980) procedure. Numbers within parentheses are p-values.

Dependent Variable: Industry-Adjusted Changes in Advertising									
	Low PP&E			Medium PP&E			High PP&E		
	Year -1 to Year 0	Year -1 to Year 1	Year -1 to Year 2	Year -1 to Year 0	Year -1 to Year 1	Year -1 to Year 2	Year -1 to Year 0	Year -1 to Year 1	Year -1 to Year 2
Constant	-0.0731 (0.1618)	-0.1418 (0.0819)	-0.2330 (0.1420)	-0.0069 (0.8650)	-0.0048 (0.9590)	0.2007 (0.1722)	0.0012 (0.9677)	-0.0171 (0.7344)	-0.0948 (0.3079)
DUMDEBT	-0.0173 (0.0195)	-0.0376 (0.0027)	-0.0434 (0.0318)	-0.0089 (0.1283)	-0.0101 (0.4723)	-0.0324 (0.1141)	-0.0034 (0.4809)	0.0037 (0.7299)	0.0037 (0.8531)
Log (Herfindahl Index)	0.0108 (0.0995)	0.0203 (0.0480)	0.0304 (0.1367)	0.0014 (0.7855)	0.0005 (0.9633)	-0.0225 (0.2337)	0.0005 (0.8897)	0.0016 (0.8026)	0.0093 (0.4044)
Number of Firms in the Industry	0.0001 (0.6807)	0.0003 (0.1177)	0.0007 (0.0827)	0.0001 (0.5049)	0.0005 (0.0428)	0.0000 (0.9819)	0.0000 (0.8231)	0.0001 (0.2718)	0.0003 (0.0747)
Market Share of Sample Firm	0.0246 (0.4567)	0.0639 (0.2598)	0.2412 (0.0528)	0.0058 (0.7625)	-0.0079 (0.7873)	-0.0034 (0.9250)	-0.0581 (0.0013)	-0.0543 (0.2799)	-0.0774 (0.1928)
Industry-Adjusted Level of Advertising in Year -1	0.1165 (0.0351)	0.3179 (0.0357)	0.5427 (0.0131)	0.3256 (0.0001)	0.5900 (0.0001)	0.7073 (0.0001)	-0.0117 (0.8497)	0.0410 (0.7662)	0.0009 (0.9961)
Industry-Adjusted Growth Rate of Assets from Year -1 to Year t	0.0256 (0.0001)	0.0314 (0.0001)	0.0310 (0.0006)	0.0304 (0.0003)	0.0327 (0.0001)	0.0330 (0.0001)	0.0123 (0.0237)	0.0300 (0.0001)	0.0286 (0.0005)
Adj. R ²	17.9%	31.4%	33.3%	50.6%	55.6%	57.8%	5.54%	24.4%	19.5%
Sample Size	180	155	141	172	149	117	172	144	117