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Advertising intensity and concentration change in manufacturing industries

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CHAPTER I. INTRODUCTION

There are two basic theoretical views of how advertising effects competition. One school of thought suggests that advertising decreases competition. Kaldor (1950) argued that through advertising economies of scale, advertising increases market concentration. Also, Bain (1956) suggested that advertising causes strong product differentiation and brand loyalty, which are barriers to entry and will lead to higher concentration.

The opposite school of thought believes that advertising increases competition. Most noted here is Nelson (1970, 1974), who argues in his first paper that advertising increases information to the consumer, which makes demand curves more elastic, putting downward pressure on prices. Also, he argues advertising allows for easier entry by new firms. In his second paper, Nelson concludes that advertising provides direct information on relative product quality. With this extra information, the consumer is a more careful shopper, making the markets more competitive.

Hence, there are plausible economic arguments on both sides of the issue: does advertising increase or decrease competition? Comanor and Wilson (1979, p. 457) state, "While these theoretical models are important for their explanations of how advertising might work, it is evident that no consensus has developed."

Retail and National Advertising

It is true that there is no consensus on advertising's effects on competition. However, this is in large part due to treating all advertising homogeneously. It is helpful to separate advertising into two different types, retail and national. Retail advertising consists of advertising that contains a high degree of information. Examples include the classified ads in newspapers, the yellow pages, some mail-order catalogs, and some retail store ads. This increase of information to the consumer tends to make the markets more efficient and competitive. Going back to Nelson's arguments, more information will make market demand curves more elastic, putting downward pressure on prices. Also, this information could help new entrants to overcome loyalty and familiarity with established products. Therefore, retail advertising in most cases is likely to be procompetitive.

In contrast, national advertising consists largely of advertising run by manufacturers. As will be shown below, it tends to rely more on persuasion than information to sell products. Also, it is dominated by television advertising which gives larger firms many advantages. (These will be covered in detail in Chapter III.) And, it is concentrated. While retail advertising is done by many millions of businesses, national advertising is dominated by relatively few. Currently, the top 100 manufacturers account for roughly one-half of all national advertising (Norris, 1984, p. 49). Therefore, national advertising in most cases is likely to be anticompetitive. Norris (1984, p. 47) writes that:

Retail and national advertising are so different if not

> contradictory in function that it is unfortunate the same word applies to both. But, since it does, distinguishing one from the other is of utmost importance. With surprising frequency, writers fail to do so, generalizing from one to the other.

At least two types of studies have confirmed that national advertising has more persuasion than information content. The first type is content analysis of commercials. At least three of these studies analyzed TV commercials: Resnik and Stern (1977), Reid and Rotfeld (1981), and Pollay et al. (1980). All three studies generated similar results, that television commercials have little if any information content. I will give the Resnik and Stern (1977) results in more detail. Three hundred seventy-eight television commercials broadcasted by the three major networks were reviewed during all periods of a week in April 1975. The information content of the commercials was tested by looking for 14 different information clues (price or value, quality, performance, components or contents, availability, special offers, taste, packaging or shape, guarantees or warranties, safety, nutrition, independent research, company-sponsored research, and new ideas). However, no information clue was challenged for truthfulness, credibility, or soundness of evidence presented. Despite the lenient evaluation criteria, only 49 percent of the commercials had at least one information clue, while 16 percent had two clues, and only 1 percent had three clues.

The second type of study that implies that national advertising contains more persuasion than information is the request that producers substantiate claims made by their advertising. One example is a study by Woodside (1977), who requested substantiation from 27 television and 27 magazine advertisers. Only 22.2 percent responded satisfactorily. The others either did not respond or their responses were viewed as nonsatisfactory. A similar result was obtained by Nader and Cowan (1973). Hence, available evidence tells us that national advertising has little information content.

It appears that national advertising works instead by persuasion and product image building. National advertising (through product differentiation) elevates prices and decreases competition best when it is difficult for consumers to determine whether one product is in fact superior to another. A good example is ReaLemon lemon juice, which in 1973 had 80 percent of the market but charged a price 35 percent higher than its identical rival products (Scherer, 1980, p. 382). Other examples are provided by the "double-blind experiments which have repeatedly demonstrated that consumers cannot consistently distinguish premium from popular-priced beer brands, but exhibit definite preferences for the premium brands when labels are affixed--correctly or not" (Scherer, 1980, p. 382). Still other examples include dentifrices, soaps, and drugs (Scherer, 1980, p. 382).

In summary, in order to look at the effects of advertising on competition, advertising must be categorized as national or retail. Nevertheless, some writers still confuse these two. Norris (1984, p. 61) states that

> Despite all the evidence to the contrary, however, a handful of economists maintain that advertising is information that enables consumers to make more rational choices, leading to improved functioning of markets, lower prices, and so forth. They appear to believe that of national as well as retail advertising; in fact, as

mentioned earlier, there is often no indication they are aware of any difference between the two (Norris, 1984, pp. 60-61).

Case Studies of Retail and National Advertising

To further illustrate the difference between retail and national advertising, below are presented one case of retail advertising that is procompetitive and two cases of national advertising that are anticompetitive.

One case where retail advertising has been shown to be procompetitive is for eyeglasses. Benham (1972) used a subsample of 634 individuals from a survey on expenditures for medical services in 1963. He ran a regression equation with the price of a pair of glasses as the dependent variable. The most important independent variable was a dummy variable which is equal to one if the individual purchased eyeglasses in a state with complete prohibition of eyeglasses advertising and equal to zero otherwise. The results showed that glasses cost on average $6.70 (or 25 percent) more in states that restrict all types of advertising by the practitioner. Hence, when the optometrists' code of ethics prohibits advertising, the practitioners benefit and consumers lose by higher eyeglass prices.

Cases where national advertising is anticompetitive are plentiful. One case is Folger's coffee. Folger operated primarily west of the Mississippi River before it was acquired by Proctor and Gamble (P&G) in 1963. After the FTC freed P&G of its consent agreement (from a 1967 case), it began to expand Folger eastward by heavy advertising--financed from its other products (P&G produces over 60 well-known grocery products) (Connor et al., 1985, p. 259). In 1972, Folger entered Cleveland and advertised heavily. In early 1973, Folger entered Philadelphia with a very strong advertising blitz--use of daytime and nighttime television on 14 stations.

General Foods (GF), another large grocery product conglomerate, owns Maxwell coffee, the coffee market leader of the East. In response to Folger's entry, GF unleashed a counterattack. GF lost $4 million in this counterattack, but expected this loss to be more than offset by future profits if it could maintain or increase its market share (Connor et al., 1985, p. 262).

Both P&G and GF were quite successful in increasing their market shares by costly cross-subsidization promotion and advertising. This meant that some small single-line coffee companies lost market shares. In fact, many were forced out of business shortly after 1973, including Breakfast Cheer Coffee of Pittsburgh, Paul de Lima Coffee Co. of Syracuse, and the Indian Coffee Co. of Cleveland (Connor et al., 1985, p. 264). As a result, the combined share of the coffee market for P&G and GF rose from 47 percent in 1968 to 63 percent in 1981 (Wall Street Journal, 1981). The same Wall Street Journal article also stated that because of the decrease in competition, the coffee roasters "have been reluctant to lower their prices in line with the prices of raw coffee" (Wall Street Journal, 1981, p. 25). Thus, today the coffee industry is more concentrated and less competitive than before the P&G-Folgers merger.

Another case where national advertising has been anticompetitive is in the Philip Morris-Miller Brewing Company merger of 1969-1970. Philip Morris is a large multinational conglomerate. Among other products it produces, it sells over 160 brands of cigarettes in over 170 countries (Connor et al., 1985, p. 250). And, it already had experience at gaining market share in the cigarette industry through successful advertising of Marlboro cigarettes. In 1955, Philip Morris changed Marlboro to a filtered tip and began advertising it with the burly Marlboro cowboy. Between 1955 and 1960, the sales of Marlboro had increased from less than a half billion dollars to over $22 billion (Telser, 1962, p. 476). Hence, Philip Morris had both the financial resources and advertising expertise to cause a major structural change in most any industry in which it bought a subsidiary company.

On the other hand, the Miller Brewing Company was a relatively small single-line company (4.5 percent of total beer sales in 1969) (Connor et al., 1985, p. 251). During 1971-1973, Philip Morris-Miller began experimenting and exploring to find what advertising strategy would best gain a large share of the beer market. In 1972, it bought the Meister Bräu, Lite, and Buckeye brands of Meister Bräu, Inc. of Chicago, and began advertising each. Lite was the most successful, so Lite's advertising was increased and Meister Bräu's and Buckeye's were decreased. Overall, Philip Morris-Miller increased its advertising budget from $9.4 million in 1970 to $140 million in 1982 (Connor et al., 1985, p. 255). This advertising increase helped Philip Morris-Miller to increase Lite's sales by over 4,000 percent between 1974 and 1982 (Connor et al., 1985, p. 256). This is a good example of gaining market shares by identifying a market segment (a low-calorie beer endorsed by big-time athletes to nullify the "sissy" image of a low-calorie beer) and then advertising heavily.

It should be noted that only a big conglomerate such as Philip Morris could finance such a promotion. Miller was profitable in 1970 but lost money every year from 1971-1975, and earned modest profits in 1976 and 1977. Even in 1981, Miller earned a 4 percent profit--compared to 17 percent on Philip Morris' cigarette operations (Connor et al., 1985, p. 258). Hence, Philip Morris was willing to face deep and sustained losses and low profits in order to earn expected higher profits in the future due to its increased market power. In contrast, a single-line firm could never have afforded these advertising costs and consequent losses.

As in the coffee industry case, the leading beer maker, Anheuser-Busch, responded by its own aggressive advertising campaign. As a result, the larger brewers became bigger and the smaller brewers became smaller, sold out, or went out of business. The number of brewers fell from 126 in 1971 to about 25 in 1982 while the four-firm concentration rose from 50.8 percent in 1972 to 78.5 percent in 1982 (Connor et al., 1985, pp. 246-247). Of course, other factors, such as increasing economies of scale, could be a factor for this increased concentration. But, undoubtedly, increased advertising intensity was the key factor as it is unlikely for economies of scale to increase a great deal over just a ten-year period. Mueller (1978, pp. 102-103) states that, "I think this is one of the most dramatic examples that I have ever seen of the restructuring of an industry in less than a decade."

Dissertation Overview

These above cases concerning the effects of retail and national advertising on competition are interesting. However, in order to test the anticompetitive effects of national advertising for a broad segment of American industries, I will run a regression model with concentration change as the dependent variable and advertising intensity (levels and changes) as the main independent variable. (Advertising intensity is advertising expenditures divided by value-of-shipments.)

Although past empirical studies (via various static models) have supported both procompetitive and anticompetitive views of advertising, only the studies using a dynamic model (concentration change as the dependent variable) have found consistent results. As Rogers (1982, p. 203) pointed out, "It is important to note that no study found advertising to exert a significant negative effect on concentration change." All advertising intensity coefficients in those studies have been positive and often significant or negative and insignificant. Rogers (1982, p. 203) further explains that these insignificant coefficients are probably a function of poor data.

<u>Use of concentration ratios</u>

Market concentration ratios are defined as the percent of total industry sales (or capacity, or employment, or value added, or physical output) contributed by the largest few firms. For the U.S., the Census Bureau publishes the concentration ratios for markets at the four-digit (industry) level or the five-digit (product class) level, as defined by the Standard Industrial Classification (SIC) system for the top four, eight, twenty, or fifty firms. The four-digit industry market classifications are more broad than the five-digit product class market classifications. For example, industry 2844, toilet preparations, can be further classified at the five-digit level to 28441, shaving preparations, 28442, perfume, 28443, hair preparations, 28444, dentifrices, and 28445, other cosmetics and toilet preparations. Since more data (other than concentration ratios) are available at the four-digit level, I will use four-digit concentration ratios in this study.

Concentration ratios are generally viewed as a reasonable measure of market power. As with any data, the SIC concentration ratios have some measurement problems. Since the SIC concentration ratios assume national markets for all industries, the market power indicated by concentration ratios tends to be overstated when an industry has considerable import competition, as in the automobile, shoe, or television industries. On the other hand, they tend to be understated when an industry ships its products only in a local or regional market, as in the cement and newspaper industries. Also, industries should be defined so that reasonably close substitute goods are classified in the same industry. The SIC classification system also has some problems here, where some industries are defined too broadly or narrowly. Probably the best example of an industry too broadly defined is industry 2834, pharmaceutical preparations, which lumps together dozens of drugs which are not adequate substitutes. Examples of an industry too narrowly defined from the use point of view (close substitutes classified in different industries) are 3221, glass containers, and 3411, metal cans.

The problem of an industry defined too narrowly or broadly is present at both the four-digit and five-digit levels. In general, Scherer (1980, p. 64) states that the four-digit industries err on the side of understating concentration because they tend to be defined too broadly on average, while the five-digit product markets error on the side of overstating concentration because they tend to be defined too narrowly on average. Therefore, studies at either the 4-digit or 5-digit level will have this definition problem, although the bias appears to be greater at the four-digit level (Scherer, 1980, p. 64). In sum, concentration ratios tend to understate market power when industry markets are defined to include nonsubstitutes or the meaningful market is local or regional. And, concentration ratios tend to overstate market power when industry markets are defined to exclude substitutes or import competition is significant.

Despite these problems, the SIC concentration ratios are one of the two types of market power data available covering the manufacturing industries. Some of the problems with concentration ratios are not as important in this dissertation because the dependent variable is concentration change. Even if the concentration ratio measures have some problems, the change in concentration over a period of years shows consistent results. As Shepherd (1979, p. 200) states, "It (concentration ratios) can show changes in structure pretty accurately. Thus, the market power indicated by a ratio of 53 or 63 may be a matter of debate, but a rise of the ratio from 53 to 63 strongly suggests that been a rise in market power."

The other common market power data source for manufacturing industry studies is profit rates. Most empirical evidence (as well as economic reasoning) indicates that concentration levels and profit rates are highly correlated. Weiss (1974, p. 202) did a survey on the concentration-profit rate literature and concluded that:

> The bulk of the studies shows a significant positive effect of concentration on profits or margins. While there is a good deal of overlap in the data (almost half depends on profit rates for American manufacturing in the 1950s), all the studies together reflect a wide range of experience--from 1936 to 1970, and covering Britain, Canada, and Japan as well as the United States.

This adds support to using concentration as a measure of market power and concentration change as a measure of change in market power.

Use of advertising intensity

As indicated above, the main independent variable in this concentration change model is advertising intensity (changes and levels). While most other studies using concentration change models have used general advertising intensity, I will also focus on, among others, network television advertising intensity for at least two reasons. First, my advertising data set is disaggregated into six different media, including spot and network television advertising. The majority of past studies using a concentration change model and advertising intensity had an advertising data set consisting of only total media expenditures. Second, as described above, national advertising tends to be anticompetitive because it is more persuasive than informative in nature. And, television advertising (especially network) in recent years is clearly the most important component of national advertising. Television advertising expenditures grew from near zero in 1947 to 69 percent of all measured media advertising in 1972 (Mueller and Rogers, 1980, p. 91). As discussed earlier, this advertising is heavily dominated by a relatively few large corporations. In addition, there exist with TV advertising numerous advantages for the larger firms (presented in Chapter III). Therefore, this study will analyze the effects of network television (and other) advertising intensity on concentration change from 1963 to 1982 and various subperiods. The data set will include 269 (out of 450 possible) four-digit SIC industries whose definitions are comparable over this period.

An overview of the rest of this dissertation is as follows. Chapter II is a literature review of all past concentration change models that use some type of advertising or advertising intensity measure as an independent variable. Chapter III gives the economic rationale for the inclusion of each independent variable and the expected sign of each coefficient. Chapter IV discusses the data source of each variable. Chapter V covers the empirical results, and Chapter VI is a general summary and conclusion.

CHAPTER II. REVIEW OF RELEVANT LITERATURE

My dissertation has one basic model--a single equation concentration change model with advertising intensity as the main independent variable. There have been ten relevant prior studies that have been done on this relationship, each of which will be categorized and discussed according to its source of advertising intensity data. A summary of the variables used and results obtained is presented in Table II.1 at the end of Chapter II.

Before reviewing these studies, it should be pointed out that the forerunner in using both concentration change and advertising intensity data was Mueller (1967). Instead of a model, he used descriptive statistics. He suggested that a stable, average concentration trend of all manufacturing industries concealed a divergent trend in concentration. He used Parker's (1967) data set that classified four-digit SIC industries into producer goods or consumer goods with low, medium and high levels of product differentiation (based on advertising intensity). The results were interesting: for the period 1947-1963, producer good industries experienced a decline in average four-firm concentration while consumer good industries experienced increases in average four-firm concentration, with larger increases in concentration industries with a higher degree of product differentiation (e.g., higher advertising intensity). Mueller concluded that "monopoly capitalism" is not inevitable because of technical economies--as supported by the evidence for the producer good industries. However, the evidence from the consumer good industries showed that advertising (through large-scale promotion, especially in TV) did lead to an increase in concentration.

The First Generation of Concentration Change Models

The first generation of concentration change models to use advertising intensity as an independent variable were Marcus (1969a), Mueller and Hamm (1974), and Wright (1978). All used Robert Parker's (1967) advertising data set, compiled at the FTC for the years 1947, 1954, 1958 and 1963. Parker used a discrete advertising variable: four-digit SIC industries were classified into either producer good industries or consumer good industries with low, medium and high degrees of product differentiation. (The degree of product differentiation was based on advertising intensity.)

Marcus (1969a) was the first to use a concentration change model with advertising intensity as an independent variable. The purpose of his paper was to "employ newer data and a more comprehensive test procedure in a reevaluation of this hypothesis"--that advertising will result in increasing industry concentration. At that time, previous tests of this proposition by Telser (1964) and Mann et al. (1967) had (both using a concentration level model) yielded conflicting results.

Marcus examined 78 four-digit SIC consumer good industries for the years 1947-1963, 1954-1963 and 1958-1963. The dependent variable was the change in eight-firm concentration ratio (ΔCR8). The independent variables were initial concentration ratio (ICR), growth (G), and the degree of product differentiation, medium (M) and high (H). As noted before, the degree of product differentiation for Parker's data set was determined by advertising intensity. If an industry spent more than 10 percent of its sales on advertising, it was classified as highly differentiated and if advertising was less than 1 percent of its sales, it was classified as being low differentiated (Marcus, 1969a, p. 119).

Marcus hypothesized that G and ICR would have negative effects on ΔCR8 while M and H would have positive effects on ΔCR8. He thought G would have a negative coefficient since dominant firms in growth industries may find it difficult to expand as fast as the entire industry (because large firms may lack the flexibility of small firms to expand output as rapidly). ICR was thought to also have a negative coefficient for two reasons: 1) A spurious reason, because ICR has an upper and lower bound and hence the likelihood of a negative association with ΔCR8 is enhanced. 2) An economic reason, because a smaller firm can expand its market share more via a given percentage reduction in price (since smaller firms have more elastic demand curves) while larger firms avoid price competition for fear of retaliation. And he believed M and H would have positive coefficients for two reasons. First, as suggested by Kaldor (1950), increasing returns to advertising would favor the larger firms in each industry. Second, as suggested by Bain (1956), the necessity to advertise in these industries will raise the required amount of capital for a successful operation, thus constituting a barrier to entry for new firms.

The regression analysis resulted in all coefficients with the same sign as predicted, though not all were significant. In particular, H was positive, larger than M, and significant in all three periods. M was positive and significant in all periods but 1958-1963, when it was positive but not significant.

Marcus concluded that the "performance of the advertising variables appears to confirm the Kalder-Bain hypothesis" (Marcus, 1969a, p. 120). Hence, advertising can be expected to lead to a substantial rise in industry concentration.

Mueller and Hamm (1974) expanded and updated the Marcus study. They began by examining average four-firm concentration change (ΔCR4) for 166 four-digit SIC industries for the period 1947-1970. On the surface, as summarized in the Mueller (1967) testimony, industry concentration appeared relatively stable: average ΔCR4 (weighted by sales) increased only 2.1 from 1947 to 1970 for all 166 industries. However, the average weighted ΔCR4 was very different when industries were categorized by Parker's producer goods and consumer goods. From 1947 to 1970, the average weighted ΔCR4 decreased 2.7 for the producer goods, while it increased 6.9 for the consumer goods. Among consumer good industries, the average weighted ΔCR4 decreased 7.0 for the low product differentiation industries and increased 6.5 and 11.0, respectively, for the medium and high product differentiation industries.

To further explore the above, Mueller and Hamm did a regression analysis to identify and quantify the significance of these concentration changes. They examined 166 four-digit SIC consumer good industries for the years 1947-1970 and 292 industries for the years 1958-1970. The dependent variable was either ΔCR4 or ΔCR8. The independent variables were the same as the Marcus study (G, ICR, M, H) plus industry size (S), net entry of firms (ΔNF), and low product differentiation (L).

Mueller and Hamm hypothesized a negative coefficient for G because slow growing (or declining) industries create a displacement problem for new entrants. S was expected to have a negative coefficient because all else equal, the larger the absolute size of an industry, the lower its entry barriers. ICR was also expected to have a negative coefficient because, ceteris paribus, leading firms in concentrated industries are likely to lose market share over time. ΔNF was also expected to have a negative coefficient because it is a truism that net entry in an industry results in a decline in the market share of existing competitors. But they pointed out that ΔNF should be appropriately viewed more as a symptom than a cause because it reflects the more fundamental cause of a structural change measured by other independent variables. Thus, they tested equations with and without ΔNF. Lastly, the signs of the M and H coefficients were expected to be positive. This is because of real or pecuniary economies of scale in advertising (to achieve product differentiation). They also noted that these economies of scale have risen in recent years due to the emergence of network TV as a preferred method of advertising for many products. [They did not predict the sign of the low product differentiation variable.]

The regression results were similar to those of the Marcus study. ICR was negative and significant in all equations. G was negative and significant when ΔNF was excluded for 1947-1970. S was negative in all equations and usually significant. ΔNF was discounted as a true independent variable. H and M were both positive and significant in all periods, with the H coefficient being larger. L was mixed, but often positive and significant during the period 1958-1970.

Mueller and Hamm concluded that the increase in consumer good concentration is largely due to extensive network TV advertising. For the producer goods, they state that the evidence showed that technological economies do not necessitate increasing concentration. Yet they warned that

> The "natural" erosive forces are not sufficiently strong or pervasive so that we may predict any substantial overall decline in concentration in producer good industries in the decade ahead.... This possible reversal in trend may reflect the growing conglomeration of American industry with its potential for rigidifying existing industrial structure, or, worse still, promoting greater market concentration (Mueller and Hamm, 1974, p. 519).

Wright (1978) used a model similar to both Marcus (1969a) and Mueller and Hamm (1974). In addition, he addressed the possible problem of specification bias in concentration change models. This possible bias results because any change in a concentration ratio measure is bounded by zero from below and by one from above. Hence, highly concentrated industries are limited in terms of the increase in the value of the dependent variables. Wright's transformed dependent variable was $SC = CR4/[(50 - |50 - ICR|)^{1/2} \cdot (50 - |50 - FCR|)^{1/2}]$ where FCR is the concentration ratio in the ending period of analysis. This form has a better specification because it adjusts changes in concentration into proportional terms. For example, a change in CR4 from 4 to 5 is equivalent to a change from 40 to 50 or 95 to 96.

Wright regressed equations with CR4 or SC as the dependent variable for 206 four-digit SIC industries from 1947 to 1963. Wright reported that "both the initial concentration and product differentiation remain significant (though slightly less so) under the new specification. This is important as now we can have confidence in the role of these variables apart from the specification bias in the equation" (Wright, 1978, p. 629).

Next, Wright used a proxy variable for plant and non-plant economies of scale to see if product differentiation (determined by advertising intensity) remained significant. The proxy variable "is the change in market share from 1947 to 1963 of the fifth through the eighth largest firms relative to the market share of all but the four largest firms" (Wright, 1978, p. 629). The product differentiation coefficients remained significant implying that product differentiation has an impact on concentration change apart from economies of scale.

Lastly, Wright used two interaction terms: concentration multiplied by product differentiation and concentration multiplied by economies of scale. The former coefficient was positive and significant in both ΔCR4 and SC equations. The latter coefficient was positive in both equations but significant only in the ΔCR4 equation. Hence, it appears that product differentiation is the more important barrier to entry.

The Second Generation of Concentration Change Models

The second generation of concentration change models to use advertising intensity as an independent variable were Ornstein and

Lustgarten (1978), Scherer (1979), Asch (1979), and Levy (1985). Their measure of advertising intensity was a continuous measure from the U.S. Commerce Department's Input-Output (IO) tables. Though not a perfect match, the SIC four-digit industries and IO industries are defined similarly. The IO advertising data set is an improvement over the Parker data set since it is continuous and appears to classify advertising expenditures closer to the SIC four-digit industries. But, it also has some serious aggregation problems, which will be covered in detail in Chapter IV.

Ornstein and Lustgarten (1978) ran regression models with both concentration level and concentration change as the dependent variables. I will review their concentration change models since these are relevant to my topic.

They ran one basic model for two different time periods: 120 four-digit SIC industries covering 1947-1967 and 317 four-digit SIC industries covering 1963-1967. ΔCR4 was the dependent variable. The independent variables were initial year advertising intensity (I A/S), change in advertising intensity [Δ(A/S)], IRC, change on average firm size (ΔAFS) and G. This was the first time IO advertising data were used. The IA/S and Δ(A/S) expected coefficient signs were positive because of economies of scale in advertising. The ICR coefficient was expected to be negative because low initial concentration is more likely to rise than fall and high initial concentration is more likely to fall than rise, since concentration ratios are bounded between zero and one. ΔAFS was predicted to have a positive effect since an increase in average firm size is a proxy for an increase in optimum firm size, which increases concentration because one determinant of concentration is optimum firm size. Lastly, G was hypothesized to have a negative effect because G is a "proxy for changes in demand over long periods" (Ornstein and Lustgarten, 1978, p. 225), which allows net entry of firms. In addition, some equations replaced $\Delta(A/S)$ with percentage change on total industry advertising $\Delta(ADV)$ because "the absolute amount of advertising expenditures will be a better indicator of economies of scale or capital barriers due to advertising" (Ornstein and Lustgarten, 1978, p. 227). Likewise, the expected sign of the ΔADV coefficient was positive.

Ornstein and Lustgarten began the empirical analysis by showing that $\Delta(A/S)$ and ΔADV are not significantly correlated, indicating that they are not good substitutes. And, since it has been reasoned that advertising increases concentration due to economies of scale in advertising, they preferred ΔADV to $\Delta(A/S)$. For 1947-1967, the ICR, G, and ΔAFS coefficients had their expected signs and were significant. The results were mixed for the advertising coefficients. IA/S and ΔADV were mostly insignificant while $\Delta(A/S)$ was positive and significant in all periods.

Ornstein and Lustgarten concluded that "although this study found a positive relationship between advertising and concentration, the nature and significance of this finding is unclear" (Ornstein and Lustgarten, 1978, p. 250). They claimed that too many different hypotheses fit the results and more research is needed. However, Comanor (1978), in an accompanying comment, thought they were too cautious and wondered "what evidence would have convinced them" (Comanor, 1978, p. 278).

Scherer (1979) was responding to an article by Professor Peltzman dealing with increases in concentration bringing unit cost reductions that outweigh the price-raising effect associated with this increase in monopoly power. However, in the beginning of this article, Scherer does present a concentration change model. He states that in his sample of 154 four-digit SIC industries for the period 1947 to 1970, concentration rose by 6.4 points in the consumer goods and fell by 1.7 points in the producer goods. This "leads one to suspect that there must be some difference in structural change dynamics associated with the type of buyer" (Scherer, 1979, p. 192).

Scherer's concentration change model was similar to past models. His data set consisted of 154 four-digit SIC industries between 1947 and 1972. ΔCR4 was the dependent variable and ICR, G, S, dummy variables for consumer, producer or mixed goods, and A/S were the independent variables. The results: IRC and S were both negative and significant, consumer and mixed dummies and A/S were positive and significant, and G was insignificant. However, in a footnote, Scherer reports the finding of a similar model with a larger data set (n=323) for the years 1963 to 1972. The only coefficient that significantly changed was A/S (which became insignificant).

Asch (1979) presented a model similar to Scherer (1979) for 1963-1972 and two sub-periods. He expected the ICR and G coefficients to be negative for reasons stated above by Marcus (1969a) and Mueller and Hamm (1974). Rather than hypothesizing a sign for the A/S coefficient, he instead states that "this paper presents new evidence on the contribution of advertising intensity to changes in concentration" (Asch, 1979, p. 288).

For his sample of 212 four-digit SIC industries, the ICR coefficient was negative and usually significant, while G had very mixed results. And the A/S coefficient was often negative and usually insignificant. Asch offered three reasons why the true relationship between A/S and ΔCR4 may not have been observed: (1) measurement error in the data; (2) A/S might be more significant if other factors influencing ΔCR4 were included; and (3) the five and ten year periods may be too short for the effects of A/S on ΔCR4 to appear.

Levy (1985) also used IO advertising data in his sample of 197 four-digit SIC industries for concentration change from 1963 to 1972. His model and results are similar to that of the three previous studies (Ornstein and Lustgarten, 1978; Scherer, 1979; and Asch, 1979). The main difference comes from his interpretation of the independent variables coefficients. This is because his model

> addresses the issue of incomplete adjustments of industry concentration. The empirical model distinguishes long-term from short-term effects and estimates the rate of adjustment when concentration deviates from its long-term equilibrium level. In developing the model tested in this paper, the dynamic structure inherent in previous analyses is made explicit (Levy, 1985, p. 56).

Levy (p. 57) begins with two long-run equilibrium models,

> in the sense that all adjustments to unexpected changes in market conditions have taken place. In level forms, the long-run level of concentration is assumed to have completely adjusted to any unexpected change, be it far in the past or recent. In difference form, the equilibrium assumption translates into complete adjustment of industry concentration during the time period examined.

The level model is:

$$CR4 = \beta_0 + \beta_1 MES + \beta_2 CAPR + \beta_3 A/S + \beta_4 G \quad (1)$$

where CR4 is four-firm concentration ratio, MES is minimum efficient plant size relative to market size, CAPR is value of fixed assets of MES plants, A/S is advertising intensity, and G is industry growth. MES is a measure of production scale economies, CAPR is a measure of capital requirements and economies of scale in raising capital, and A/S is a measure of product differentiation. The expected coefficients of MES, CAPR, and A/S are positive according to both scale economy and entry barrier explanations. But the G coefficient is uncertain because a negative effect results if growth enables entrants to take advantage of scale economics while a positive effect results if large forms in the industry are able to more quickly expand in reaction to anticipated demand growth.

The difference form (change model) is the level model with each variable differenced. Hence,

$$\Delta CR = \beta_0' + \beta_1' \Delta MES + \beta_2' \Delta CAPR + \beta_3' \Delta(A/S) + \beta_4' \Delta G \quad (2)$$

According to Levy, the corresponding coefficients of each equation have the same interpretation as long as the error term is not autocorrelated.

However, Levy (p. 58) points out that "adjustments in concentration to changing market conditions may be quite slow due to costs of adjustment for firms within the industry and for potential entrants." In addition, Brozen (1970, 1971) argues that the above-average concentration is a disequilibrium phenomenon which is eliminated by competition. And, Gaskins (1971) presents a model where the dominant firm's pricing (e.g., pricing above or below the entry deterring price) affects the rate of entry of firms into the industry. Hence,

> the analyses by Brozen and Gaskins both suggest that concentration will change over time when initial concentration deviates from its expected long-run equilibrium level. A dynamic model is presented here which allows incomplete adjustment to deviations of concentration from its expected long-run equilibrium value. The manner in which expected long-run concentration is specified in this model is crucial and receives special attention (Levy, 1985, p. 58).

Levy adopts a partial adjustment model to allow for these incomplete adjustments. Formally, it is:

$$CR4_t - CR4_{t-1} = \lambda(CR4^*_t - CR4_{t-1}) \quad (3)$$

where $CR4_t$ is the actual concentration level in period t and $CR4^*_{t-1}$ is the long-run level of concentration in period t expected by entrants and established firms in period t-1. And,

> The coefficient, λ, represents the rate of adjustment to deviations of the initial level of concentration from its long-run equilibrium level. According to arguments by Brozen and Gaskins, concentration will partially adjust when its expected long-run future level differs from its initial level implying a positive value of λ. For stability, λ must be greater than zero and less than one (Levy, 1985, p. 59).

Levy next formulates three different proxies for CR4* (which is an expectation and is unobservable). The first formulation assumes that firms in period t-1 expect equilibrium concentration in period t to be determined by the level variables in period t-1. Hence, equation 1 is lagged one period and substituted into CR4* in equation 3 to obtain:

$$\Delta CR4_t = \alpha_0 + \alpha_1 CR4_{t-1} + \alpha_2 MES_{t-1} + \alpha_3 CAPR_{t-1} + \alpha_4 A/S_{t-1} + \alpha_5 G_{t-1} + \varepsilon \quad (4)$$

Here, the $CR4_{t-1}$ (or ICR) coefficient estimates λ, the rate of adjustment in equation 3. And, the other independent variable coefficients represent their short-run effect, which equals λ times their long-run effect (their β coefficient in equation 1). This

> specification is similar to that adopted in previous studies explaining changes in concentration by variables measured in level form. However, the dynamic adjustment model is not explicitly stated in those studies and adjustment effects are not distinguished from long-run effects (Levy, 1985, p. 59).

The second formulation adds the difference form variables to equation 1 to provide for the effect of firms also accounting for changes in the long-run level of industry concentration between period t-1 and period t. Thus, CR4* becomes

$$\begin{aligned} CR4_t^* = {} & \beta_0' + \beta_1' \, MES_{t-1} + \beta_2' \, CAPR_{t-1} \\ & + \beta_3' \, A/S_{t-1} + \beta_4' \, G_{t-1} + \beta_5' \, \Delta MES \\ & + \beta_6' \, \Delta CAPR + \beta_7' \, \Delta(A/S) + \beta_8' \, \Delta G + \varepsilon \end{aligned} \qquad (5)$$

Substituting equation 5 into equation 3 yields:

$$\begin{aligned} \Delta CR4 = {} & \alpha_0' + \alpha_1' \, CR4_{t-1} + \alpha_2' \, MES_{t-1} \\ & + \alpha_3' \, CAPR_{t-1} + \alpha_4' \, A/S_{t-1} + \alpha_5' \, G_{t-1} \\ & + \alpha_6' \, \Delta MES + \alpha_7' \, \Delta CAPR + \alpha_8' \, \Delta(A/S) + \alpha_9' \, \Delta G + \varepsilon \end{aligned} \qquad (6)$$

Again, the coefficient of ICR (α_1') estimates the rate of adjustment in equation 3. And, the other independent variable coefficients represent their short-run effect times their long-run effects (e.g., $\alpha_i' = \lambda\beta_i'$).

The last formulation is a

> case where firms in period t-1, on average, correctly anticipate and fully react to the values of the explanatory variables in period t. In terms of equation 5, changes in the determinants of concentration will then have the same effects on expected long-run concentration as the corresponding initial levels of the determinants (have on the level of long-run concentration) and thus $\beta_1' = \beta_5'$, $\beta_2' = \beta_6'$, $\beta_3' = \beta_7'$ and $\beta_4' = \beta_8'$. Since $\beta' x_{t-1} + \beta' \Delta x = \beta' x_t$, for any determinant x with effect β' in equation 5, equation 5 can be rewritten as equation 1 (Levy, 1985, pp. 60-61).

Hence, equation 7 is:

$$\Delta CR4_t = \alpha_0 + \alpha_1 CR4_{t-1} + \alpha_2 MES_t + \alpha_3 CAPR_t + \alpha_4 A/S_t + \alpha G_t + \varepsilon \quad (7)$$

Again, α_1 estimates λ and $\alpha_i = \lambda\beta_i$.

Using nonlinear estimation techniques (because $\alpha_i = \lambda\beta_i$), Levy estimated equations 4, 6 and 7. He used Wright's (1978) nonlinear transformation of concentration change to correct for any bias resulting from concentration ratios being bounded between zero and one. In addition, to the full sample of 197 industries, equations were also reported separately for low and high concentrated industries, where an industry was classified low if $CR4 \leqslant .45$.

The results are basically consistent with past concentration change studies, except for the interpretation of the coefficients. The coefficient of $CR4_{t-1}(\lambda)$ is usually significant and ranges from 0.12 to 1.00. The high concentrated industries have a smaller coefficient, implying slower adjustment. The level and difference MES coefficients were all positive and usually significant, while the level and difference CAPR coefficients were both positive and negative but never significant. Lastly, the level and difference coefficients for A/S and G were also both positive and negative and never significant.

The Third Generation of Concentration Change Models

The third generation of concentration change models to use advertising intensity as an independent variable were Mueller and Rogers (1980, 1984) and Rogers (1982). They used similar concentration change models as used before, but had a new advertising data source, Leading National Advertisers, Inc. (LNA). LNA advertising data, like IO data, are a continuous measure. But the LNA data offer two important advantages over the IO data. First, the LNA data better reflect advertising expenditures for each industry (covered in detail in Chapter IV). Second, the LNA data give not only total advertising expenditures, but also break down the expenditures into TV, radio, outdoor, newspaper supplements and magazine advertising. Having the advertising expenditures broken down into different media is important since many (Blair, 1972; Mueller and Hamm, 1974; Porter, 1976; Mueller and Rogers, 1980; 1984; Rogers, 1982) have hypothesized that the mix of media in advertising is important in determining how advertising intensity affects market structure and performance. TV advertising intensity is expected to have a larger positive effect on concentration change than other (and thus total) advertising because TV advertising is more persuasive in nature and offers greater advantages to larger users than other types of advertising.

Mueller and Rogers (1980) were the first to use LNA advertising data. They had access to a 1967 LNA advertising data set compiled by Robert Bailey at the FTC. (The major problem of using LNA advertising data is that it is a long, tedious job to compile it. More on how a LNA data set is compiled will be covered in Chapter IV.)

Mueller and Rogers' model is similar to previous ones. Their sample consisted of 167 four-digit SIC industries from 1947 to 1972 and sub-periods of 1947 to 1958 and 1958 to 1972. $\Delta CR4$ is the dependent variable while ICR, S, G and A/S are the independent variables. In addition, A/S is disaggregated into TV plus radio (TVR) advertising intensity and newspaper plus outdoor and magazine (NOM) advertising intensity. ICR, G and S were all expected (for reasons listed in above articles) to have a negative effect on ΔCR4. And, A/S and especially TVR were expected to have positive coefficients, while the NOM expected sign was ambiguous. They cited many possible reasons for TVR having a positive effect. There have been volume discounts for both spot and network TV and economies of scale in national over local TV advertising. Also, there was case study evidence that conglomerates may subsidize advertising and promotion outlays to increase their market shares in particular markets. Lastly, while advertising that contains a high proportion of informational content (e.g., price advertising by local newspapers) may encourage competitive market structures, advertising aimed at creating product differentiation through image-building, as is typical for most TV advertising, may lead to increase barriers to entry and concentration.

Their empirical results were as expected. The ICR, G, and S coefficients all had their expected signs, with only G being insignificant. A/S and TVR were positive and significant in all periods, with TVR having a larger coefficient and being more significant. NOM was negative and insignificant. Thus, these results, especially the A/S, TVR, NOM coefficients, support Mueller and Rogers' basic hypothesis, that "television advertising has played an especially potent role in increasing concentration of consumer goods industries. Studies that combine television advertising with all other forms of advertising have obscured this unique role of television advertising" (Mueller and Rogers, 1980, p. 95).

In his dissertation, Rogers (1982) examined concentration change for the food and tobacco industries at the SIC five-digit product class level for the period 1954-1972, using LNA advertising data. He chose the five-digit level because on balance, it represents a true market better than the four-digit industry class level. And, he chose the food and tobacco industries for two reasons. First, there are advantages to limiting a study to only a subset of manufacturing, because

> a cross-section study of the manufacturing sector may find it necessary to include many more variables because different influences may be at work within different subsets of the manufacturing sector. For example, the factors affecting concentration in heavy industrial product classes may differ from those affecting concentration in light industrial product classes (Rogers, 1982, p. 94).

Secondly, the food product classes are heavy users of TV advertising. They spent 82 percent of their total advertising expenditures on TV in 1978 (Rogers, 1980, p. 119), which is important since the focus of Rogers' dissertation is on advertising intensity (especially TV) affecting concentration change.

Rogers worked with four basic data sets: Food and tobacco products for 1954-1972, 1958-1972 and 1963-1972, and grocery store products (GSP) for 1958-1972. The GSP sample was derived by eliminating from the food and tobacco sample the product classes that are primarily producer goods and adding the non-food and non-tobacco product classes that have significant sales in grocery stores. Because the longer periods have fewer comparable product classes (due to changing SIC product class definitions), the 1954-1972, 1958-1972, 1963-1972 and 1958-1972 GSP periods had 59, 84, 100 and 79 product classes, respectively.

Rogers first analyzed the 1958-72 period as a compromise between having a longer period or a larger sample size. The independent variables and expected signs of the coefficients are similar to those of Mueller and Rogers (1980). The ICR coefficient was negative and significant, while the G coefficient was positive and significant for 1958-1972, but positive and insignificant for 1954-1972. The S coefficient was negative but insignificant. Advertising intensity was the most important independent variable. The A/S or TVR coefficients, whether from 1954, 1967, 1972, an average of the three or the last two, were all positive and significant. Also, the TVR coefficients were typically stronger and more significant than their A/S counterparts. This meant that "industries that were the heaviest users of advertising to create and maintain product differentiation experienced the largest increases in concentration over the period 1958 to 1972. This conclusion is not dependent on advertising data for any particular year" (Rogers, 1982, p. 132).

Rogers also used Δ(A/S) and ΔTVR variables. He states that Δ(A/S) is more important than A/S on explaining ΔCR4 if "the advertising-concentration relationship is in equilibrium in both the initial and terminal years of the study. Since an equilibrium is unlikely, the hypothesis should be modified to include the level of advertising intensity as well as any changes that have occurred" (Rogers, 1982, p. 135). When used separately, the A/S, Δ(A/S), TVR, and ΔTVR coefficients were all positive and significant. When A/S and ΔA/S were used together in an equation, the A/S coefficient was positive and significant while the Δ(A/S) coefficient was positive and insignificant. The TVR and ΔTVR coefficients used together had just the opposite results (ΔTVR positive and significant with TVR positive and insignificant). Rogers stated that there might be collinearity problems between these pairs of level and change variables (as indicated by their simple correlation coefficients), suggesting that the heavy users of the 1967 level variables were also product classes that most increased their advertising intensity between 1958 and 1972. He concluded that both advertising intensity (especially TV and radio) and changes in advertising intensity are strongly related to increased concentration.

Next, Rogers analyzed the 1954-72 period. Though 25 product classes were lost (due to changed SIC product class definitions), the longer time span increased the chance for any structural change to occur and brought stronger results. The results were similar to the 1958-1972 period, but had stronger and more significant coefficients. The one exception was G, whose coefficient became insignificant. Rogers suggests that this is probably due to multicollinearity between A/S or TVR and G in the longer period. Likewise, the 1963-1972 period and five year sub-periods analyzed had similar results, especially for the A/S and TVR coefficients.

The grocery store product (GSP) data sample yielded results similar to the previous results, but the advertising intensity coefficients were weaker and statistically less significant. Rogers stated two possible reasons why the GSP coefficients were less significant. First, there was the removal of 20 producer good product classes that fit the model well. These product classes did not use TV advertising and had decreases in concentration. Second, the non-food and non-tobacco GSP product classes had large advertising intensity. For example, the 1967 average A/S was 2.9 percent for the 64 food and tobacco GSP product classes and 9.2 percent for the 15 non-food and non-tobacco product classes.

> Thus, although the non-food and non-tobacco GSP product classes fit the model's hypothesized relationships, the very large A/S that many of these product classes have were not associated with change in concentration values as large as would be predicted given the estimated coefficients from the food and tobacco analysis. A nonlinear specification of A/S would seem to be called for in future work that uses both a food and non-food GSP sample (Rogers, 1982, p. 169).

The following can be summarized from Rogers' dissertation. ICR has earned its place in concentration change models as its coefficients have been consistently negative and significant. And, ICR should continue to have a deconcentrating effect as long as average concentration is well below 100 (average 4CR was around 46 in 1972). If concentration becomes so highly skewed towards high concentration, then ICR may become a statistical artifact.

The size coefficient was usually negative but never significant for 1954-1972 or 1958-1972, suggesting that an equilibrium between S and ΔCR was reached.

Growth effects concentration (1) by affecting net entry of firms into an industry (which tends to decrease concentration) or (2) through differences in growth rates between small and large firms in an industry (which probably increases concentration, due to large firm advantages in growth, as in capital markets). However, since 1954, there has been little net entry in the food and tobacco industries. Thus, a positive G coefficient might be expected. The results showed the effect of G on ΔCR4 to be positive but generally insignificant, implying that other factors must explain concentration change in these product classes during the 1954-1972 period.

Lastly, the advertising intensity variables (A/S, Δ(A/S), TVR, ΔTVR) all showed that media advertising, especially electronic, has contributed to increased concentration, and that this effect has not stopped or slowed much since 1963.

Mueller and Rogers (1984) basically updated their earlier study (Mueller and Rogers, 1980). They considered an update to 1977 important since "some economists have speculated that the positive relationship between advertising and concentration change ceased, or even reversed, sometime in the 1960s, as industries reached a new equilibrium" (Mueller and Rogers, 1984, p. 1). As noted above, both Scherer (1979) and Asch (1979) found A/S mostly insignificant in concentration change models for 1963 to 1972. Asch stated that "the major effect of advertising on concentration may have occurred prior to the periods examined" (Asch, 1979, p. 295). Mueller and Rogers' data set consisted of 165 four-digit SIC industries from 1947-1977. However, the majority of their analysis dealt with sub-period analysis in order to check if the effect of advertising intensity, especially for TV, on concentration change for periods before and after the mid-1960s was increasing, decreasing or remaining stable.

The independent variables were ICR, S, G, and A/S (or TVR and NOM), same as in Mueller and Rogers (1980). The expected signs and economic reasons for the coefficient signs are similar to those of their 1980 article. For the period 1947-1977, the ICR, G and S coefficients were all negative and significant while A/S and TVR coefficients were positive and significant (with TVR coefficient larger and more significant than A/S). Thus, it appears TV advertising is more important than other forms of advertising for increasing concentration. The NOM coefficient was negative but insignificant. Thus, the model performed as expected for the longer period, 1947-1977.

When the data were separated into sub-periods, the model also performed as expected. First, the data were separated into three sub-periods, 1947 to 1958, 1958 to 1967, and 1967 to 1977. For all three periods, the estimated coefficients on A/S and TVR displayed remarkable similarity across the three sub-periods, with the TVR coefficient being larger and more significant. This strong positive finding for 1967-1977 is evidence that electronic advertising (TV plus radio) has not lost its ability to further increase concentration since the mid-1960s. Next, the data were separated into two sub-periods, 1947-1963 and 1963-1977. Here, the A/S and TVR coefficients were positive and significant in both periods, though both A/S and TVR had smaller coefficients in the latter period. But, Mueller and Rogers stated that these smaller coefficients for 1963-77 "stops short of supporting the hypothesis that the concentrating effect of television advertising had been played out by the

1960s" (Mueller and Rogers, 1984, p. 8). Also, they pointed out in a footnote that the 1963 concentration ratio for one industry had to be estimated by the FTC since the Census Bureau's concentration ratio was not reported for disclosure reasons. When the 1947-1963 and 1963-1977 sub-periods were re-estimated using a concentration ratio from a linear trend (between 1958-1967) instead of the FTC's estimate for SIC 3942, the differences between the A/S and TVR coefficients were much less.

Finally, though possibly for too short of periods to show structural change, they examined five sub-periods of five year intervals, from 1954-1977. Again, the model performed as expected. The most interesting result involved TVR. TVR reached its maximum effect and significance in 1958-1963. After falling to roughly half of its effect in 1963-1967 from 1958-1963, the TVR coefficient continued to gain in size and significance in 1967-1972 and 1972-1977, "suggesting that a new equilibrium between television advertising and concentration change had not been reached by the mid-1960s" (Mueller and Rogers, 1984, p. 10).

Mueller and Rogers stated that there are probably three reasons why both Scherer (1979) and Asch (1979) found the effect of A/S on concentration change to be insignificant from 1963 to 1972. First, they used IO advertising data which fail to separate out TV advertising--the most powerful advertising medium for increasing concentration. Second, the IO data are very broadly defined and include advertising directed at intermediate buyers. Third, the IO data have serious aggregation problems (which are discussed in detail in Chapter IV).

Mueller and Rogers also present a lagged regression model in response to Caves and Porter (1980), who stated in reference to concentration change models that "we strongly suspect that those robust-looking unlagged results may in fact reveal little about fundamental causal relations" (Caves and Porter, 1980, p. 14). All independent variables (except advertising intensity since they had only 1967 advertising data) were lagged one sub-period. For all periods tested, the lagged results were similar to the unlagged results. Hence, Mueller and Rogers concluded that lagged models provided little, if any, added insight to the causes of concentration change. Also, they stated that there is no way of knowing the appropriate lag and, even if they did, researchers are constrained to lag lengths that correspond to census years.

In sum, all concentration change models that use an advertising intensity variable as an independent variable had fairly consistent results; the advertising intensity coefficient was usually positive and significant and in a few cases insignificant. But it was never negative and significant. And the studies that found an advertising intensity coefficient insignificant used Input-Output advertising data which are plagued by compilation problems that are discussed in Chapter IV. These consistent results are in contrast to the conflicting results of both concentration level and profit rate models that use advertising intensity as an independent variable. (The signs of advertising intensity coefficients in past profit rate models have varied, often depending only on how fast advertising is depreciated.)

Reasons for this Study

This study will add evidence to the question of whether advertising intensity levels and changes, increase manufacturing concentration at the SIC four-digit industry level.

First, additional knowledge can be obtained by updating this study to include changes in concentration ratios to 1982. TV advertising was new in the late 1940s, but quickly grew to the dominant medium for advertising by the early 1960s in terms of dollars spent. Some have hypothesized that when TV advertising was new, it initially caused a disequilibrium in many consumer industries which caused an increase in concentration. But since around 1963, this may have been played out (i.e., concentration change may no longer be affected by advertising intensity). Scherer (1980, p. 116) points out, "The concentration increasing impact of intense advertising appears to have ceased and perhaps reversed by the early to mid 1960s, perhaps coinciding with both consumers' and advertisers' increased maturity in relating to television as a medium of information and persuasion." However, Mueller and Rogers (1984) found evidence that advertising intensity's effect on concentration change has not stopped since the mid-1960s. Obviously at some point, as concentration increases and because it is bounded on top by a maximum ratio of 100 percent, the effect of advertising on concentration has an upper limit. But, currently the average four-digit SIC four-firm concentration ratio is under 50 percent. Updating the changes in a concentration model to 1982 will help to determine if advertising intensity has continued to have a positive effect on concentration change. The coefficients in the 1977-1982 period should be of special interest when compared to those for 1963-1967, 1967-1972, and 1972-1977.

Also, this study will use a better estimation of advertising intensity between 1963 and 1982 by taking an average of the 1967 LNA advertising data (compiled by Mr. Robert Bailey of the FTC) and 1982 LNA advertising data (compiled by myself). All previous studies using LNA advertising data at the four-digit SIC industry level (Mueller and Rogers, 1980; 1984) were confined to using only 1967 data. (Rogers (1982) used 1954, 1967, and 1972 LNA data, but limited his study to the food and tobacco industries.) However, Rogers (1982, p. 118) points out that "an isolated year's data may not accurately represent the advertising intensity throughout the period." Also, Ornstein and Lustgarten (1978, p. 230) make this same criticism. An example of how advertising intensity can vary by year for certain industries follows. Stanley Ornstein (1977, pp. 74-85) published Input-Output advertising data for the years 1947, 1963 and 1967. For industry SIC 2013 (sausage and other prepared meat products), the advertising to sales ratio fell from .61 in 1963 to .33 in 1967.

Further, having use of both 1967 and 1982 LNA data should yield a good measurement of both total and TV advertising intensity change. This will be the first time a change in TV advertising intensity variable will be used at the four-digit SIC industry level for manufacturing. Ornstein and Lustgarten (1978) were the only authors before to use a change in advertising intensity variable (which came from the Input-Output tables) in a concentration change model. For both periods they studied, the advertising intensity coefficient was insignificant while the change in advertising intensity coefficient was positive and significant. Also, Caves and Porter (1980, p. 2) argue that theoretically a change in concentration model should also have change variables as the independent variables. Thus, an advertising intensity change variable may be more important than an advertising intensity level variable in a concentration change model.

Also, it appears from Rogers (1982) that the relationship between concentration change and advertising intensity may be of a nonlinear form. This may occur because in some industries (in particular, tight oligopolies), firms advertise beyond the optimal amount. Hence, a quadratic function of advertising intensity as an independent variable will be tested.

In addition, this will be the first concentration change model to use a convenience good dummy variable as an independent variable, where the dummy variable equals one for convenience good industries and zero otherwise. Porter (1974) found this distinction useful for testing his profit-rate model. Convenience good industries are characterized by goods that have a relative small unit price and are sold in stores with little sales assistance. Advertising intensity is expected to be more effective for convenience good industries for two basic reasons: (1) due to the relative small unit price, gains from gathering information from other sources are small; and (2) due to little sales assistance, other information on the products is more costly to obtain. Hence, it is expected that in the absence of other information, advertising intensity, especially through image building (national advertising) will be more effective at influencing concentration change for convenience good industries.

Finally, since the last major revision of the Standard Industrial Classification (SIC) codes took place in 1963, fewer four-digit SIC industries will have to be omitted from this analysis due to changing industry definitions than were excluded from previous studies. Thus, out of the 450 four-digit SIC industries in 1977, 269 will be able to be used in this study. In comparison, Mueller and Rogers (1980) could use only 165 four-digit SIC industries for their study covering the years 1947-1977.

Table II.1. Summary of the literature review (key to abbreviations can be found in Table II.2)

Author, period studied, and sample size	Dependent variable and level of analysis	Independent variables used and brief results	Comments
		I. First Generation studies	
Marcus (1969a) 1947-1963 1954-1963 1958-1963 N=78	ΔCR8 Consumer goods only 4-digit SIC	1947-63 / 1954-63 / 1958-63 G: -** / -* / - M: +** / +** / + H: +** / +** / +* ICR: -** / -** / -**	First ΔCR model to use advertising intensity as an independent variable.
Mueller and Hamm (1974) 1947-1970 N=166 1958-1970 N=292	ΔCR4, ΔCR8 4-digit SIC	ICR: -** both periods G: -* when ΔNF excluded for 47-70 S: - to -** ΔNF: - to -**, but discounted as a true independent variable H: +* to +** both periods M: +* to +** both periods L: mixed, yet 58-70 + and often *	They concluded that the increase in consumer good concentration is largely due to extensive network TV advertising.
Wright (1978) 1947-1963 N=206	ΔCR4 and SC (emphasized) 4-digit SIC	ICR: -** G: - to -* S: - H: +** M: +** L: - for ΔCR4 and + for SC With an economies of scale proxy (ST), the product differentiation coefficients remained significant	Wright addresses the problem of possible specification bias in concentration change models by using SC in place of ΔCR. H and M remain significant under the new specification.

Table II.1. (Continued)

Author, period studied, and sample size	Dependent variable and level of analysis	Independent variables used and brief results	Comment
		II. Second Generation studies	
Ornstein and Lustgarten (1978) 1947-1967 N=120 1963-1967 N=317	ΔCR4 4-digit SIC	ICR: -* to -** both periods IA/S: highly insignificant both periods Δ(A/S): +* to +** both periods ΔADV: highly insignificant both periods ΔAFS: +** both periods G: -* to -** 47-67, - to -* 63-67	First ΔCR model to use U.S. Input-Output tables for continuous advertising data.
Scherer (1979) 1947-1972 N=154	ΔCR4 4-digit SIC	ICR: -** C: +* G: - Mixed: +* S: -* A/S: +*	1. Scherer reports in a footnote that for 1963-1972 (N=323), the only coefficient that significantly changed was A/S, which became insignificant. 2. IO advertising data are from 1963.
Asch (1979) 1963-1972 and sub-periods N=212	TCR4/ICR4 and ΔCR4 4-digit SIC	ICR: -**, except in subsets involving only durable goods (then it was insignificant) G: very mixed results, - and + and sometimes significant IA/S: + and -, but all highly insignificant CPD: +** (for all industries in sample) DUR: +* (for all industries in sample)	1. Asch's basic conclusion is that the role of advertising was insignificant in determining concentration change. 2. Also used subsamples of durable/nondurable goods and producer/consumer goods.

Table II.1. (Continued)

<table>
<tr><th>Author, period studied, and sample size</th><th>Dependent variable and level of analysis</th><th>Independent variables used and brief results</th><th>Comment</th></tr>
<tr><td>Levy (1985)
1963-1972
N=197 and
2 sub-samples,
high and low
concentration
industries</td><td>SC
[Used by Wright]</td><td><table>
<tr><th></th><th>All industries</th><th>High concentration industries</th><th>Low concentration industries</th></tr>
<tr><td>ICR:</td><td>+**</td><td>+ to +*</td><td>+**</td></tr>
<tr><td>MES:</td><td>+ to +**</td><td>+</td><td>+**</td></tr>
<tr><td>CAPR:</td><td>+</td><td>+ and -</td><td>+</td></tr>
<tr><td>A/S:</td><td>-</td><td>-</td><td>+ and -</td></tr>
<tr><td>G:</td><td>-</td><td>-</td><td>+ and -</td></tr>
<tr><td>ΔMES:</td><td>+**</td><td>+</td><td>+**</td></tr>
<tr><td>ΔCARP:</td><td>+</td><td>+</td><td>-</td></tr>
<tr><td>Δ(A/S):</td><td>+</td><td>-</td><td>+</td></tr>
<tr><td>ΔG:</td><td>-</td><td>-</td><td>-</td></tr>
</table>Note: MES, CAPR, A/S and G are summarized for 1963 and 1972 levels.</td><td>1. Levy uses a partial adjustment model to distinguish between short-term and long-term effects of the determinants of concentration change. His regression results are similar to the other concentration change models using IO advertising data, except the coefficients are interpreted as the short-term effects times the long-term effects.
2. IO advertising data are from 1963 and 1972.</td></tr>
<tr><td colspan="4"><u>III. Third Generation studies</u></td></tr>
<tr><td>Mueller and Rogers (1980)
1947-1972 and sub-periods N=167</td><td>ΔCR4
4-digit SIC</td><td>ICR: -**
G: -
S: -* to -**
except 47-58
TVR: +**
A/S: +* to +**
H: +**
M: +**
L: -
NOM: -</td><td>1. This was the first ΔCR model to use electronic (TVR) advertising intensity as an independent variable. A stronger positive relationship was found with TVR than A/S.
2. LNA advertising data are from 1967.</td></tr>
</table>

Table II.1. (Continued)

Author, period studied, and sample size	Dependent variable and level of analysis	Independent variables used and brief results	Comments
Rogers (1982) Food and tobacco 1954--1972 N=59 1958--1972 N=84 1963--1972 N=100 Grocery store products 1958--1972 N=79	ΔCR4 5-digit SIC	ICR: -** in most periods S: - but rarely significant G: + and often significant for 58-72 TVR, A/S: both +* to +** when not used with ΔTVR, Δ(A/S). Also, TVR is usually stronger NOM: - but never significant ΔTVR, Δ(A/S): both +* to +** when not used with TVR, A/S When ΔTVR and TVR or Δ(A/S) and A/S were used together, always one was significant, but seldom both. Rogers suggested this might be due to collinearity	1. Only ΔCR model at 5-digit SIC level, which probably represents a true market better than at the 4-digit level. 2. Used only food and tobacco product markets because they are more homogeneous and are heavy users of TV advertising. 3. LNA advertising data are from 1954, 1967 and 1972.
Mueller and Rogers (1984) 1947--1977 and sub-periods N=165	ΔCR4 4-digit SIC	ICR: -** (-* for some 5-year periods) S: - and often significant G: - and often significant A/S: +* to +** TVR: +** (+* for some 5-year periods) NOM: - but never significant	1. Mueller and Rogers basically updated their earlier article to 1977 to see if A/S and TVR were still affecting ΔCR. 2. They also presented a lagged regression model and obtained similar results. 3. LNA advertising data are from 1967.

Table II.2. Key to Table II.1

Symbol	Meaning
SIC	Standard Industrial Classification System
Δ	Change in
CRi	A concentration ratio based on the i largest firms
N	Number of observations
ICR	Initial concentration ratio
TCR	Terminal concentration ratio
G	Growth
S	Size
NF	Number of firms
H	High degree of product differentiation
M	Medium degree of product differentiation
L	Low degree of product differentiation
IA/S	Initial advertising-to-sales ratio
A/S	Advertising-to-sales ratio
ADV	Advertising expenditures
AFS	Average firm size
SC	Wright's transformed concentration ratio variable (to remove any specification bias)
ST	Wright's transformed proxy for economies of scale
TVR	Television (radio) advertising-to-sales ratio
NOM	Newspaper, outdoor, and magazine advertising-to-sales ratio
C	Consumer goods industry dummy variable
Mixed	Between consumer and producer goods industry
Dur	Durable-nondurable dummy variable
CPD	Consumer-producer dummy variable
MES	Minimum efficient plant size relative to market size
CAPR	Value of fixed assets of MES plants
-	Negative sign on the coefficient but statistically insignificant
-*	Negative sign on the coefficient and statistically significant at 5%
-**	Negative sign on the coefficient and statistically significant at 1%
+,+*,+***	Similar to the above, but the coefficient is positive

CHAPTER III. RATIONALE FOR THE INCLUSION OF EACH INDEPENDENT VARIABLE

The reason for using industry concentration change as the dependent variable was given in Chapter I. Basically, a change in concentration is a change in market structure and implies a change in the degree of competition. Chapter II contained a literature review of all concentration change studies that included advertising intensity as one of the independent variables. This review also indicated how other independent variables might change concentration. This chapter will go into more detail on the economic hypotheses of the seven independent variables in this concentration change model.

The seven independent variables are: initial concentration ratio, industry size, industry growth rate, a research and development dummy variable, a convenience good dummy variable, a consumer good industry dummy variable, and advertising intensity (especially for electronic and network TV).

Chapter IV discusses the variable construction, and Chapter V gives the empirical results.

Initial Concentration Ratio

Initial concentration ratio (IRC) is an often included independent variable in concentration change models. Curry and George (1983, p. 224) did a survey article on industry concentration. In their review of concentration change models, they stated that:

Taken as a whole the studies suggest that the most important

> explanatory variable is the initial level of concentration, which is included in most of the studies listed in Table III, and is significant in all but one of them. It appears that the higher the initial level, the smaller the likelihood that concentration will increase further and the greater the chances of a decline.

Hence, a negative relationship is expected for how ICR affects concentration change. The relationship can be justified for two general reasons. One reason is statistical. Concentration ratios are bounded between zero and 100 percent, so an initial concentration ratio of 95 percent can only increase 5 percent at most, whereas the opportunities for a decline are much greater. Conversely, an initial concentration ratio of 5 percent has greater opportunities to increase. While this "statistical artifact" exists, it appears not to be a very important reason for ICR negatively influencing concentration change. First, in 1967 the average industry concentration was around 39. Only at extreme values should this statistical artifact reason dominate the economic reasons. Second, a number of concentration change studies have accounted for this statistical artifact phenomenon, and concluded that it is not very important. In the Mueller and Hamm (1974) paper, a referee suggested that their negative coefficient for ICR might be a statistical artifact because industries with very high concentration ratios could thereafter experience decreases but not increases in concentration, thus violating the assumption of homoscedasticity. In response, they ran three different tests (explained in their footnote 24) to see if ICR was a biased estimator due to the potential statistical artifact problem. In all three tests, ICR showed to be unbiased.

Wright (1978) used another solution to account for this possible regression bias by transforming his dependent variable to be nonlinear and unbounded (see Chapter II). Both the transformed and conventional concentration change models yielded very similar results for the ICR coefficient. Hence, a significant regression bias does not appear to exist for using ICR as an independent variable in a concentration change model.

Furthermore, a number of economic reasons do exist to explain why the expected coefficient of ICR would be negative in a concentration change model. These include reasons explaining why industries with a high ICR would tend to lose concentration over time and/or industries with a low ICR would tend to increase concentration over time.

One reason, as Marcus (1969a, p. 117) pointed out, is that large firms usually will not attempt to increase their market shares by decreasing price because of fear of retaliation from competing large firms which are intent on maintaining their market shares. In contrast, small firms might try to increase their market shares by a price reduction because they are less menacing and less likely to invoke retaliatory pressure.

A second reason comes from highly concentrated industries that are making an above normal profit. Assuming that the firms can successfully collude, they then have a continuum of trade-offs between current profits and future market shares. In option one, they can collude to set price to maximize short-run profits but lose market share over time because of new firms entering due to the high profits. For further explanation, see Stigler (1952, p. 232). Instead, they can choose option two where the firms collude to set price to deter entry and give up some short-run profits in expectation of higher long-run profits. This is often referred to as "limit pricing." Relevant factors in the selection between these two alternatives include the discount rate of future profits, how long the firms can keep the high short-run profits under option one, and the difference between the short-run profits under option one and the short-run profits under limit pricing. Past case studies show that the steel, corn products and copper industries are examples of pricing under option one, and that Alcoa in the aluminum industry and U.S. Shoe Machinery in the shoe machinery industry are examples of pricing under limit pricing. Therefore, firms in a highly concentrated industry sometimes will choose to maximize their short-run profits at the expense of future market share.

A third reason comes from the possible cross-subsidization by a conglomerate. A conglomerate often diversifies by acquiring a relatively small single-line company. Then it can use earnings from other products or geographical markets to cross-subsidize this newly acquired firm. This cross-subsidization (which can take on many forms, though advertising is a good example) helps to expand the market share of the acquired firm while the market leaders often have the means to fight back and preserve their market share. However, the other small single-line firms are often forced to merge or to go out of business. Consequently, concentration rises. Two examples of this (Proctor & Gamble-Folgers Coffee and Phillip Morris-Miller Brewing Company) were given in Chapter I. Conglomerates look for this type of diversification in less concentrated industries because there is more room to gain market shares and typically government antitrust agencies have shown little disapproval of diversification by merging with smaller firms.

Fourth, as pointed out by Rogers (1982, p. 54), horizontal mergers in low concentration industries are not often challenged by the antitrust authorities as such mergers might be in higher concentrated industries. As long as one of the firms involved in the merger is included in computing the concentration ratio (i.e., one of the top four firms for a four-firm concentration ratio), then the concentration ratio will rise.

Finally, industries with a low ICR may increase in concentration because some firms will grow faster than others by chance and luck. This is called the "law of proportionate effect." Scherer (1980, p. 146) reports a computer simulation designed to conform to this law of proportional effect. In this experiment, the industry starts with 50 firms who each have a 2 percent market share. In each succeeding time period, each firm randomly grows, but with a mean growth rate equal to 6 percent with a standard deviation of 16 percent. The results showed that patterns resembling the concentrated structures of much American manufacturing industry emerged within a few decades. Concentration increased more rapidly for earlier time periods (when ICR is lower) and more slowly later on (when ICR is higher). Therefore, concentration is expected to increase more rapidly when ICR is lower by chance alone. Also, Scherer (1980, p. 148) reports that even if growth rates are not independent from year to year or if larger firms have a smaller deviation for growth, other simulation studies accounting for these properties still obtained similar results. As a result of all the above hypotheses, a negative coefficient is expected for ICR.

Size

Ceteris paribus, the larger the size of an industry, the greater is the number of optimal-sized firms that can exist and thus the lower the level of concentration. Hence, a negative coefficient is expected for industry size.

Other past studies have included size as an independent variable. Scherer (1980, p. 100), in a review of the determinants of concentration, states that, "It seems clear that large market size, absolute or (especially) relative, is a significant inhibitor of high concentration." Also, Mueller and Hamm (1974, p. 514) state that, "Other things being the same, the larger the absolute size of an industry, the lower its entry barrier."

Industry Growth Rate

Growth (G) is also an often included independent variable in past concentration change models. Unlike ICR, the growth coefficients as well as the economic reasoning have not been consistently negative or positive. However, these mixed results can be, for the most part, reconciled. I expect that using growth as an independent variable will add to our understanding how growth affects concentration change.

Most economic reasoning suggests that growth will have a negative effect on concentration change, though some suggest the opposite. Before covering these in further detail, it should be mentioned that growth could lead to a decrease in concentration for a technical reason. With a fixed number of industry classifications in the Census of Manufacturers and if the economy grows by creating new products, then concentration could decrease because new products are improperly classified with existing products (Nelson, 1963). However, this effect should be only a minor influence on concentration change since the census will start a new industry classification whenever the volume of the product becomes large enough that the census staff considers it significant. Also, often these new products will be classified in one of the not-elsewhere-classified (NEC) industries, which are "catch-all" industries for miscellaneous products and are excluded from my sample of industries (see Chapter IV).

When looking at the economic reasons for growth influencing concentration change, it is best to begin by noting that growth can effect concentration change in two general ways: (1) by influencing the number of firms, and/or (2) by differential growth rates between large and small firms in the industry. It is widely thought (Mueller and Hamm, 1974; Caves and Porter, 1980) that if growth affects concentration change through influencing the number of firms (i.e., net entry), it will have a deconcentrating effect. Mueller and Hamm (1974, p. 514) pointed out that "industries that are growing slowly, or worse still, declining are likely to create a particularly difficult displacement problem for new entrants." But more rapid growth will encourage new entry of firms and *ceteris paribus*, decrease concentration.

Also, dominant firms in oligopolistic industries may adopt a long run profit maximization strategy which involves their yielding an increasing part of their market share (mainly due to new entry) in order to earn short-run profits. Thus, in faster growth industries, leading firms would lose their market shares faster and this would speed deconcentration.

There are conflicting arguments about whether growth increases or decreases concentration change because of differential growth rates between small and large firms. On the one hand, large firms may choose to grow by diversifying into other industries at the expense of growth in their primary industry, while smaller firms grow in their primary industry. This would result in a decrease in concentration. There are a number of reasons for this diversification. Nelson (1960) lists four: (1) diversification helps to stabilize overall sales; (2) large firms prefer to enter more profitable and/or faster growing industries; (3) large firms may be trying to avoid anti-trust action; and (4) large firms may eventually experience diseconomies of scale. Shepherd (1964, footnote 16) further suggests that larger firms may wish to diversify as an outlet for entrepreneurial talent.

On the other hand, Sawyer and Rogers suggest that the dominant firms may have an advantage over smaller firms for growth. Sawyer (1971) hypothesized that growth would have a positive effect on concentration change when the number of firms is held constant. He reasoned that larger firms grow at a faster rate in a particular industry than smaller firms because of diversification, which allows for a transferring of resources as needed among different industries. In contrast, smaller firms are more dependent upon capital markets for the necessary funds for expansion. Rogers (1982, p. 64) adds that large firms may outgrow smaller firm rivals due to conglomerate advantages as: (1) deep pocket, (2) reciprocity, and (3) cross-subsidization. In addition, Rogers (1982, p. 63) points out that sometimes larger firms build plants with known excess capacity, and can expand output very rapidly by only adding variable inputs if industry growth takes place.

The empirical evidence for the U.S. on firm size and growth is very mixed, though Scherer (1980, p. 148) states that these studies "suggest that assuming growth rates uncorrelated with initial firm size is not a bad first approximation of the real-world facts." One study in particular (Marcus, 1969b) found that for the sample of industries, the observed growth rates were independent of size.

In sum, the effect of growth on concentration change through the change in the number of firms is expected to be negative while the effect of growth on concentration through differential growth rates of small and large firms is uncertain, both theoretically and empirically.

The results of the growth coefficient in past concentration change models appear to show a consistent pattern. Growth has usually been negative and significant for concentration change models when net entry of firms is not also included as an independent variable. But when both growth and net entry are included, growth is often positive and significant while net entry of firms is often negative and significant. For example, see Kamerschen (1968), Sawyer (1971) and Mueller and Hamm (1974). Apparently, net entry of firms has a deconcentrating effect of growth on concentration and differential growth rates between large and small firms in the same industry tend to have a concentrating effect of growth on concentration. Of these two, net entry of firms seems to dominate since the growth coefficient is usually positive when net entry of firms is also included as an independent variable and negative when net entry of firms is not included as an independent variable. This is consistent with the results of Rogers (1982). His growth coefficient tended to be positive and significant but also little entry had taken place in his sample of food and tobacco industries 1954-72. Consequently, I expect a negative growth coefficient unless there is little net entry in my sample of 4-digit SIC industries from 1963 to 1982.

It should be noted that industry growth and net entry of firms are highly correlated (because net entry of firms is one way that growth can affect concentration change) and thus both should not be included as independent variables in the same concentration change model. However, growth is the preferred independent variable of the two for a couple of reasons. First, Shepherd (1964, p. 208) points out that through the association between growth and net entry of firms is definite, "the influence of growth on the number of firms is probably more important than the reverse causation." Second, net entry of firms is a partial element of industry concentration. "This is precisely why some authors expressed reservations about its inclusion as an independent variable in a change in concentration model" (Rogers, 1982, p. 60).

It is interesting to note that Farris (1973) adds another hypothesis for growth in a concentration model. For low initial concentration ratios, he expected growth to have a positive effect on concentration change since large firms can grow without resistance from competition and not worry about anti-trust action. But when ICR is high, Farris expected growth to have a negative effect on concentration change. This is because both competition and the government anti-trust enforcers would be more sensitive and resistant to market share expansion.

Farris' hypothesis was supported as the growth coefficients were significant with the expected signs. In the Rogers (1982) study, growth was positive and significant only when ICR was low.

Research and Development Dummy Variable

Nelson and Winter (1982) ran simulation experiments to test if research and development (R&D) activity increased concentration. In their model, all firms spent the same fraction of their capital on R&D. Consequently, the larger firms spent a larger absolute amount on R&D which gives them a better chance to succeed in their innovation and imitation efforts, plus their successful R&D will apply to a larger capacity without further costs. Assuming these scale advantages of R&D to large firms and holding the number of firms constant, their results showed that R&D led to increased market concentration.

However, when entry is allowed, then it is possible for R&D to facilitate entry if there is easy imitation (Mueller and Tilton, 1969). Also, some economists believe that smaller firms make more efficient use of their R&D funds. Hence, R&D could cause a decrease in concentration. Therefore, on economic grounds the expected effect of R&D on concentration change cannot be predicted.

Because of this, Mukhopadhyay (1985) states that the effect of R&D on concentration change remains an empirical question. He tested a R&D variable in a concentration change model. In his sample of 304 SIC 4-digit industries from 1963 to 1977, the R&D dummy coefficients (representing technological progress) were consistently significantly negative. Thus, it appears R&D can have a negative effect on concentration, especially if R&D facilitates entry by easy imitation. Since Mukhopadhyay was the only study before to use a R&D dummy in a concentration change model, I will use it again in my model (with a different sample and period) to see if the R&D dummy coefficient remains negative and significant.

Convenience Good Dummy Variable

It appears to be useful to distinguish between two different types of consumer goods when examining how advertising intensity can affect market structure. These two types are convenience goods and shopping goods. Holton (1958) used this terminology although this basic idea goes back to Copeland (1923). Porter (1974) was the first to apply this classification to a cross-industry analysis (using a profit rate model). This will be the first time this idea has been used in a concentration change model, where the convenience good dummy (CONV) equals one for convenience good industries and zero otherwise.

The expected CONV coefficient is positive because advertising is hypothesized as more effective at product differentiation and image building for convenience type consumer goods. Convenience goods have a relatively small unit price, are repeatedly purchased and are sold in retail outlets where local density is high but sales assistance is very low. Examples of convenience outlets are supermarkets, gasoline stations (which in the last 10 years are increasingly combined with small "convenience" grocery stores), and liquor stores.

Due to the relative low unit price and high frequency of purchase, the consumer considers the purchase relatively unimportant. However, the cost of obtaining information on competing products quality (and sometimes price) is high, especially relative to the unit price of the convenience good. Hence, the probable gains from searching out this information on quality and price is low, and the consumer tends to buy these convenience goals without shopping around much and collecting information. "Since the purchase is not perceived to be important, the consumer is willing to rely on less objective criteria (attributers) accordingly. Relatively more objective (in the sense that the consumer has some control over the information he receives) and costly information sources such as sales assistance by the retailer and direct shopping and comparison are not utilized" (Porter, 1974, page 423). One of the most important "less objective criteria" the consumer relies on is advertising. Therefore, it is hypothesized that in the absence of other information, advertising through image building and persuasion (which characterizes most national advertising) will be more effective at influencing concentration change for convenience good industries.

In contrast, shopping goods have a relatively high unit price and the purchase can usually be delayed (the purchase is relatively infrequent and can usually be delayed). Shopping goods are sold in retail outlets where outlets are selectively rather than densely located and sales assistance is very high. Examples of shopping goods outlets are shoe stores, appliance stores, small clothing shops and automobile dealers.

Due to the relatively high unit price and the fact that purchases can usually be delayed, the consumer considers these purchasers more important. Here, probable gains from making quality and price comparisons are large relative to the consumers' expected search costs. Thus, the consumer will shop around (often several stores) to compare prices, styles, and quality. And, the retail sales person often can influence the sale of different products through the provision of (low cost) information (Porter, 1974, p. 421).

> This may occur through a selling presentation, through personal recommendation or advice solicited by the consumer and through the perceived expertise of the sales person with respect to the product (or any combination of all of these). The retailer conveys product information about the reliability, features and method of use that may be difficult to obtain from other sources.

Also, especially for the higher priced shopping goods (appliances, TVs, stereos, and automobiles), consumers will turn to other sources of information. First, consumers acquire information from talking to each other (people tend to talk more about what kind of automobiles they drive than what kind of razor blades they use). Second, they read various types of consumer reports. The popularity of consumer reports (printed by government agencies, and both profit and nonprofit private organizations) has increased substantially the last twenty years.

Therefore, the consumers have other sources than advertising upon which to base their purchases of shopping goods and also have an incentive to use these other sources. So, it is expected that advertising intensity will not be as effective for influencing concentration change for shopping good industries as it is for convenience good industries.

Consumer Good Dummy Variable

Mueller and Hamm (1974), Scherer (1979), Caves and Porter (1980), Mueller and Rogers (1980; 1984), and Adams and Heimforth (1986) are among those studies that found concentration in consumer goods industries to have increased during periods when concentration in producer good industries has remained stable or decreased. This finding has been explained by the product differentiation barrier to entry of consumer good industries. Advertising is an important component of product differentiation (maybe the most important). In fact, advertising intensity is often used as a proxy for product differentiation. But the consumer good dummy variable (CONS) may also capture some non-advertising created product differentiation effects on concentration change. However, due to moderate collinearity between CONS and the advertising intensity variables, when the two are used together, the level of significance will likely be reduced for both variables. Consequently, equations will be estimated with and without CONS.

Advertising Intensity

Advertising intensity is the major independent variable in this study. As noted in Chapter I, not all types of media advertising intensity can be expected to affect concentration change the same way. By its nature, national advertising intensity (heavily represented by TV advertising intensity, especially network TV advertising intensity) is expected to have anti-competitive effects on market structure. This is because national advertising is more persuasive than informative. Also, TV advertising has more advantages for larger advertisers than other advertising media. These advantages of larger advertisers (for all advertising in general but especially with TV advertising) are presented in detail below. In addition, the importance of network TV advertising can be seen by comparing the relative prices of advertising media between 1969 to 1976. Network TV advertising prices rose two to eight times higher than did prices for spot TV, spot radio, network radio, outdoor, newspapers and magazines (Levmore, 1978, p. 13). Therefore, because of the various large scale advantages for advertising in general and because of the further large scale advantages and strong national advertising characteristics of TV (especially network TV) advertising, the expected coefficients for total advertising intensity and network TV advertising intensity are positive, with the latter being stronger and more significant.

Before going further, it should be noted that for a concentration change model, independent change variables (such as total advertising intensity change) are thought to be theoretically the correct form of the independent variables (Caves and Porter, 1980). However, independent level variables (such as total advertising intensity level) can affect concentration change through a lag effect (Caves and Porter, 1980). For example, for a concentration change model from 1967 to 1982, a proper independent advertising intensity variable would be an advertising intensity change from 1967 to 1982. But the 1967 advertising intensity level, while affecting the 1967 concentration level, would also affect the concentration level in some years after 1967 (e.g., the concentration change period from 1967 to 1982) because of the lagged effect. While there is no theoretical way to determine how long this lag effect will last, clearly both the level and change of advertising intensity variables can be expected to affect concentration change. Hence, both the level and change of advertising intensity variables (e.g., total advertising intensity level and total advertising intensity change) will be included in the various concentration change models tested.

Other concentration change studies have included both level and change variables. In particular, Rogers (1982), Ornstein and Lustgarten (1978) and Levy (1985) all included level and change advertising variables in their model. A similar argument was used by Mueller and Hamm (1974) to include both size and growth in their concentration change model.

The various advantages large advertisers have over small advertisers (especially for TV) explain the mechanisms by which advertising intensity (especially for TV) is expected to contribute to a higher (or slower declining) concentration level. First, the largest of all advertisers, large multiproduct companies (conglomerates) have an advantage over smaller rivals (often single-product companies) by using cross-subsidization. Cross-subsidization occurs when a firm uses revenues earned in one of its (geographic or product) markets to subsidize activities (e.g., advertising) in another of its markets. Firms will use this tactic when the expected future gains from the increased market shares resulting from cross-subsidization exceed the short run cost of the cross-subsidization.

> There is case study evidence demonstrating that large conglomerate firms are able to use advertising in a cross-subsidizing manner, evidence which might be legally viewed as predatory if it were reflected in deep price cutting. Instead, large conglomerates may subsidize advertising and promotion outlays to increase their market shares in particular markets (Rogers, 1982, pp. 78-79).

This can result in an increase in concentration. Two prominent examples of cross-subsidization through advertising are Proctor and Gamble's expansion into coffee and Phillip Morris into beer (covered in detail in Chapter I). In both cases, there was an increase in market concentration within a short time period.

Also, there exists both real and pecuniary scale advantages in advertising. At least three authors found evidence of real scale advantages in advertising. Brown (1978) derived an average advertising cost schedule for the cigarette industry where the average cost refers to "amount of advertising capital required per unit of sales for any chosen level of sales" (p. 433). The derived cost curve was found to decrease sharply over a large range of sales (up to twenty to thirty billion cigarettes). Brown (1978, pp. 433-434) concluded that "new entrants are at a considerable cost disadvantage in terms of advertising that is not quickly overcome."

In addition, Peles (1971) found scale advantages in the beer and cigarette industries. He suggested that this is in part due to two advantages national sellers who advertise have over smaller regional producers. First, national advertisers can minimize their advertising waste by better matching their advertising coverage to their distribution area. Second, any residual effect of a national brand's advertising is not lost when a consumer moves from one region to another.

Also, Porter (1976, p. 401) writes that "the economies of scale in advertising depend on the threshold level of advertising required of entrants to achieve parity with going firms." The effective threshold is probably higher for electronic (radio and TV) advertising since the message is not available for repeated readings (as printed advertising is). The effective threshold is probably higher yet for network TV advertising since it is highly indivisible with respect to geographic boundaries and market size (Porter, 1976, p. 401).

The pecuniary scale advantages of advertising are probably greater than the real scale advantages. According to Blake and Blum (1965), until at least the mid-1960s, there were substantial volume discounts in TV advertising. Though the formal quantity discounts ended by the late 1960s, Scala (1973, p. 254, footnote 99) argues that other forms of price discrimination continued until at least into the early 1970s. For example, the thirty second commercial is considered 65 to 70 percent as effective as the one minute commercial. But until 1971, networks required advertisers to buy a minimum one minute commercial. This practice discriminated against the single product manufacturer who could not split their one minute commercial among two products.

More recently, Levmore (1978, p. 28) found that "there is every reason to believe that although the fixed rates and discounts have been formally abandoned in favor of a system in which prices are established through case by case bargains, these current bargained-for rates contain in them these very discounts." These discounts exist but are hidden as advertising agencies typically bargain to buy a whole package of TV advertising (daytime, prime time, etc.) for their clients. The advantage of lower TV advertising rates for larger clients is further shown when smaller firms, acquired by larger ones, continue to create their own advertising but receive lower rates because the parent company bargains for them. "A striking example of this is the Pepperidge Farm Co., which insists that it received better rates when it increased its advertising budget and then deliberately had Campbell Soup's advertising agency place its purchase of television time (after Campbell acquired Pepperidge) in order to get more muscle" (Levmore, 1978, p. 114). And, in his interviews, Levmore (1978, p. 114) found that advertising personnel from small and large firms, the networks and advertising agencies all believed that large advertisers enjoy rate advantages.

There also exist pecuniary scale advantages for spot TV advertising. Porter (1976, p. 403) found that by examining only the actual rate structure for spot TV, quantity discounts exist. In addition, Porter (1976, p. 403) states that TV network rates for advertising equal 10 percent to 70 percent of the sum of the individual spot rates, in terms of reaching a given number of viewers. Hence, regional producers who use regional (spot) TV advertising to compete with national advertisers (using network TV) are still at a disadvantage. One example is reported by Mueller (1979, p. 5), who found the following on a cost per thousand viewers basis: "In 1977-78, for every $1.00 spent by a national brewer on major sports event, a regional brewer had to spend $1.63 on local spot sports or $1.72 on prime spots."

Another kind of pecuniary scale advantage is the favorable editorial treatment large advertisers sometimes receive. This is most common for newspapers and magazines. Norris (1984, p. 81) reports of one example:

> It is common knowledge in the trade and was reported by CBS News that at least one magazine selects its "Car of the Year" on the basis of the amount of advertising space purchased. This is probably not known by most of the magazine's readers. The selection is then advertised in other media to the unsuspecting general public. It is not difficult to imagine that many consumers are influenced by what they consider an objective evaluation by experts.

In sum, there appears to be a consensus that scale advantages in advertising do exist. Comanor and Wilson (1979) wrote a survey article on advertising and competition. In conclusion of their review of the scale advantages in advertising (both real and pecuniary), they wrote that (p. 470)

> Taken together, these results suggest that economies of scale in advertising are generally present, which provides an important advantage to large sellers and large advertisers.... These economies may be an important factor leading to the anticompetitive implication of heavy advertising expenditures.

Another advantage for large advertisers results from the fact that the absolute cost of some advertising (especially TV) is so great that it creates a barrier to entry. For example, in 1976, the cost of sponsoring a half-hour program on network TV in prime time cost $50,000 per show (Porter, 1976, p. 402). And, the argument that repetition must occur for the effectiveness of electronic advertising would further increase the minimum absolute cost of running effective TV commercials.

There are also a number of restrictive practices that favor larger advertisers. One is that larger TV advertisers often receive more favorable time slots (Scala, 1973). For example, a prime time advertising of a sports event is of much greater value to a brewery than other prime time. Also, much of the prime time space available is limited to sale in package deals available only to large advertisers (Levmore, 1978). In addition, all this is exacerbated by network rules that prevent competing products from being advertised too closely together. Rogers (1982, p. 70) states, "Those rules ensure buyers of advertising time that their advertisement will not be positioned too close together. It is not difficult to understand why only large advertisers are awarded such sponsorships, for they are very important sources of revenue to the network and certain favors and advantages are expected."

A second restrictive practice results from TV networks refusing to give two or more companies, who wish to act as a joint buyer of time, the same treatment as large corporation receives. According to a Senate hearing (U.S. Senate, 1966), smaller companies with seasonal products who have tried to buy time together for a year long period (in order to receive rate discounts) have been turned down simply because such companies do not have single ownership.

Blair (1972, p. 317) points out a third restrictive practice--the ban on subcontracting purchased time. This clearly hurts the smaller and/or single product firms. Meanwhile, conglomerates need not worry about buying time and then not being able to use it since they each have many different products to advertise.

In addition to the above advantages of large advertisers, there exists a number of advertising characteristics that also favor larger advertisers. Unlike other forms of advertising media, TV advertising supply cannot vary with demand. This makes it easier for larger firms to dominate prime time because they are the favorite and most important customers of the TV networks. For example, of all the commercials on the TV networks during March 1966, 19.9 percent went to the top five advertisers (Blair, 1972, p. 314). And, as stated earlier in this chapter, TV advertising (especially for network TV) has been recently increasing in cost faster than other media advertising. This is in part due to the fixed supply of TV advertising but indicates that TV advertising is thought to be the most important (and effective) of all types of media advertising by the advertisers. Also associated with the fixed supply of TV advertising is shelf space in the stores. The more successful advertisers usually get better shelf space. It has been long known that a product needs space as an indispensible prerequisite for survival. Blair (1972, p. 313) sums it up, "The preemption by large firms of the medium whose supply is fixed and which in addition has the greater pulling power, should make higher concentration almost a certainty."

Another advertising characteristic that favors larger advertisers is their diversification. A multiproduct firm stands less chance of wasting purchased advertising. For example, if one advertised product is not responding well in sales, they can switch another product(s) into its spot. Or, if it has seasonal products (sleds and skateboards), it can advertise each during the appropriate season in the same advertising spot. Also, a diversified firm may get an advertising spillover effect from brand or firm loyalty. For example, a firm who advertises stereo turntables may get a positive effect on its sales of stereo speakers. In many markets, this is referred to as "institutional advertising" (Levmore, 1978, p. 104).

A third advertising characteristic that favors larger firms is the ability to pool advertising risks more effectively than smaller firms. First, there always is a general risk that an advertising campaign may fail (no matter how much money is spent on prior research, pretesting, and production of the advertisement). The most classic example is Ford's Edsel in the 1950s. But, recent examples include R. J. Reynolds' Now cigarettes, Proctor and Gamble's Wondra hand cream, and Cadbury Schweppes' Rondo soft drink (Rogers, 1982, p. 93). However, larger firms can better survive these setbacks because they have other profitable products and usually will have success advertising other products.

Second, a more specific risk is audience size, which also favors larger advertisers. Rogers (1982, p. 73) points out that risk of audience size greatly favors large firms. For example, "large firms will often buy time on different channels at the same time of day because total audience size is less variable than the audience size of each channel. A once popular show may lose popularity as the year progresses, and the viewers will tune into other shows that are on at the same time."

The last advertising advantage of larger firms covered in this chapter is a result of the advertising agency. Advertising agencies handle all sales of TV network commercials for a commission based on a percent of the media's gross charges (similar to travel agents in the travel industry). Because of these commissions coupled with the fact that advertising agencies will not handle clients with competing products, the large advertising agencies seek the larger advertisers and exclude the smaller ones. Levmore (1978, p. 68) states,

> As a rule, agencies seek large clients and concentrate on not losing those large clients to competing agencies. This "rule," which stresses the concern of agencies for large clients, follows quite directly from the industry practice which precludes an agency from representing competing products. A small account, then, may interfere with the acquisition of a larger, more profitable, client.

Hence, the smaller advertisers are excluded from the large advertising agencies who not only have the most expertise in making commercials, but also have the most bargaining power with the networks for securing better time slots and discounts for their clients.

In sum, there are a number of large firm advantages in advertising (especially for TV network advertising). First, multi-product firms (conglomerates) may use advertising in a cross-subsidizing manner. Second, these exists various real and pecuniary scale advantages. Third, some forms of advertising cost so much (especially network TV) that it creates an absolute cost barrier to entry. Fourth, large firms benefit from a number of restrictive practices in advertising. Fifth, there exists a number of advertising characteristics that favor larger firms.

Finally, larger firms are the favorite customers of advertising agencies and receive preferential treatment. Because of these large firm advantages (plus the persuasive nature of national advertising), it is expected that both the level and change of advertising intensity (especially for network TV) will increase concentration for some industries or slow the decrease in concentration for other industries. Hence, positive coefficients for the advertising intensity variables are expected. (As pointed out in Chapter I, the advertising data used in this study are dominated by manufacturers, e.g., national advertising.)

Omitted Variables

There are two potentially relevant independent variables not included in the above model: change in economies of scale and conglomerate mergers. However, the model does include the independent variables generally considered most relevant by others, as revealed by the literature review chapter.

Probably the most important determinant of concentration change omitted is change in economies of scale (e.g., change in minimum efficient scale of plant or firm operation). Bain (1956) found that plant size was the most important source of firm economies, though Scherer's (1975) analysis of multiplant economies of several industries has cast some doubt on Bain's finding. Both firm and plant economies of scale have been tried in concentration change models.

If economies of scale increase, it is expected that concentration would increase, *ceteris paribus*. Of the ten articles reviewed in Chapter

II, only Wright (1978) and Ornstein and Lustgarten (1978) included some type of change in firm economies of scale variable (which was positive and significant in both studies). Mueller and Rogers (1980) had included a change of plant economies of scale variable in their original draft, but omitted it in the final journal article because a referee thought it had serious shortcomings.

The shortcoming of using a scale of economies variable is due to the fact that there are presently no data available to construct adequate proxies for an industry-wide study. This is why it is not included in this study. Wright (1978), Ornstein and Lustgarten (1978), and the earlier draft of Mueller and Rogers (1980) all used the only type of data available to construct an economies of scale variable--"surrogate measures," or crude proxies based on the distribution of various average firm or plant sizes. This measure assumes that small firms or small plants are sub-optimal.

But these various measures do not necessarily reflect optimal firm or plant size. There are two problems in using surrogate measures for optimal plant size. First, firms will often expand plants (rather than establish a new one) because it is convenient, there is room to add on, or because of political pressure. For example, in 1982, the George A. Hormel and Co. had to choose between adding on the existing plant in Austin, Minnesota, in 1982 (1,800 new jobs) or adding on a smaller plant (600 new jobs) in Austin and build two new plants (600 new jobs each) in Mankato, Minnesota, and Waverly, Iowa. Hormel chose to add all new plant facilities in Austin in response to the local union and city officials (Willette, 1986). A similar example was the recent Oscar-Meyer meat packing expansion in Madison, Wisconsin.

Second, estimates of economies of scale must be derived independently of observed changes in firms' size distributions, since this is the major influence on concentration change. However, Marcus (1969a, p. 118, footnote 2) points out that using change in mid-output plant size (a surrogate measure) to explain concentration change is inappropriate because the two are not independent. He writes,

> This variable (change in mid-output plant size) may not however be independent of changes in firm size. Consider, for example, the not unlikely situation where constant returns to scale prevail past some minimum size. In such a case, large firms will employ, on average, larger plants if for no other reason than their size permits the utilization of larger plants. Smaller firms, following the same reasoning, will employ on average smaller plants since their size limits them to a lower maximum plant size. Observed changes in mid-point output plant size will reflect in such a case the firm's growth rather than explain it.

Similar problems exist in using surrogate measures for optimal firm size. In particular, these also will not be independent of changes in firms' size distribution, the major influence on concentration change.

A second omitted independent variable is conglomerate mergers, which was not used in any of the ten articles of the literature review (Chapter II). However, four other studies (Markham, 1973; FTC, 1972; Goldberg, 1974; Adams and Heimforth, 1986) tested for the effect of conglomerate mergers on concentration change. Conglomerate mergers were hypothesized to increase concentration, ceteris paribus, because the merged firms may engage in anticompetitive practices as reciprocity or cross-subsidization. Edwards (1955, pp. 334-335) summarizes well the advantages the conglomerate firm has over smaller rivals:

> In encounters with small enterprises it Äconglomerate firmÜ can buy scarce materials and attractive sites, inventions, and facilities; preempt the services of the most expensive technicians and executives; and acquire reserves of materials for the future. It can absorb losses that would consume the entire capital of a smaller rival...moment by moment the big company can outbid, outspend or out-lose the small one; and from a series of such momentary advantages it derives an advantage in attaining its large aggregate results.

In all four studies, no evidence was found that conglomerate mergers increased concentration in the markets of the acquired firms. Hence, conglomerate mergers will not be used in this study. However, it is interesting to note that Adams and Heimforth (1986, p. 152) concluded that "substantial indirect evidence is found from descriptive statistics and regression analyses that conglomerate mergers are associated with a lessening of competition in the market of the acquired firm."

This concludes the economic rationale for the inclusion of each independent variable to be tested in the concentration change model. The next chapter discusses how the available data were used to construct the empirical measures of the variables. Then, Chapter V will present the empirical results.

CHAPTER IV. THE SAMPLE AND VARIABLE CONSTRUCTION

The population used in this study is the 4-digit SIC manufacturing industries (as explained in Chapter 1). The actual sample used is a subset of the population because some industries must be eliminated for various reasons. After describing the sample, the construction of each variable is explained.

The Sample

Out of the population of 450 4-digit SIC industries, the basic sample used consists of 269 industries. Hence, some industries were dropped because they were not appropriate for the study. Below, these reasons are given.

First, industries whose definitions were changed since 1963 were excluded. The U.S. Census Bureau periodically redefines manufacturing industries to more closely reflect changing patterns of production and consumption. In these revisions, some industries are absorbed into others, some new industries are identified, and some industries have products added to or deleted from their definitions.

Ornstein (1977) suggested that these comparable-data samples used in concentration change models are biased because they tend to include the slowest growing and least technological dynamic industries and exclude the faster growing and more technological dynamic industries. However, other authors argued that these samples are not biased in representing the population. Mueller and Hamm (1974) stated that some industry definitional changes resulted in a downward bias while others resulted in an upward bias. Also, they add that some industries are excluded from a sample because of disclosure reasons. Because this occurs only in highly concentrated industries, it results in a downward bias. Then, they tested for the overall bias (of using a sample less than the population in a concentration change model). They compared their 166 industry sample for 1947-1970 to their 292 industry sample for 1958-1970. (The latter sample represented 74% of all value added by manufacturers in 1970). They concluded that "these comparisons suggest that the 166 industry sample is quite representative both as to trend and level of industry concentration" (p. 512).

Furthermore, Caves and Porter (1980, p. 3) pointed out that "If the sample excludes new and fast growing industries, it also excludes declining sectors that have been consolidated with other industries." Hence, the definitional changes do not appear to cause the sample to be biased.

Also, the last major revision in the SIC industry definitions took place in 1963. Consequently, fewer industries had to be omitted from this analysis due to such changes than were excluded from many previous studies. Out of the population of 450 industries, 181 are excluded for various reasons, including 104 for definitional changes between 1963 and 1982. Therefore, roughly 23 percent of the industries are excluded due to definitional changes. This is small relative to some past concentration change studies (as Mueller and Rogers, 1980, where their sample size was 167 industries).

Also, the "not elsewhere classified" (NEC) industries were determined to be not appropriate for this study. These deleted NEC industries number 59. Each is a "catch-all" industry for miscellaneous products that do not fit into the other and better defined industries. Hence, the NEC industries do not even come close to reasonably representing a true economic market and were consequently deleted.

In addition, 8 industries are excluded because the U.S. Census suppresses some concentration ratios to prevent disclosure of firms operating in that industry. Naturally, this occurs in the most highly concentrated industries. These industries include the makers of cigarettes, cellulosic man-made fibers, primary lead, primary aluminum, typewriters, telephone apparatus, sewing machines and dolls.

Also, a small number of industries were excluded from the sample because of various institutional characteristics. One industry was 2021 (butter), omitted because of a change in the way cooperatives were handled. Before 1972, the census did not apparently consolidate the records of the various member plants. Thus, the 1967 CR4 for butter was 14 but leaped to 37 in 1972. Meanwhile, Land O'Lakes (a large cooperative) had a market share that exceeded 14 in 1967.

Also, SIC 2875 (nitrogenous or phosphatic fertilizers, mixing only) is omitted, because the final product cannot be distinguished from SIC 2873 (nitrogenous fertilizers) or SIC 2874 (phosphatic fertilizers). The only difference is that in 2875 fertilizer is produced from purchased materials, whereas in 2873 and 2874 fertilizer is produced from materials produced in the same establishment. Consequently, industry 2875 is of little use in a concentration change model of 1967 to 1982. In addition, industries 2873 and 2874 have been omitted because of definition changes in 1972.

SIC 2992 (refining oil and greases from purchased materials) was also omitted. Similarly to the above case, if the oil is instead refined from materials produced in the same establishment, then the oil product goes into industry 2911 (petroleum refining). In 1977, the value-of-shipments from 2992 was 1.8 percent of that in 2911. Since 2911 greatly dominates the refining industry, 2911 is included in the sample, while 2992 is deleted.

Lastly, industries 3911 (precious jewelry) and 3961 (costume jewelry) were both omitted due to problems of correctly assigning LNA advertising data to either industries. As explained later in this chapter, the LNA advertising data were created by assigning each product advertised to a certain 4-digit SIC industry. However, it was impossible to assign LNA jewelry advertising data to either 3911 or 3969. After talking with a local jewelry dealer, I learned that most jewelry companies produce both in 3911 and 3969. The big profit margins are in producing low priced jewelry (3911) and costume jewelry (3969). These two types of jewelry are often identical except often a semi-precious stone (costing usually $3 to $5) is added to costume jewelry (3969), which makes it into precious jewelry (3911). Hence, it was not possible to accurately assign the LNA jewelry advertising data to either 3911 or 3969. Also, the concentration trends for both industries since 1963 have moved in opposite directions. Because advertising intensity is the major independent variable in this study, 3911 and 3969 were omitted from the sample.

Variable Construction

Concentration ratio change (ΔCR)

The dependent variable (ΔCR) is measured simply by the concentration ratio of the ending year of analysis minus the concentration ratio of the beginning year of analysis. Concentration ratios for the top 4 firms in each manufacturing industry are taken from Census of Manufactures, Industry Statistics, volume II.

Initial concentration ratio (ICR)

ICR is the concentration ratio in the beginning period of analysis. It also comes from the Census of Manufactures, Industry Statistics, volume II.

Industry size (S)

The size of each industry is measured by the natural logarithm of the initial year's value-of-shipments (VOS). Scherer (1979) and Mueller and Rogers (1980; 1984) both used the logarithm of VOS because the distribution of VOS is highly skewed, and use of the logarithm results in a more linear distribution. The VOS comes from the Census of Manufactures, Industry Statistics, volume II.

Industry growth rates (G)

Unlike ΔCR and ICR, the measurement of growth is not as simple. Growth could potentially be measured by changes in the quantity of shipments (Q) or by changes in the value-added or value-of-shipments (which is price times quantity (P.Q)). Because quantity data are not available at the 4-digit SIC level, changes in the value-added or value-of-shipments will be used. But, this should not be a problem. Rogers (1982, p. 182) was able to use both Q and P.Q as measures of growth because his food and tobacco sample was at the 5-digit SIC level. He found that "there exists a strong positive association between the two measures (simple correlation coefficient is .82), which suggests the two measures do move together."

It should also be noted that since there is a price effect in using the change in value-added or value-of-shipments to measure growth, these measures tend to increase in periods of inflation. Consequently, two steps are taken. First, change in value-added will be used instead of change in value-of-shipments because this way a product's increase in value-of-shipments due to increasing input prices will not be included in the growth measure. Second, the value-added will be divided by the producer price index (price indexes are not available for individual 4-digit industries for 1963-1982). Hence, growth will be measured as:

$$\frac{\text{VA(ending year)/PPI(ending year)}}{\text{VA(initial year)/PPI(initial year)}}$$

where VA equals value added and PPI equals producer price index for all commodities. The VA comes from the Census of Manufactures, Industry Statistics, volume II, and the PPI comes from U.S. Department of Labor.

Research and development dummy variable (RD)

RD is a dummy variable equal to one (and zero otherwise) for all 4-digit industries that are part of a broader (2-digit) industry group that has a research intensity of 1% or more. These industry groups are comprised of the following:

28 (Chemicals and allied products);

30 (Rubber and plastic products);

32 (Stone, clay, glass and concrete products);

34 (Fabricated metal products);

35 (Machinery, except electrical);

36 (Electrical and electronic machinery and equipment);

37 (Transportation equipment); and

38 (Measuring and controlling instruments; photographic and medical goods; watches).

The original source was the National Science Foundation. For this study, I collected these data from Mukhopadhyay (1985, p. 144).

Convenience good dummy variable (CONV)

CONV is a dummy variable equal to one (and zero otherwise) for all 4-digit industries classified by myself to be manufacturing convenience type goods. As discussed in Chapter III, convenience goods have a relatively small unit price, are repeatedly purchased and are sold in retail outlets where local density is high but sales assistance is very low. Examples of convenience outlets are supermarkets, gasoline stations (which in the last 10 years are increasingly combined with small "convenience" grocery stores), and liquor stores. Based on this definition plus referencing Porter's classification of 42 4-digit convenience good industries (Porter, 1974, p. 428, Table 1), I was able to classify 38 industries as convenience good industries.

Consumer good dummy variable (CONS)

CONS is a dummy variable that has a value of one when an industry is primarily producing consumer goods and zero otherwise. The 1972 Input-Output tables for the U.S. economy (U.S. Department of Commerce, 1979, table 1) were used to classify the type of product produced for most SIC industries in the sample. Industries for which sales to consumers accounted for 50% or more of total sales were categorized as consumer good industries. However, due to differences between I-O industry classifications and the SIC system, some industries were classified by SIC definition. Of the sample of 269 industries, 88 were consumer good industries and 181 were producer good industries.

Advertising intensity

There currently exist four different sources of advertising expenditure data that are available for a U.S. manufacturing industry study: (1) Parker's data set compiled at the FTC; (2) the Internal Revenue Service; (3) the Input-Output tables; and (4) the Leading National Advertisers Inc. The first three have serious shortcomings, discussed below. Consequently, the advertising expenditure data used in this study come from the Leading National Advertisers, Inc. (LNA).

Robert Parker's (1967) advertising data set was compiled at the FTC for the years 1947, 1954, 1958 and 1963. Parker used a discrete advertising variable: 4-digit SIC industries were classified into either producer good industries or consumer good industries with low, medium and high degrees of product differentiation.

However, Parker's data were heavily criticized. First, the degree of product differentiation was based on the advertising intensity of the top few firms in each industry, taken from various media trade journals. As Ornstein and Lustgarten (1978, p. 230) pointed out, since most large firms are diversified, their advertising to sales ratios may have little relationship to a particular 4-digit SIC industry. Second, the consumer good industries with an A/S less than one percent were classified as low product differentiation, while industries with a high A/S were classified as high product differentiation. But, what constituted a "high ratio" was nowhere stated explicitly. Also, Parker adopted the Federal Reserve Board's classification of industries into producer and consumer goods. This caused some goods to be misclassified into producer or consumer good industries. Ornstein and Lustgarten (1978, p. 229) discovered that at least 12 goods in Parker's 1963 sample of consumer goods should have been classified as producer goods. This misclassification was determined by using Input-Output tables to classify industries as a producer good if the industry shipped over 50 percent of its output to other producers. For example, flavorings and syrups (61 percent shipped to producers) and watch cases (94 percent shipped to producers) were misclassified as consumer goods. Lastly, the three categories of product differentiation came from a continuous measure of advertising intensity. Hence, the cut-off points for the discrete variables were somewhat arbitrary.

The Internal Revenue Service data are also plagued with many problems (Rogers, 1982, p. 106). One problem is that these data are for the Standard Industrial Classification (SIC) 3-digit level, which is too broad. Also, the data come from the corporation reports, which tend to overstate cost because advertising is tax deductible. And perhaps most important, a corporation is assigned to a single IRS category unless the corporation reports by divisions or subsidiaries. As companies become more diversified, the data have less meaning. For example, when Phillip Morris acquired Miller Brewing Company in 1970, all of Miller's advertising was assigned to the tobacco industry.

The Input-Output (IO) advertising data are available for most 4-digit industries and include what the LNA data include (spot and network TV, network radio, outdoor, magazine and newspaper supplements) plus "talent and production costs, signs and advertising displays, art work, postage and printing" (Ornstein and Lustgarten, 1978, p. 231).

Ornstein and Lustgarten (1978, pp. 230-231) were the first to use IO data, "in order to eliminate incompatibility in industry aggregation between advertising data and concentration ratios." However, upon closer examination, this incompatibility in the industry aggregation between advertising data and concentration ratios is not eliminated with the IO data. The problem is due to the value-added allocation rule that the Department of Commerce uses to save time and money. Under this rule, if a LNA product class (of which there are 243) contained two 4-digit SIC industries, and one SIC industry had twice the value added as the other, it would be allocated twice the amount of advertising.

To demonstrate how this leads to inaccurate IO data, Rogers (1982, p. 113) shows that for 1972, the IO data give chewing gum $9.5 million in total advertising based on the value-added allocation rule, while Rogers' LNA data give chewing gum $35.7 million. To show how important this is in my LNA data set, in 1982 only 42 of the 202 LNA product classes (that I aggregated) matched up as perfect fits with the 4-digit SIC industries. So, 160 of the LNA product classes had more than one SIC industry code assigned to their products, and some had up to 44 different SIC industries assigned to their products. In these cases, it is easy to see how the IO data using their value-added allocation rule would provide inaccurate estimates of advertising expenditures for many 4-digit industries.

A second drawback is that IO data are not available for all 4-digit SIC industries, since there is not a one-to-one correspondence between the SIC system and the IO tables. For example, in Ornstein and Lustgarten's (1978, p. 231) sample of 4-digit SIC industries for 1963 and 1967, the IO tables were able to supply advertising data for only 80 percent of the industries (and only 60 percent of the industries for their 1947 sample of industries).

In contrast, the LNA data do eliminate the incompatibility of industry aggregation between advertising data and the 4-digit SIC industries. This is because the advertising expenditures of the individual products (rather than product groups) are assigned to 4-digit industries. The major drawback is that this task of assigning each individual product's advertising to a specific 4-digit industry is time consuming.

Another advantage of the LA advertising data set is that since it is compiled by assigning each individual product's advertising one at a time, it is possible to include only those advertisements that relate directly to product differentiation. Hence, industry-wide demand shifters were excluded from the LNA data. For example, the American Dairy Association advertisements encouraging milk consumption were excluded while advertisements by firms or cooperatives for their specific brand of milk were included (e.g., Borden's milk).

The LNA data are disaggregated into six basic media--network and spot TV, network radio, outdoor, magazine and newspaper supplements. These data are obtained as follows. The Broadcaster Advertisers Reports, Inc. (BAR) monitors every broadcast minute during the year for ABC, CBS, and NBC networks. From these tapes, they compute the network radio and TV advertising. Likewise, for spot TV, BAR monitors 278 TV stations in the top 75 markets. Advertising expenditures for 120 leading magazines plus the newspaper supplements of Family Weekly, N.Y. Times Magazine and Parade are summarized by the Publishers Information Bureau. Outdoor advertising (in markets over 100,000 population) is compiled by the Institute of Outdoor Advertising. Then, each individual product is assigned its various advertising totals and grouped into one of the LNA 243 product classes (LNA, 1982). Hence, LNA data book contains the measured advertising expenditures for the 6 above media for over roughly 17,000 manufactured products.

There are a number of reasons why LNA advertising data represent mainly national advertising. First, the LNA advertising data reports the name of the advertiser along with each product advertised. By working through some 17,000 products compiled, it was easy to notice that in the vast majority of the cases, the product was advertised by the manufacturer, not a retailer. Second, national advertising is done in the type of media reported by LNA--where persuasion rather than information is common and only large advertisers can afford to purchase these ads. This is consistent with the LNA media--network TV and radio, spot TV in the top 75 U.S. markets, the top 120 magazines and outdoor advertising in cities of population greater than 100,000. In contrast, retail advertising tends to be more in the type of media as newspapers (especially classified ads), some spot radio, and the yellow pages. Lastly, LNA reports advertisements only of $100 or more, which would eliminate some retail-type advertising.

I compiled the 1982 LNA advertising set as follows. I assigned a 4-digit SIC industry to roughly 12,000 nonfood products on manufacturing. Some products were assigned easily while others required a call to the Census Bureau (SIC classification office) in Washington D.C. or calls/trips to local merchants to be able to assign the SIC code. When this was done, I sorted the products (on the computer) by the SIC industry and then added by the SIC industry to arrive at a clean, accurate data set. Dr. Rogers did the same for some 5,000 food products to complete the 1982 data set. Also, the 1967 LNA data set was compiled in a similar fashion by Robert Bailey of the FTC for the 6 media included in the 1982 LNA data set plus for spot radio.

The 1982 and 1967 LNA media categories are comparable except for newspaper. Bailey's 1967 data are more inclusive, covering both newspaper and newspaper supplement advertising, while the 1982 data include only the newspaper supplement advertising. Unfortunately, the two cannot be separated in Bailey's data. Consequently, the total advertising intensity measures used in this study will include TV (network and spot), network radio, magazine and outdoor advertising data. Excluding the newspaper advertising is most important for calculating the change in total advertising intensity. But, this exclusion has a small effect on total advertising intensity since newspaper supplement advertising accounted for 2% of the total LNA advertising for 1982 in my data set.

It should be noted that 985 out of some 17,000 products assigned to 4-digit SIC industries (less than 6%) were joint products whose descriptions fit into two or more different 4-digit SIC industries. For example, the product(s) advertised as Stanley tools in the LNA data book could possibly be classified into SIC 3423 (hand and edge tools) or SIC 3546 (power driven hand tools). For these joint products, their advertising was allocated to each industry they could possibly belong to, in proportion to the amount each industry advertises. Since industry 3546 advertises four times the amount of industry 3423, for the Stanley tools, 80 percent of the advertising went to 3546 and 20 percent to 3423.

In sum, because the LNA advertising data are aggregated by assigning each individual LNA product to a SIC industry and then, summing by the

SIC industries, the LNA advertising data sets better represent the amount of advertising expenditure by each SIC industry than any other advertising data available. In addition, it is more flexible than other advertising sources since any combinations of the 6 measured media can be used. For example, I will use, among other combinations for the advertising intensity variable, total advertising intensity (the 5 media, excluding newspaper supplements) and network TV advertising intensity. Lastly, it should be noted that any criticism of the LNA data also applies to the IO advertising data since the IO data are in large part obtained from the LNA advertising books.

The advertising variables used in the actual regression analysis will be advertising intensity, levels and change. Thus, the numerator (advertising expenditures) comes from the LNA data set, described above, and the denominator (value-of-shipments) comes from the <u>Census of Manufactures, Industry Statistics</u>, volume II.

Two more details about the advertising data will be covered before going to the empirical results in Chapter 5. First, since the early 1970s, two 4-digit industries no longer use TV advertising. Industry 2111 (cigarettes) was banned by law from the use of TV advertising in 1971 while industry 2085 (distilled liquors) voluntarily agreed not to advertise on TV or radio. Because this strongly affects the main independent variables, advertising intensity, these two industries will be dropped from the sample for the analysis. (The cigarettes industry was already dropped from the sample due to disclosure problems.)

Second, for three pairs of industries, I used the combined advertising intensity for each industry because in all cases these industries produce identical products. For example, 2011 is meat packing with animals killed in the plant while 2013 is meat packing with purchased animals (killed elsewhere). Since the products of 2011 and 2013 are identical, I assigned all meat packing advertising to both 2011 and 2013 and divided this by the value-of-shipments of 2011 plus 2013 to arrive at an advertising intensity figure to be used for both 2011 and 2013. A similar situation exists for flour (2041, 2045) and sugar (2062, 2063).

In summary, the LNA data are the most accurate source of advertising for studying the effect of national advertising on competition in the U.S. manufacturing sector. As Rogers (1982, p. 114) states, the data problem is too important to overlook:

> There are disagreements between the Input-Output and LNA data. These disagreements exist even for directly comparable media and, at times, the differences are substantial. Economists are often guilty of being over eager to use data that appear appropriate without first thoroughly examining the data quality. The profession seems more interested in debating model specification and other econometric questions. However, the data problem is as serious, if not more so, as the problems that now receive so much attention (e.g., simultaneity).

CHAPTER V. EMPIRICAL RESULTS

The previous four chapters have laid the groundwork for the empirical results reported below. Some descriptive statistics of advertising intensity and concentration change are first discussed, followed by the regression results of the concentration change model.

Descriptive Statistics of Advertising Intensity

It is instructive to first examine the percentage of the 1967 and 1982 LNA data on total advertising that comes from each type of LNA measured medium. As discussed in Chapter IV, the total advertising intensity variable (TOTAL) is comprised of the advertising intensities from network TV (NTV), spot TV (STV), network radio (NRAD), magazine (MAG), and outdoor (OUT). Also, because of their high correlation and common property of being electrical media, NTV, STV and NRAD are also grouped into electrical media (ELEC), while OUT and MAG are grouped as OM. As discussed in Chapter IV, newspaper advertising intensity was dropped for the analysis because the 1967 and 1982 newspaper advertising data are not comparable.

Table V.1 shows the different LNA advertising intensities as a percent of TOTAL. NTV grew from 37% of TOTAL in 1967 to 53% in 1982, and in both years is the single most important component of TOTAL. This is not surprising since network TV is hypothesized to be the most powerful type of national advertising. The importance of NTV is shown by the fact that unit cost for network TV advertising has risen faster than for any other medium between 1969-1976 (Levmore, 1978, p. 13). STV is the second

Table V.1. Different LNA advertising intensities as a percent of LNA total advertising intensity[a]

	1967	1982
NTV	37%	53%
STV	31%	25%
NRAD	2%	2%
ELEC	70%	80%
MAG	28%	20%
OUT	2%	0%
OM	30%	20%

[a]For all industries in the sample, n=269.

largest component of TOTAL in both 1967 and 1982 but fell from 31% of TOTAL in 1967 to 25% in 1982. NRAD stayed at 2% from 1967 to 1982, and the combined category, ELEC, clearly dominates TOTAL, accounting for 70% of TOTAL in 1967 and 80% in 1982. Lastly, OM (dominated by MAG) fell from 30% in 1967 to 20% in 1982. Hence, NTV and ELEC (the main component of ELEC is NTV) dominate the LNA advertising data, and grew in importance between 1967 and 1982.

Similar information to Table V.1 is in Table V.2, except the actual LNA advertising intensities are reported in percentage. From 1967 to 1982, TOTAL decreased slightly, from .60 to .59. NTV had a significant (at 0.10 level, two-tailed test) increase of .09, while MAG (and OM) had significant decreases.

Table V.3 reports the simple correlation coefficients of the five different LNA media advertising intensities for 1967 and 1982 to see how

Table V.2. LNA advertising intensities (advertising expenditures as a percent of value-of-shipments)[a]

	1967	1982	Change	T-statistics (2-tailed tests)[b]
TOTAL	.60	.59	-.01	-0.15
NTV	.22	.31	.09	1.89*
STV	.19	.15	-.04	-1.31
NRAD	.01	.01	.00	1.39
ELEC	.42	.47	.05	0.79
MAG	.17	.12	-.05	-3.03***
OUT	.01	.00	-.01	-0.55
OM	.18	.12	-.06	-3.08***

[a]For all industries in the sample, n=269.
[b]The t-tests are for significant changes between 1967 and 1982 advertising intensities.
*Designates the 0.10 level of significance.
***Designates the 0.01 level of significance.

strongly any two are related. Since ELEC dominates TOTAL and NTV and STV dominate ELEC, it is not surprising that TOTAL is highly correlated to NTV, STV and ELEC for 1967 and 1982. And, for both years, the three electronic media (NTV, STV, and NRAD) have fairly high correlations among themselves (.60 to .84). Consequently, the three are highly related and one alternative measure of advertising intensity is ELEC. NTV, STV, NRAD (and, therefore, ELEC) all have relative low correlations with MAG and OUT for both years (.04-.55), indicating MAG and OUT (or OM) are not closely related to ELEC. Therefore, based on these correlations and the national type advertising characteristics of electronic media, the main advertising intensity variables used on this study are TOTAL, ELEC and

Table V.3. Correlation coefficients of the different LNA media advertising intensity variables, for 1967 and 1982[a]

	NTV	STV	NRAD	ELEC	MAG	OUT	OM
				1967			
TOTAL	0.90	0.87	0.75	0.96	0.64	0.22	0.64
NTV	1.00	0.71	0.65	0.93	0.41	0.08	0.41
STV		1.00	0.82	0.92	0.34	0.26	0.35
NRAD			1.00	0.80	0.28	0.04	0.27
ELEC				1.00	0.41	0.17	0.41
MAG					1.00	0.18	0.99
OUT						1.00	0.23
				1982			
TOTAL	0.97	0.92	0.67	0.98	0.67	0.30	0.68
NTV	1.00	0.84	0.71	0.99	0.51	0.22	0.51
STV		1.00	0.60	0.92	0.55	0.34	0.57
NRAD			1.00	0.73	0.17	0.04	0.17
ELEC				1.00	0.53	0.26	0.54
MAG					1.00	0.25	0.99
OUT						1.00	0.34

[a]For all industries in the sample, n=269.

NTV. OM will also be tried in a regression equation, but a weak result is expected since it is a small percent of TOTAL and a weaker form of national advertising.

The last table of interest in this section on advertising intensity data is Table V.4, the simple correlation coefficients for the various advertising intensity variables to be used in the concentration change model. First, it should be noted that the correlations between the initial year's advertising intensity (1967) and the average of 1967 and 1982 advertising intensity for all variables is very high (.96 for TOTAL,

Table V.4. Correlation coefficients for the various advertising intensity variables to be used in the concentration change model[a,b]

	DTOTAL	TOTAL67	ANTV	DNTV	NTV67	AELEC	DELEC	ELEC67	AOM	DOM	OM67
ATOTLA	-.14	.96	.96	.34	.81	.98	.04	.89	.71	-.60	.72
DTOTAL	1.00	-.40	-.24	.80	-.59	-.21	.95	-.51	.13	.03	.10
TOTAL67		1.00	.95	.10	.90	.96	-.21	.96	.62	-.56	.64
ANTV			1.00	.22	.90	.97	-.09	.93	.55	-.48	.56
DNTV				1.00	-.22	.31	.86	0.00	.34	-.29	.34
NTV67					1.00	.84	-.47	.93	.40	-.35	.41
AELEC						1.00	-.06	.95	.54	-.50	.56
DELEC							1.00	-.38	.33	-.27	.34
ELEC67								1.00	.39	-.38	.41
AOM									1.00	-.69	.98
DOM										1.00	-.82

[a]For all industries in the sample, n=269.

[b]A before a variable means average, e.g. ATOTAL = Average advertising intensity for 1967 and 1982. D before a variable means change, e.g. DTOTAL = Advertising intensity for 1982 - Advertising intensity for 1967. After a variable, 67 means advertising intensity for 1967.

.90 for NTV, .95 for ELEC and .98 for OM). This indicates that similar regression results can be obtained from using either one. In past concentration change models with advertising intensity level as an independent variable, Ornstein and Lustgarten (1978) and Asch (1979) used initial advertising intensity, while Scherer (1979) used either mid-year or initial advertising intensity and Rogers (1982) used various years and averages of various years of advertising intensity. But both Ornstein and Lustgarten (1978, p. 230) and Rogers (1982, p. 118) point out that one year's data may not be an accurate representation of advertising intensity throughout the period, and that an average of two or more years of data is desirable. Consequently, most equations will be estimated using an average of 1967 and 1982 advertising intensity, though a few will be estimated for the 1967-1982 period with 1967 advertising intensity. However, as pointed out above, this distinction should not be critical for my study because of the very high correlations between the 1967 advertising intensity data and the average advertising intensity data.

Second, from Table V.4, it should be noted that the change and the average level of advertising intensity variables have very low correlations (-.14 for TOTAL, .22 for NTV, and -.06 for ELEC. Only OM has a relatively high correlation, -.69). In Chapter III, the rationale was given to why it is appropriate to have both level and change advertising intensity variables in a concentration change model. Multicollinearity between these two variables was a problem for Rogers' (1982) data set, but should not be a problem in this study due to the low correlations between level and change advertising intensity variables.

Lastly, in reference to Table V.4, it should be pointed out that average levels of TOTAL, ELEC and NTV are all highly correlated (.96-.98), as are the changes in TOTAL, ELEC and NTV (.80-.95). Therefore, it is expected that all three variables in the model (for level and change advertising intensity) will perform similarly, with the NTV having stronger coefficients as hypothesized in Chapter III.

Descriptive Statistics of Concentration Change

Table V.5a shows the average levels and changes of 4-firm concentration ratios (CR4) for all industries and consumer good and producer good industries. The average CR4 for the full sample (n=269) exhibited very little change between 1963 and 1982, increasing by 0.8 percentage points. Most of the increase occurred between 1963 and 1972 (0.7 increase) and very little change occurred since 1972. Hence, the average level of CR4 of 38.7 in 1963 and 39.5 in 1982 gives the impression of little change in the market structures and extent of competition in American manufacturing industries.

However, as was found by Mueller and Hamm, "the calm surface of average CR's conceals substantial undercurrents of change. Most importantly, consumer and producer good industries experience sharply contrasting patterns" (1974, p. 513). Whereas average CR4 in producer good industries have decreased some (-1.8) from 1963 to 1982, the consumer good industries have experienced a persistent and substantial upward trend. For the consumer good industry group, concentration

Table V.5a. Average levels and changes of CR4 for all industries and consumer good and producer good industries

	All industries in the sample	Consumer good industries	Producer good industries	T-statistics and levels of significance (2-tailed tests)[a]
	n=269	n=88	n=181	
Average Level:				
1963	38.7	37.0	39.6	0.94
1967	39.0	38.3	39.3	0.36
1972	39.4	40.6	38.8	-0.64
1977	39.4	40.9	38.7	-0.83
1982	39.5	42.9	37.8	-1.89*
Average Change:				
1963-82	0.8	5.9	-1.8	-5.71***
1967-82	0.5	4.6	-1.5	-4.89***
1963-72	0.7	3.6	-0.8	-5.06***
1972-82	0.1	2.3	-1.0	-3.35***
1963-67	0.3	1.3	-0.3	-2.97***
1967-72	0.4	2.3	-0.5	-3.79***
1972-77	0.0	0.3	-0.1	-0.72
1977-82	0.1	2.0	-0.9	-4.06***

[a]The t-tests are for significant differences between the consumer good and the producer good industries.

*Designates the 0.10 level of significance.

***Designates the 0.01 level of significance.

increased 1.3 for 1963-1967 and 2.3 for 1967-1972. The increase slowed down to 0.3 for 1972-1977, but increased by 2.0 points for 1977-1982. Similar differential patterns in average concentration change between consumer good and producer good industries have been noted by (in addition to Mueller and Hamm, 1974) Scherer (1979), Caves and Porter (1980), and Mueller and Rogers (1980, 1984).

It is interesting to note that for 1963-1982, 1967-1982 and all subperiods except 1972-1977, che t-statistics to test for differences in the change in CR4 between consumer good and producer good industries are significant at the 1% level (for 2-tailed tests). These significant differences can be attributed to differences between consumer and producer goods industries in the extent of advertising and other product differentiation barriers to entry. In the regression analysis section, a consumer good dummy variable and various advertising intensity variables will be included as independent variables to further explore this effect on concentration change.

Table V.5b presents all industries and consumer good and producer good industries that had an increase, decrease, or no change in average concentration. For all industries, it is found that roughly the same number (127) experienced increases in CR4 as experienced decreases (130); 12 industries had no concentration change.

For the industries with an increase in concentration, their average CR4 increased 8.5 points, from below the entire sample average in 1967 to above the entire sample average in 1982. Conversely, for the industries with a decrease in concentration, their average CR4 decreased 7.3 points,

Table V.5b. Industries with an increase, decrease, or no change in CR4 to accompany Table V.5a

	All industries in the sample	Consumer good industries	Producer good industries	T-statistics and levels of significance (2-tailed tests)[a]
	n=269	n=88	n=181	
Industries with an Increase in Concentration, 1967-82	n=127	n=53	n=74	
Average level, 1967	35.0	35.9	34.4	-0.40
Average level, 1982	43.5	46.7	41.2	-1.38
Average change, 1967-82	8.5	10.8	6.8	-3.11***
Industries with a Decrease in Concentration, 1967-82	n=130	n=32	n=98	
Average level, 1967	43.2	41.3	43.9	0.64
Average level, 1982	35.9	35.9	36.0	0.01
Average change, 1967-82	-7.3	-5.4	-7.9	-2.41**
Industries with No Change in Concentration, 1967-82	n=12	n=3	n=9	
Average level, 1967 and 1982	34.8	50.3	29.6	-1.26

[a]The t-tests are for significant differences between the consumer and the producer good industries.

**Designates the 0.05 level of significance.

***Designates the 0.01 level of significance.

from above the entire sample average in 1967 to below the entire sample average in 1982. For the 12 industries with no concentration change, their average remained at 34.8, below the entire sample average for 1967 (and 1982).

As might be expected for the consumer good industries, more increased in average CR4 (53) than decreased (32), while for the producer good industries, more decreased (98) than increased (74). Comparing the consumer good and producer good industries that experienced increases, the consumer goods industries started at a somewhat higher 1967 average CR4 and increased 10.8 points, while the producer good industries increased 6.8. This difference in the increase was significant at the 1% level (2-tailed test). Comparing the consumer good and producer good industries that had decreases, the producer good industries started at a higher 1967 average CR4 but decreased 7.9 points, while the consumer good industries decreased 5.4 points. This difference in the decrease was significant at the 5% level (2-tailed test). Also, for the 3 consumer good industries with no concentration change, their average CR4 remained at 50.3, while for the 9 producer good industries with no concentration change, the average CR4 remained at 29.6.

Table V.6 reports average levels and changes in CR4 for low (L), medium (M) and high (H) advertising intensity level categories. (This table is analogous to Table V.5a.) ATOTAL stands for the average LNA total advertising intensity levels of 1967 and 1982. Industries were classified as H if ATOTAL was >2%, M if 2% > ATOTAL > .25%, and L if ATOTAL was <.25.

Table V.6. Average levels and changes in CR4 according to LNA total advertising-to-sales ratio category (average of 1967 and 1982), for all industries

	High (ATOTAL ≥2%)	Medium (2%> ATOTAL >0.25%)	Low (ATOTAL ≤0.25%)	T-statistics and levels of significance (2-tailed tests)[a]		
				L/M	L/H	M/H
	n=27	n=46	n=196			
Average Level:						
1963	54.2	43.0	35.6	-2.21**	-4.37***	-2.22**
1967	54.4	43.8	35.7	-2.48**	-4.58***	-2.16**
1972	56.2	44.6	35.9	-2.68***	-5.00***	-2.33**
1977	57.6	44.3	35.8	-2.65***	-5.46***	-2.72***
1982	59.3	45.2	35.4	-3.06***	-6.01***	-2.75***
Average Change:						
1963-82	5.1	2.2	-0.2	-1.31	-2.34**	-1.05
1967-82	4.9	1.4	-0.3	-1.08	-2.49***	-1.31
1963-72	2.0	1.6	0.3	-1.12	-1.20	-0.27
1972-82	3.1	0.6	-0.5	-0.83	-2.19**	-1.25
1963-67	0.2	0.8	0.1	-0.88	-0.14	0.49
1967-72	1.8	0.8	0.2	-0.70	-1.30	-0.73
1972-77	1.4	-0.3	-0.1	0.20	-1.48	-1.26
1977-82	1.7	0.9	-0.4	-1.33	-1.67*	-0.60

[a]The t-tests are for significant differences between industries with different advertising-to-sales ratios (e.g., between low and medium advertising intensity and low and high advertising intensity and medium and high advertising intensity).

*Designates the 0.10 level of significance.

**Designates the 0.05 level of significance.

***Designates the 0.01 level of significance.

Upon examining the average level of CR4, L industries had the lowest CR4 (35.4 in 1982), followed by the M industries (45.2 in 1982), and H had the highest CR4 (59.3 in 1982). The differences between these average CR4s for all years between all 3 industry combinations (e.g. L/M, L/H, M/H) are significant at the 1% or 5% levels, for 2-tailed tests.

The pattern of average CR4 change between L, M and H is similar to what was found with respect to the consumer good and producer good industries. For 1963-1982, the H industries increased 5.1 points, while the M industries increased 2.2 points and the L industries decreased 0.2 points. These average CR4 changes were significantly different at the 1% or 5% levels between H and L for 1963-1982, 1967-1982, and 1972-1982. Since the H industries already had an average CR4 of 59.3 in 1982, future increases in these industries associated with advertising intensity may be less as this average CR4 becomes closer to 100, the upper limit on concentration ratios.

Table V.7 reports H, M, and L industries that had an increase, decrease, or no change in average concentration. (This table is analogous to Table V.5b.) For industries with an increase in concentration, the H industries started out in 1967 at the highest average CR4 and increased the most (11.3 points). The M industries' average 1967 CR4 was second highest and increased second most (9.1 points). Similarly, the L industries had the lowest average 1967 CR4 and the lowest increase (7.8 points). When testing for differences in means, the L versus M and L versus H 1967 and 1982 average levels of CR4 were

Table V.7. Industries with an increase, decrease, or no change in CR4 to accompany Table V.6a

	High (ATOTAL ⩾2%)	Medium (2%> ATOTAL >0.25%)	Low (ATOTAL ⩽0.25%)	T-statistics and levels of significance (2-tailed tests)[a]		
				L/M	L/H	M/H
	n=27	n=46	n=196			
Industries with an Increase in Concentration, 1967-82	n=17	n=22	n=88			
Average level, 1967	48.9	42.5	30.5	-2.68***	-3.67***	-0.93
Average level, 1982	60.2	51.6	38.3	-2.76***	-3.97***	-1.21
Average change, 1967-82	11.3	9.1	7.8	-0.85	-1.74*	-0.77
Industries with a Decrease in Concentration, 1967-82	n=9	n=21	n=100			
Average level, 1967	66.2	42.0	41.5	-0.11	-3.69***	-3.57***
Average level, 1982	59.2	35.4	34.0	-0.33	-4.11***	-3.49***
Average change, 1967-82	-7.0	-6.6	-7.5	-0.72	-0.25	0.21
Industries with No Change in Concentration, 1967-82	n=1	n=3	n=8			
Average level, 1967 and 1982	43.0	66.3	21.9	--	--	--

[a]The t-tests are for significant differences between industries with different advertising-to-sales ratios (e.g. between low and medium advertising intensity and low and high advertising intensity and medium and high advertising intensity).

*Designates the 0.10 level of significance.

***Designates the 0.01 level of significance.

significant at the 1% level (but not the average changes of CR4).

For industries with a decrease in concentration, the H industries started out with the highest average 1967 CR4 (66.2), followed by the M industries (42.0) and the L industries (41.5). But all 3 categories decreased by roughly the same amount (-6.6 to -7.5). When testing for differences in means, the L versus H and the M versus H 1967 and 1982 average levels of CR4 were significant at the 1% level (but no average changes of CR4 were significant).

As for the industries with no concentration change from 1967-1982, average CR4 was 43.0 for the H industries, 66.3 for the M industries and 21.9 for the L industries. However, the H and M categories have too few industries (1 and 3, respectively) to have much meaning. In the regression analysis section, various advertising variables will be used as independent variables to further explore their effects on concentration change.

Regression Results

The regression results reported here focus first on the 1967-1982 period because this coincides with the LNA advertising data, which are for 1967 and 1982. Later, some basic regression results are reported for 1963-1982 and for several subperiods. In order for the results to be more comparable between different periods, the basic sample of 269 industries is used in regressions throughout this study. First, the basic model is summarized below.

<u>The basic model</u>

$$\Delta CR = b_0 + b_1 ICR + b_2 S + b_3 G + b_4 RD + b_5 CONV + b_6 CONS + b_7 \text{Advertising Intensity} + e$$

where:

ΔCR: the 4-firm concentration ratio of the ending year of analysis minus the concentration ratio of the beginning year of analysis.

ICR: the 4-firm concentration ratio of the beginning year of analysis.

S: the natural logarithm of the initial year's value-of-shipments.

G: the period's ending value-added divided by its initial value added, where the value-added figures are adjusted for inflation by the producer price index.

RD: a dummy variable equal to one (and zero otherwise) for all industries who belong to a 2-digit group that has a research-to-sales ratio of 1% or more.

CONV: a dummy variable equal to one (and zero otherwise) for all industries classified as convenience goods.

CONS: a dummy variable equal to one (and zero otherwise) for all industries classified as consumer goods.

Advertising Intensity: advertising-to-sales ratio measured as a percent, in the following ways:

TOTAL: total available LNA advertising intensity.

NTV: advertising intensity from network TV.

ELEC: advertising intensity from network and spot TV plus network radio.

OM: advertising intensity from outdoor and magazines.

e: error term.

Note that for the various advertising intensity variables, an A before a variable means the average of 1982 and 1967 and a D before a variable means the difference between 1982 and 1967, while a 67 (82) after a variable means advertising intensity for 1967 (1982). For example, TOTAL67 means TOTAL for 1967. Thus, ATOTAL = (TOTAL82 + TOTAL67)/2 and DTOTAL = TOTAL82 - TOTAL67. Also, a 2 superscript on a variable means that the variable is squared (e.g. $ATOTAL^2$ = ATOTAL x ATOTAL).

Lastly, the expected signs of the coefficients of the independent variables are (as discussed in Chapter IV):

$b_1 < 0$
$b_2 < 0$
b_3 uncertain
b_4 uncertain
$b_5 > 0$
$b_6 > 0$
$b_7 > 0$

Correlation coefficients of variables for 1967-1982

Table V.8 presents the simple correlation coefficients for the variables used in the 1967-1982 concentration change model. In the first row are the correlations between the dependent variable (concentration change) and an array of independent variables. ICR, S, G and RD all show a negative relationship, while CONV, CONS, and all advertising intensities except DOM show a positive relationship. This is in accordance with the expected signs of the independent variable coefficients. The only exception is the negative, but small correlation between concentration change and DOM. But this is not surprising since OM is a small percentage of TOTAL and is hypothesized to have a weaker effect than other LNA media on

Table V.8. Correlation coefficients for the variables used in the 1967-1982 concentration change model[a]

	ICR	S67	G8267	RD	CONV	CONS	ATOTAL	DTOTAL	ANTV	DNTV	AELEC	DELEC	AOM	DOM
ΔCR4	-.22	-.14	-.18	-.34	.11	.29	.08	.12	.05	.15	.08	.12	.07	-.02
ICR	1.00	-.13	.06	.25	.08	-.02	.27	.00	.27	.12	.26	.04	.20	-.15
S67		1.00	.02	.03	.26	.03	.04	-.13	.08	-.08	.08	-.12	-.08	-.02
G8267			1.00	.14	.19	.01	.14	-.02	.11	.07	.13	.05	.12	-.22
RD				1.00	-.24	-.33	-.02	.03	.00	.00	-.04	.04	.03	-.03
CONV					1.00	.47	.50	-.27	.48	.02	.53	-.18	.21	-.26
CONS						1.00	.44	.02	.38	.15	.40	.07	.42	-.19
ATOTAL							1.00	-.14	.96	.34	.98	.04	.71	-.60
DTOTAL								1.00	-.24	.80	-.21	.95	.13	.03
ANTV									1.00	.22	.97	-.09	.55	-.48
DNTV										1.00	.31	.85	.34	-.29
AELEC											1.00	.06	.54	-.50
DELEC												1.00	.33	-.27
AOM													1.00	-.69

[a]For all industries in the sample, n = 269.

concentration change.

ICR, S and G all have relatively low correlation coefficients among themselves and other independent variables, implying that multicollinearity among ICR, S and G and with other independent variables should not be a problem. In particular, the correlation between S and G is only .02. In past concentration change models, the possible multicollinearity between S and G has been a concern (Rogers, 1982, p. 129).

RD has very low correlations with the other independent variables except for CONV and CONS, which are still relatively low (-.24 and -.33, respectively). Thus, multicollinearity should also not be a problem for RD.

As discussed in the previous section, the correlations between the level and changes of advertising are very small, indicating that both the level and change form of advertising intensity variables can be used together without multicollinearity problems.

Lastly, with respect to Table V.8, it should be noted that there does exist a multicollinearity problem between CONV, CONS and levels of advertising intensities (e.g. ATOTAL, AELEC, and ANTV). Pindyck and Rubinfeld (1981, p. 89) state that "multicollinearity is likely to be a problem if the simple correlation between two variables is larger than the correlation of either or both variables with the dependent variable." This is the case here. The correlation between CONV and CONS equals .47, while the correlation is .11 between ΔCR and CONV and .29 between ΔCR and CONS. Similar correlations exist between CONV, ATOTAL (or AELEC or ANTV) and ΔCR and between CONS, ATOTAL (or AELEC or ANTV) and ΔCR. This multicollinearity problem is of no surprise since the convenience good industries are a subset of the consumer good industries, and it is the consumer good industries that do the vast majority of the advertising. Hence, regressions will be reported using advertising intensity with and without CONV or CONS.

CONS is designed to detect some non-advertising created product differentiation effects on concentration change, but it also detects the advertising created product differentiation effects on concentration change (e.g., the source of the multicollinearity problem). In his study, Scherer (1979, p. 192, footnote 3) found "considerable collinearity between the two variables." Therefore, positive and significant coefficients of advertising intensity levels with a consumer dummy variable included would yield stronger evidence to advertising intensity levels increasing concentration. However, a positive and significant coefficient for advertising intensity levels that becomes insignificant with CONS added could be due to multicollinearity and does not necessarily invalidate advertising intensity levels as a significant variable.

Regression results for 1967-1982

The findings of the multiple regression analyses are in general agreement with the descriptive statistics on concentration change and the simple correlations presented in Table V.8. The first four regresions are reported in Table V.9.

Table V.9. Regression results for 1967-1982. The dependent variable is ΔCR (4-firm), with various specifications[a,b]

Variable	Equation 1	Equation 2	Equation 3	Equation 4
Constant	19.69	15.84	17.05	16.81
ICR	-.09 (-3.23)***	-.09 (-3.12)***	-.09 (-3.23)***	-.09 (-3.13)***
S	-1.82 (-3.31)***	-1.50 (-2.93***)	-1.66 (-3.06)***	-1.35 (-2.56)***
G	-2.51 (-2.77)***	-2.19 (-2.52)**	-2.38 (-2.66)***	-2.20 (-2.42)**
RD	-4.49 (-3.63)***	-3.87 (-3.17)***	-3.65 (-2.93)***	-5.40 (-4.59)***
CONV	4.60 (2.45)***		1.81 (.89)	
CONS		4.84 (3.92)***	4.32 (3.17)***	
AOM				2.71 (1.41)*
DOM				-.40 (-.12)
R^2	.19	.22	.22	.18

[a]T-ratios are in parentheses.
[b]Significance levels (all but RD and G) are 1-tailed tests.
*Designates the 0.10 level of significance.
**Designates the 0.05 level of significance.
***Designates the 0.01 level of significance.

In equations 1-4, the ICR coefficients are consistently their hypothesized sign (-.09 in equations 1-4) and significant at the 1% level. Hence, ICR is found to have a negative influence on concentration change. Also, S, as expected, was negative (-1.35 to -1.82 in equations 1-4) and significant at the 1% level. Consequently, it appears that industry size, <u>ceteris paribus</u>, leads to a decrease in concentration as larger size allows for the existence of more optimal-sized firms. While no sign was predicted for the coefficients of G and RD, both are negative and significant at the 1% level in the first 4 regressions (except in equation 4 where G is significant at the 5% level). Hence, for this sample, G (-2.19 to -2.51 in equations 1-4) appears to have a negative effect on concentration change as growth increases entry of the number of firms in the industry and/or growth of small firms in industries is greater than it is for larger firms. And RD (-3.65 to -5.40 in equations 1-4) appears to have a deconcentrating effect as research and development spending facilitates entry if there is easy imitation and/or because smaller firms may make more efficient use of their R&D funds.

In fact, in the remaining regression equations for 1967-1982 and 1963-1982 (see Tables V.9-V.14), ICR, S, G and RD all remain negative and significant at the 1% level. And the values of their coefficients remain consistent within the ranges of their coefficients in Table V.9. Hence, these four variables prove to be consistent and very significant determinants of concentration change. (As pointed out in Table V.8, the simple correlations among ICR, S, G and RD and with other independent variables are small, implying that the significant relationships between these variables and concentration change are not hidden because of multicollinearity problems.) The rest of the regression analysis for 1967-1982 and 1963-1982 focuses on the positive determinants of concentration change, CONV, CONS and advertising intensity.

As discussed in reference to Table V.8, there is considerable multicollinearity between CONV, CONS and the various advertising intensity level variables. Consequently, Tables V.9-V.13 report regression results for 1967-1982 with ICR, S, G and RD included in all equations but alternative specifications for the CONV, CONS and advertising intensity variables.

Equation 1 in Table V.9 shows that CONV (used without CONS or any advertising intensity variables) has a positive coefficient that is significant at the 1% level. Thus, this finding is consistent with the hypothesis (as discussed in Chapter III), that advertising is more effective in increasing concentration in the convenience goods industries. Equation 2 in Table V.9 shows that CONS (without CONV or advertising intensity variables included) also has a positive and very significant effect on concentration change, implying a product differentiation barrier to entry exists in consumer good industries. In equation 3, CONV and CONS are used together without any advertising intensity variables. The CONS coefficient dominates and remains strong (4.32) and significant at the 1% level, as CONV becomes insignificant. But, this is not unexpected because of the multicollinearity problems between CONV and CONS. Lastly, in Table V.9 equation 4 reports the results of using AOM and DOM (outdoor and magazine advertising). AOM is positive but significant only at the 10% level, while DOM is highly insignificant. This weak result was expected because OM is a small percentage of total advertising intensity and also is not as characteristic of national advertising as is electric advertising. OM was tried for completeness, but because of the weak results, even without CONV and CONS included in the regression equation, OM will be dropped from the rest of the regression analysis. The remainder of the analysis will focus on TOTAL, ELEC and NTV.

Table V.10 reports the regression results for TOTAL, ELEC and NTV, with the average advertising intensity level variables in both linear and quadratic form. CONV and CONS are excluded in Tables V.10 and V.11, but either CONV or CONS is included with the advertising intensity level variables in Table V.12 and both CONV and CONS are included with the advertising intensity level variables in Table V.13.

For Table V.10, TOTAL is included in equations 1 and 2, ELEC in equations 3 and 4, and NTV in equations 5 and 6, where the first of each set of equations reports average advertising intensity levels in linear form and the second reports average advertising intensity levels in quadratic form. The linear and quadratic equations are presented side-by-side for easy comparison. The reasoning for testing a quadratic function is that in some industries (as in moderately high oligopoly), firms may advertise beyond the optimal amount (see Chapter II). Also, each equation includes the average level (e.g., ATOTAL) and the change (e.g., DTOTAL) of advertising intensity. (For this rationale, see Chapter III.) Multicollinearity between the level and change advertising

Table V.10. Regression results for 1967-1982. The dependent variable is ΔCR (4-firm). Average advertising intensity level variables in linear and quadratic form are used, excluding CONV, CONS[a,b]

Variable	Equation 1	Equation 2	Equation 3
Constant	17.33	17.82	17.79
ICR	-.10 (-3.56)***	-.12 (-3.95)***	-.10 (-3.56)***
S	-1.38 (-2.65)***	-1.47 (-2.84)***	-1.43 (-2.75)***
G	-2.32 (-2.63)***	-2.46 (-2.81)***	-2.40 (-2.72)***
RD	-5.16 (-4.42)***	-4.71 (-4.02)***	-5.13 (-4.39)***
ATOTAL	1.12 (3.07)***	2.96 (3.39)***	
ATOTAL2		-.20 (-2.32)**	
DTOTAL	1.37 (2.27)**	1.15 (1.91)**	
AELEC			1.20 (2.79)***
AELEC2			
DELEC			1.39 (2.39)***
ANTV			
ANTV2			
DNTV			
R^2	.21	.23	.21

[a]T-ratios are in parentheses.
[b]Significance levels (all but RD and G) are 1-tailed tests.
**Designates the 0.05 level of significance.
***Designates the 0.01 level of significance.

Table V.10. (Continued)

Variable	Equation 4	Equation 5	Equation 6
Constant	18.65	17.70	18.26
ICR	-.11 (-3.83)***	-.10 (-3.53)***	-.11 (-3.93)***
S	-1.58 (-3.02)***	-1.42 (-2.73)***	-1.51 (-2.91)***
G	-2.56 (-2.92)***	-2.32 (-2.62)***	-2.38 (-2.73)***
RD	-4.83 (-4.13)***	-5.17 (-4.44)***	-4.82 (-4.14)***
ATOTAL			
ATOTAL2			
DTOTAL			
AELEC	3.28 (3.12)***		
AELEC2	-.25 (-2.16)**		
DELEC	1.09 (1.84)**		
ANTV		1.27 (1.76)**	4.95 (2.77)***
ANTV2			-.72 (-2.25)**
DNTV		2.11 (2.69)***	1.60 (1.97)**
R^2	.22	.21	.22

variables should not be a problem, due to the low simple correlations between them (see Table V.8).

The results of Table V.10 show very strong support that both level and change of advertising intensity have a positive effect on concentration change. In equation 1, the coefficient of ATOTAL is 1.12 (significant at the 1% level), and DTOTAL is 1.37 (significant at the 5% level). The quadratic form in equation 2 increases substantially the ATOTAL coefficient (from 1.12 to 2.96) and raises the t-statistic a little but somewhat lowers the coefficient and t-statistic for DTOTAL. The quadratic ATOTAL coefficient ($ATOTAL^2$) equals -.20 and is significant at the 5% level. Therefore, in equation 2, ATOTAL and $ATOTAL^2$ together have a positive effect on concentration change that increases at a decreasing rate until ATOTAL = 7.4%. (This is derived by taking the partial derivative of ΔCR with respect to ATOTAL.) After ATOTAL surpasses 7.4%, ATOTAL still has a positive effect on concentration change, but at a decreasing rate until ATOTAL = 14.8%. Since no industries in the sample have an ATOTAL > 14.8%, and only 4 industries (out of 269) have an ATOTAL > 7.4%, these coefficients are reasonable. Because the quadratic equation fits well, it appears that ATOTAL increases concentration, but at a decreasing rate. (The R^2 also is .02 higher in equation 2 than in equation 1.) Equations 3 and 4 for ELEC and 5 and 6 for NTV are analogous to equations 1 and 2 for TOTAL in Table V.10. Likewise, for ELEC and NTV, the average level variables (linear and quadratic) and difference variables are all positive and significant, mainly at the 1% level (a couple at the 5% level). For both DELEC and

DNTV, their coefficients decrease some and they lose significance from the 1% to the 5% level in moving to the quadratic form. But ANTV increases in significance (5% to 1% level) in moving to the quadratic form. Overall, in comparison, the linear and quadratic specifications both work well, although the quadratic appears to have a better fit (slightly higher R^2) and is more interesting. The quadratic function also seems to more realistically explain how advertising intensity levels affect concentration change (e.g., increasing concentration, but at a decreasing rate for the relevant levels of advertising intensity in the data set).

Lastly, with respect to Table V.10, it is interesting to compare the size of the coefficients for TOTAL, ELEC and NTV. In the linear specified equations (1, 3, 5), NTV has larger coefficients than TOTAL and ELEC for both average level and change. NTV also has a higher t-statistic than TOTAL and ELEC for the change variables, while TOTAL and ELEC have higher t-statistics than NTV for the average level variables. The TOTAL and ELEC coefficients and t-statistics are very similar. Hence, as hypothesized, it appears that NTV has a stronger effect on concentration change than TOTAL or ELEC. And, in linear form for TOTAL, ELEC and NTV, the change variable coefficients are larger than the level variable coefficients. Also in linear form, the t-statistic is larger for the change variable than the average level variable for NTV, but larger for the average level variable than the change variable for TOTAL and ELEC.

Table V.11 reports regression equations for TOTAL, ELEC and NTV in

Table V.11. Regression results for 1967-1982. The dependent variable is ΔCR (4-firm); 1967 advertising intensity level variables in quadratic form are used, excluding CONV, CONS[a,b]

Variable	Equation 1	Equation 2	Equation 3
Constant	17.63	18.49	17.98
ICR	-.11 (-3.82)***	-.11 (-3.76)***	-.11 (-3.75)***
S	-1.43 (-2.76)***	-1.56 (-2.98)***	-1.47 (-2.83)***
G	-2.46 (-2.80)***	-2.51 (-2.86)***	-2.30 (-2.63)***
RD	-4.81 (-4.09)***	-4.83 (-4.12)***	-4.94 (-4.22)***
TOTAL67	2.45 (3.07)***		
$TOTAL67^2$	-.13 (-1.88)**		
DTOTAL	1.72 (2.62)***		
ELEC67		3.09 (2.94)***	
$ELEC67^2$		-.20 (-1.96)**	
DELEC		1.90 (3.03)***	
NTV67			3.80 (2.10)**
$NTV67^2$			-.45 (-1.52)*
DNTV			2.62 (3.27)***
R^2	.22	.22	.22

[a]T-ratios are in parentheses.
[b]Significance levels (all but RD and G) are 1-tailed tests.
*Designates the 0.10 level of significance.
**Designates the 0.05 level of significance.
***Designates the 0.01 level of significance.

quadratic form using 1967 advertising intensity for the level variables. Arguments for using either 1967 or an average of 1967 and 1982 for advertising intensity levels are presented earlier in this chapter. The 1967 levels are used here for completeness but yield similar results to those corresponding equations in Table V.10. This is expected because of the high correlations between ATOTAL and TOTAL67, and AELEC and ELEC67 and ANTV and NTV67 (see Table V.8).

Table V.12 shows how the regression results of Table V.10 will change when either CONV or CONS are added. As discussed earlier in reference to Table V.8 (the correlation matrix), positive and significant advertising intensity level coefficients with CONV or CONS added would yield stronger evidence that advertising intensity levels have a positive effect on concentration charge. However, a positive and significant coefficient for advertising intensity levels that becomes insignificant with CONV or CONS added could be due to multicollinearity and does not necessarily invalidate advertising intensity level as a significant determinant of concentration change.

The first 3 equations report TOTAL, ELEC and NTV in quadratic form with CONV included. The advertising intensity level variables dominate CONV, as CONV becomes mainly insignificant. However, the change and levels forms of TOTAL, ELEC and NTV remain significant at the 5% or 1% levels. Again, NTV has larger coefficients for change and level than do TOTAL and ELEC.

Equations 4-6 report TOTAL, ELEC, and NTV in quadratic form with CONS included. In equations 4 and 5, both CONS and TOTAL (or ELEC) in

Table V.12. Regression results for 1967-1982. The dependent variable is ΔCR (4-firm). Average advertising intensity level variables in linear and quadratic form are used, including CONV or CONS[a,b]

Variable	Equation 1	Equation 2	Equation 3
Constant	18.88	19.47	19.47
ICR	-.12 (-3.96)***	-.11 (-3.84)***	-.12 (-3.97)***
S	-1.64 (-3.05)***	-1.71 (-3.17)***	-1.71 (-3.17)***
G	-2.65 (-2.98)***	-2.74 (-3.06)***	-2.65 (-2.97)***
RD	-4.33 (-3.55)***	-4.48 (-3.68)***	-4.32 (-3.54)***
CONV	2.59 (1.15)	2.35 (1.00)	2.90 (1.34)*
CONS			
ATOTAL	2.41 (2.43)***		
$ATOTAL^2$	-.17 (-1.81)**		
DTOTAL	1.34 (2.14)**		
AELEC		2.61 (2.10)**	
$AELEC^2$		-.20 (-1.61)*	
DELEC		1.25 (2.04)**	
ANTV			3.82 (1.94)**
$ANTV^2$			-.60 (-1.81)**
DNTV			1.80 (2.19)**
R^2	.23	.23	.23

[a]T-ratios are in parentheses.
[b]Significance levels (all but RD and G) are 1-tailed tests.
*Designates the 0.10 level of significance.
**Designates the 0.05 level of significance.
***Designates the 0.01 level of significance.

Table V.12. (Continued)

Variable	Equation 4	Equation 5	Equation 6
Constant	16.55	17.09	16.67
ICR	-.11 (-3.60)***	-.10 (-3.59)***	-.11 (-3.63)***
S	-1.47 (-2.85)***	-1.54 (-2.97)***	-1.49 (-2.91)***
G	-2.40 (-2.75)***	-2.50 (-2.87)***	-2.39 (-2.78)***
RD	-4.04 (-3.32)***	-4.04 (-3.32)***	-3.91 (-3.23)***
CONV			
CONS	2.97 (1.95)**	3.19 (2.21)**	3.47 (2.46)***
ATOTAL	1.85 (1.78)**		
$ATOTAL^2$	-.12 (-1.31)*		
DTOTAL	1.08 (1.80)**		
AELEC		2.02 (1.70)**	
$AELEC^2$		-.15 (-1.24)	
DELEC		1.02 (1.74)**	
ANTV			2.82 (1.43)*
$ANTV^2$			-.45 (-1.34)*
DNTV			1.62 (2.02)**
R^2	.24	.24	.24

Table V.12. (Continued)

Variable	Equation 7	Equation 8	Equation 9
Constant	15.95	16.31	16.08
ICR	-.10 (-3.38)***	-.10 (-3.43)***	-.10 (-3.41)***
S	-1.42 (-2.76)***	-1.46 (-2.83)***	-1.44 (-2.81)***
G	-2.31 (-2.65)***	-2.40 (-2.77)***	-2.35 (-2.72)***
RD	-4.08 (-3.35)***	-4.03 (-3.31)***	-3.94 (-3.25)***
CONV			
CONS	3.80 (2.74)***	3.83 (2.84)***	4.09 (3.06)***
ATOTAL	.60 (1.47)*		
DTOTAL	1.71 (1.96)**		
AELEC		.66 (1.42)*	
DELEC		1.17 (2.02)**	
ANTV			.38 (.50)
DNTV			1.91 (2.46)***
R^2	.23	.23	.24

both level and change forms are positive and remain significant at the 5% level. In equation 6, CONS remains significant at the 1% level while the significance of the coefficient of ANTV drops to the 10% level and DNTV remains significant at the 5% level. Therefore, both the level and change forms of advertising intensity (except for ANTV) remain very significant even with CONS included as another independent variable. This provides stronger evidence that advertising intensity (level and change) has led to higher concentration in the 1967-1982 period for U.S. manufacturing industries.

Equations 7-9 report TOTAL, ELEC and NTV in linear form with CONS included. Because the linear model does not fit the data as well as the quadratic model, and also due to the multicollinearity between advertising intensity level and CONS, the advertising intensity level variables are dominated by the CONS, as CONS remains significant at the 1% level in equations 7-9, but ATOTAL and AELEC fall to the 10% level of significance and ANTV is not significant at all. But, DTOTAL, DELEC, and DNTV are all significant at the 1% or 5% levels.

Table V.13 reports TOTAL, ELEC, and NTV in quadratic form with both CONV and CONS included. As expected, the t-statistics for CONV, CONS and advertising intensity level are weakened because of multicollinearity between CONV, CONS and advertising intensity level. CONV is insignificant but CONS is still significant at the 5% level. ATOTAL and AELEC fall in significance to the 10% level while ANTV is not significant at all. However, because of the low multicollinearity between CONV, CONS and the advertising intensity level variables with the

Table V.13. Regression results for 1967-1982. The dependent variable is ΔCR (4-firm). Average advertising intensity level variables in quadratic form are used, including CONV and CONS together[a,b]

Variable	Equation 1	Equation 2	Equation 3
Constant	17.63	17.63	17.50
ICR	-.10	-.10	-.10
	(-3.62)***	(-3.60)***	(-3.66)***
S	-1.59	-1.62	-1.61
	(-2.95)***	(-3.01)***	(-3.00)***
G	-2.54	-2.60	-2.55
	(-2.85)***	(-2.92)***	(-2.87)***
RD	-3.83	-3.88	-3.70
	(-3.07)***	(-3.11)***	(-2.97)***
CONV	1.79	1.32	1.67
	(.77)	(.55)	(.75)
CONS	2.73	3.01	3.19
	(1.76)**	(2.04)**	(2.18)**
ATOTAL	1.57		
	(1.42)*		
$ATOTAL^2$	-.11		
	(-1.09)		
DTOTAL	1.22		
	(1.94)**		
AELEC		1.71	
		(1.30)*	
$AELEC^2$		-.13	
		(-1.01)	
DELEC		1.11	
		(1.82)**	
ANTV			2.34
			(1.13)
$ANTV^2$			-.40
			(-1.18)
DNTV			1.74
			(2.12)**
R^2	.24	.24	.24

[a]T-ratios are in parentheses.
[b]Significance levels (all but RD and G) are 1-tailed tests.
*Designates the 0.10 level of significance.
**Designates the 0.05 level of significance.
***Designates the 0.01 level of significance.

advertising intensity change variables, DTOTAL, DELEC, and DNTV all remained significant at the 5% level.

In sum, for the 1967-1982 period, DTOTAL, DELEC and DNTV are always positive and significant at the 1% or 5% level, regardless of the model or specification. CONV, CONS, ATOTAL, AELEC and ANTV are all positive and highly significant by themselves. But probably due to multicollinearity, these t-statistics are weakened when used together. Yet, when ATOTAL, AELEC or ANTV are used with CONS in a quadratic form, ATOTAL and AELEC remain significant at the 5% level (ANTV drops to the 10% level). Consequently, these results show that both the change and level advertising intensity variables have a significant positive effect on concentration change, with the NTV coefficients usually being higher. Thus, it appears that network TV advertising is the medium with the strongest effect on concentration change.

Regression results for 1963-1982

Nine regression equations for 1963-1982 are presented in Table V.14. Equations 1-3 report the average TOTAL, ELEC and NTV levels in quadratic form without CONV or CONS. As before, the coefficients of the ATOTAL, AELEC and ANTV variables are significant, and the t-statistics are quite high for both the average level and average level squared terms. The coefficients are also quite large, especially for NTV (ANTV = 6.23, $ANTV^2$ = -.91). Hence, the level of advertising intensity has a positive effect on concentration change for 1963-1982, as was found for the 1967-1982 period.

Table V.14. Regression results for 1963-1982. The dependent variable is ΔCR (4-firm). Average advertising intensity level variables in quadratic form are used, including CONS in equations 4, 5 and 6[a,b]

Variable	Equation 1	Equation 2	Equation 3
Constant	21.15	22.17	21.55
ICR	-.16 (-5.30)***	-.15 (-5.10)***	-.16 (-5.22)***
S	-1.74 (-3.06)***	-1.88 (-3.26)***	-1.75 (-3.06)***
G	-2.09 (-3.49)***	-2.14 (-3.56)***	-2.05 (-3.41)***
RD	-4.80 (-3.78)***	-5.00 (-3.94)***	-5.02 (-3.96)***
ATOTAL	3.78 (4.09)***		
$ATOTAL^2$	-.28 (-3.07)***		
DTOTAL	.70 (1.08)		
AELEC		4.07 (3.63)***	
$AELEC^2$		-.33 (-2.70)***	
DELEC		.55 (.86)	
ANTV			6.23 (3.27)***
$ANTV^2$			-.91 (-2.65)***
DNTV			1.01 (1.16)
R^2	.27	.27	.26

[a]T-ratios are in parentheses.

[b]Significance levels (all but RD and G) are 1-tailed tests.

***Designates the 0.01 level of significance.

Table V.14. (Continued)

Variable	Equation 4	Equation 5	Equation 6
Constant	19.37	19.88	19.32
ICR	-.14 (-4.76)***	-.14 (-4.70)***	-.14 (-4.75)***
S	-1.75 (-3.10)***	-1.84 (-3.23)***	-1.74 (-3.09)***
G	-2.01 (-3.38)***	-2.05 (-3.43)***	-2.00 (-3.38)***
RD	-3.93 (-3.01)***	-3.95 (-3.02)***	-3.86 (-2.96)***
CONS	4.09 (2.51)***	4.47 (2.88)***	4.70 (3.10)***
ATOTAL	2.25 (2.05)**		
$ATOTAL^2$	-.18 (-1.77)**		
DTOTAL	.60 (.93)		
AELEC		2.28 (1.81)**	
$AELEC^2$		-.20 (-1.50)*	
DELEC		.45 (.70)	
ANTV			3.30 (1.57)*
$ANTV^2$			-.54 (-1.51)*
DNTV			1.02 (1.19)
R^2	.29	.29	.29

*Designates the 0.10 level of significance.

**Designates the 0.05 level of significance.

Table V.14. (Continued)

Variable	Equation 7	Equation 8	Equation 9
Constant	20.68	21.16	21.00
ICR	-.15 (-4.82)***	-.15 (-4.80)***	-.14 (-4.78)***
S	-1.61 (-2.80)***	-1.68 (-2.90)***	-1.65 (-2.85)***
G	-2.03 (-3.33)***	-2.06 (-3.39)***	-2.03 (-3.33)***
RD	-5.39 (-4.23)***	-5.35 (-4.19)***	-5.43 (-4.27)***
ATOTAL	1.20 (3.07)***		
DTOTAL	1.01 (1.55)*		
AELEC		1.31 (2.84)***	
DELEC		.95 (1.52)*	
ANTV			1.61 (2.07)**
DNTV			1.65 (1.94)**
R^2	.25	.24	.25

However, the difference variables (DTOTAL, DELEC, DNTV) all fail to be significant in equations 1-9. (In all the equations for 1967-1982 presented earlier, DTOTAL, DELEC and DNTV were always significant at the 1% or the 5% level.) The reason for this difference in findings is not clear. The simple correlation coefficients for 1963-1982 (similar to Table V.8 for 1967-1982) were checked, but nothing that could explain this change was detected. However, two points can be stated. First, the change variables are for 1967-1982 (due to the available data) and thus do not coincide with the concentration change period, 1963-1982. Second, periods that begin in 1963 seem to be atypical periods of concentration change. In fact, the poor results from Input Output advertising intensity data used in several of the earlier concentration change studies (Ornstein and Lustgarten, 1978; Asch, 1979; Scherer, 1979; Levy, 1985) occur for periods starting in 1963. When Mueller and Rogers (1984) divided the concentration change period that they tested into 2 subperiods, 1947-1963 and 1963-1977, the 1963-1977 results were weaker. However, with 3 subperiods (1947-1958, 1958-1967, and 1967-1977), the 1958-1967 and 1967-1977 periods had similar results. Mueller and Rogers (1984, p. 11) state 2 possible reasons for 1963 being an atypical year:

> Again we see the weakest results are from periods that begin in 1963. Perhaps either a very short-run equilibrium between advertising and concentration change was reached around 1963 or, alternatively, the period has a few too many unpredicted concentration changes that prevent the results from reaching conventional significance levels. In any event, the significant concentrating effect of advertising continued beyond 1963 with the 1967-77 period displaying values with equal magnitude to that for the 1958-67 period.

Equations 4-6 in Table V.14 report the average TOTAL, ELEC, and NTV levels in quadratic form with CONS included. CONS is consistently positive and significant at the 1% level. DTOTAL, DELEC and DNTV all remain insignificant. ATOTAL, $ATOTAL^2$ and AELEC are all significant at the 5% level and $AELEC^2$, ANTV and $ANTV^2$ all are significant at the 10% level. Thus, even with the multicollinearity present due to including CONS with advertising intensity level variables, the average advertising intensity levels remain somewhat significant.

For completeness, equations 7-9 in Table V.14 report the average TOTAL, ELEC and NTV levels in linear form, excluding CONS. Here, ATOTAL and AELEC are significant at the 1% level and ANTV is significant at the 5% level, while DTOTAL and DELEC are significant at the 10% level and DNTV is significant at the 5% level. Therefore, the quadratic and linear models perform similarly for 1963-1982. The quadratic model yields a higher R^2 value and slightly more significant coefficients for the advertising intensity level variables, but the linear model produces more significant coefficients for the advertising intensity change variables.

Regression results for 1963-1972 and 1972-1982

Results for 10- and 5-year subperiods are presented to see how the independent variables (especially the advertising intensity variables) vary between and among subperiods. Because the results of TOTAL and ELEC have been similar for 1967-1982 and 1963-1982, only TOTAL and NTV will be reported for subperiod analysis. And, the advertising intensity change variables will be dropped because the available data (change of 1967 to 1982) do not correspond to any of the subperiods. Also, concentration changes slowly; hence, the independent variables (as the determinates of concentration change) will tend to have smaller coefficients and t-statistics. Because of this, coupled with the multicollinearity between CONV, CONS and advertising intensity levels, CONV and CONS will be excluded in the subperiod analysis.

Mueller and Rogers (1984, p. 9) give the following caution about examining such short periods:

> Since structural change is seldom rapid, we hesitate to examine such short periods of time. The results are likely to be unstable and lacking much explanatory power. However, with this caution in mind we proceeded in hopes that the results would help us trace the adjustment process (if any) over the longer time period.

In Table V.15, equations 1-4 report average and 1967 advertising intensity levels in quadratic form for 1963-1972 and equations 5 and 6 report average advertising intensity levels in quadratic form for 1972-1982. In all 6 equations, ICR and RD remain negative and significant at the 1% level. RD continues to be highly significant and has relatively large coefficients (-2.66 to -2.99). S also remains consistently negative at the 1% or 5% level for 1963-1972 and at the 1% level in 1972-1982. G remains negative but is insignificant.

The significance of the advertising intensity variables varies. In equation 1, ATOTAL and $ATOTAL^2$ are significant at the 1% level, while TOTAL67 and $TOTAL67^2$ in equation 3 are significant at only the 10% level. This is somewhat surprising since the correlation between ATOTAL and TOTAL67 is .96. Similarly for network TV, ANTV in equation 2 has stronger results than NTV67 in equation 4, where the NTV67 coefficient is insignificant. Hence, the average advertising intensity level data show

Table V.15. Regression results for 1963-1972 and 1972-1982. The dependent variable is ΔCR (4-firm). Average and 1967 advertising intensity variables in quadratic form are used, excluding CONV and CONS[a,b]

	1963-1972			
Variable	Equation 1	Equation 2	Equation 3	Equation 4
Constant	10.97	10.94	10.83	10.79
ICR	-.08 (-3.83)***	-.07 (-3.58)***	-.07 (-3.54)***	-.07 (-3.45)***
S	-.92 (-2.42)***	-.90 (-2.32)**	-.90 (-2.32)**	-.90 (-2.32)**
G	-.70 (-.77)	-.64 (-.69)	-.63 (-.68)	-.51 (-.55)
RD	-2.66 (-3.07)***	-2.89 (-3.32)***	-2.86 (-3.26)***	-2.99 (-3.44)***
ATOTAL	1.85 (2.97)***			
$ATOTAL^2$	-.17 (-2.78)***			
TOTAL67			.92 (1.59)*	
$TOTAL67^2$			-.07 (-1.31)*	
ANTV		2.06 (1.68)**		
$ANTV^2$		-.32 (-1.41)*		
NTV67				1.48 (1.12)
$NTV67^2$				-.18 (-.83)
R^2	.15	.13	.13	.13

[a]T-ratios are in parentheses.
[b]Significance levels (all but RD and G) are 1-tailed tests.
*Designates the 0.10 level of significance.
**Designates the 0.05 level of significance.
***Designates the 0.01 level of significance.

Table V.15. (Continued)

Variable	1972-1982 Equation 5	1972-1982 Equation 6
Constant	12.29	12.41
ICR	-.09 (-3.57)***	-.09 (-3.66)***
S	-1.07 (-2.57)***	-1.09 (-2.62)***
G	-1.49 (-1.26)	-1.34 (-1.14)
RD	-2.73 (-2.83)***	-2.81 (-2.94)***
ATOTAL	2.10 (2.87)***	
$ATOTAL^2$	-.14 (-1.95)**	
TOTAL67		
$TOTAL67^2$		
ANTV		4.95 (3.53)***
$ANTV^2$		-.72 (-2.80)***
NTV67		
$NTV67^2$		
R^2	.13	.14

better results than the 1967 advertising intensity level for 1963-1972. But for 1967-1982 (see Tables V.10 and V.11), the two variables did perform similarly. The reason for the difference in results for these two variables for 1963-1972 is not clear.

Both ATOTAL and ANTV are highly significant in 1972-1982. In comparison, ATOTAL has similar results in 1963-1972, while ANTV has stronger results in 1972-1982. This is not surprising since network TV advertising probably is the strongest form of national advertising, has more advantages than any other medium for large advertisers, and this increasing importance of network TV advertising is reflected by the fact that its prices have increased recently more than the prices of other advertising media (Levmore, 1978, p. 13).

Regression results for 5-year subperiods of 1963-1982

Tables V.16-V.18 report the 5-year subperiod results. Since a 5-year period is a relatively short time span for industry structural change to occur, it is anticipated that the results in general will be weaker than those found when longer periods are examined.

Table V.16 reports the 1963-1967 results. ICR, S, G and RD all remain negative, but only ICR is significant (at the 1% level). As with the 1963-1972 period, the ATOTAL variable is quite significant and stronger than TOTAL67. Also, TOTAL (average or 1967) is more significant than NTV.

Table V.17 reports the 1967-1972 results. Here, S and RD are both negative and significant at the 1% level, while ICR is negative

Table V.16. Regression results for 1963-1967. The dependent variable is ΔCR (4-firm). Average and 1967 advertising intensity variables in quadratic form are used, excluding CONV and CONS[a,b]

Variable	Equation 1	Equation 2	Equation 3	Equation 4
Constant	5.32	5.50	5.42	5.62
ICR	-.06	-.06	-.06	-.06
	(-4.27)***	(-4.14)***	(-4.22)***	(-4.26)***
S	-.23	-.22	-.23	-.25
	(-.92)	(-.88)	(-.91)	(-1.01)
G	-1.33	-1.42	-1.36	-1.36
	(-1.32)	(-1.40)	(-1.35)	(-1.35)
RD	-.19	-.28	-.23	-.28
	(-.34)	(-.50)	(-.41)	(-.50)
ATOTAL	.94			
	(2.34)***			
$ATOTAL^2$	-.09			
	(-2.20)**			
TOTAL67			.62	
			(1.69)**	
$TOTAL67^2$			-.04	
			(-1.34)*	
ANTV		1.11		
		(1.41)*		
$ANTV^2$		-.16		
		(-1.12)		
NTV67				1.33
				(1.57)*
$NTV67^2$				-.15
				(-1.10)
R^2	.09	.08	.09	.09

[a]T-ratios are in parentheses.
[b]Significance levels (all but RD and G) are 1-tailed tests.
*Designates the 0.10 level of significance.
**Designates the 0.05 level of significance.
***Designates the 0.01 level of significance.

Table V.17. Regression results for 1967-1972. The dependent variable is ΔCR (4-firm). Average and 1967 advertising intensity variables in quadratic form are used, excluding CONV and CONS[a,b]

Variable	Equation 1	Equation 2	Equation 3	Equation 4
Constant	6.03	5.88	5.72	5.60
ICR	-.03	-.03	-.03	-.02
	(-1.72)**	(-1.55)*	(-1.42)*	(-1.33)*
S	-.78	-.76	-.75	-.74
	(-2.48)***	(-2.42)***	(-2.38)***	(-2.34)***
G	1.15	1.27	1.31	1.38
	(1.00)	(1.11)	(1.14)	(1.21)
RD	-2.36	-2.48	-2.52	-2.56
	(-3.33)***	(-3.51)***	(-3.53)***	(-3.62)***
ATOTAL	.87			
	(1.63)*			
$ATOTAL^2$	-.08			
	(-1.54)*			
TOTAL67			.24	
			(.50)	
$TOTAL67^2$			-.02	
			(-.43)	
ANTV		.91		
		(.89)		
$ANTV^2$		-.15		
		(-.78)		
NTV67				.21
				(.19)
$NTV67^2$				-.03
				(-.19)
R^2	.10	.09	.09	.09

[a]T-ratios are in parentheses.
[b]Significance levels (all but RD and G) are 1-tailed tests.
*Designates the 0.10 level of significance.
**Designates the 0.05 level of significance.
***Designates the 0.01 level of significance.

but not as significant as for 1963-1967. G becomes positive but insignificant. And, the advertising intensity level variables are all insignificant (except ATOTAL, which is significant only at the 10% level). This could lend support to Scherer's idea (1980, p. 116) that "the concentration increasing impact of intense advertising appears to have ceased and perhaps reversed by the early to mid 1960s, perhaps coinciding with both consumers' and advertisers' increased maturity in relating to television as a medium of information and persuasion."

However, Table V.18 shows that for both ATOTAL and ANTV, the coefficients and level of significant increase for 1972-1977 and even more for 1977-1982. In particular for 1977-1982, both ATOTAL, $ATOTAL^2$ and ANTV, $ANTV^2$ are highly significant, with the network TV intensity level showing larger coefficients than total advertising level (ANTV = 3.09 and $ANTV^2$ = -.52) and strong t-statistics (near 3.0 for both).

If any pattern can be concluded from advertising intensity levels affecting concentration changes in the 5-year periods from 1963 to 1982, it is that advertising intensity has not ceased to have an impact on increasing concentration, as Scherer hypothesized. Instead, the effects of advertising intensity levels (especially for NTV) seem to be increasingly important in each successive 5-year period since 1967. However, one might expect this effect to slow down some time in future periods after 1982, if the average 4-firm concentration in manufacturing for consumer goods reaches the point of very high concentration. The average 4-firm concentration in this study's sample for consumer goods was 42.9 in 1982, but 59.3 for industries with ATOTAL greater than or

Table V.18. Regression results for 1972-1977 and 1977-1982. The dependent variable is ΔCR (4-firm). Average advertising intensity variables in quadratic form are used, excluding CONV and CONS[a,b]

	1972-1977		1977-1982	
Variable	Equation 1	Equation 2	Equation 3	Equation 4
Constant	7.73	7.84	3.27	3.28
ICR	-.05	-.05	-.04	-.04
	(-2.73)***	(-2.83)***	(-2.14)**	(-2.19)**
S	-.81	-.83	-.31	-.31
	(-2.78)***	(-2.85)***	(-1.08)	(-1.07)
G	-.29	-.18	.88	.93
	(-.23)	(-.14)	(.60)	(.64)
RD	-1.25	-1.27	-1.70	-1.72
	(-1.85)*	(-1.90)**	(-2.43)**	(-2.49)**
ATOTAL	.67		1.30	
	(1.33)*		(2.37)***	
$ATOTAL^2$	-.03		-.10	
	(-.63)		(-1.91)**	
TOTAL67				
$TOTAL67^2$				
ANTV		1.69		3.09
		(1.73)**		(2.94)***
$ANTV^2$		-.18		-.52
		(-1.10)		(-2.74)***
NTV67				
$NTV67^2$				
R^2	.08	.08	.07	.08

[a]T-ratios are in parentheses.
[b]Significance levels (all but RD and G) are 1-tailed tests.
*Designates the 0.10 level of significance.
**Designates the 0.05 level of significance.
***Designates the 0.01 level of significance.

equal to 2%. Hence, there is still room for advertising intensity to continue to effect increased concentration in the near future, but not as much room that there was in the 1963-1982 period.

Lastly, with respect to Table V.18, ICR remains negative and quite significant for 1972-1977 and 1977-1982. S remains negative and significant at the 1% level for 1972-1977 but insignificant for 1977-1982. RD also remains negative, at the 10% level of significance, for 1972-1977 and at the 5% level of significance for 1977-1982. G is negative for 1972-1977 and positive for 1977-1982, but insignificant.

In sum, for ICR, S, G and RD for the 5-year subperiods, all coefficients were always negative (except for G for 1967-1972 and 1977-1982). ICR was always significant, either at the 1% or 5% level except for being significant at the 10% level in 3 equations for 1967-1972. S was significant at the 1% level for 1967-1972 and 1972-1977. But S was insignificant for 1963-1967, and 1977-1982. RD was insignificant for 1963-1967, and significant at 10%, 5% or 1% levels thereafter. And G was never significant. Overall, the ICR, S, and RD results in 5-year analysis are consistent with the larger period analysis. But because structural change (which is reflected in concentration change) occurs slowly, the coefficients and corresponding t-statistics are in general smaller, as expected. Only G was consistently insignificant for the 5-year results. Also, the R^2 statistics in the 5-year periods are roughly one-third of what they are in the 1967-1982 period. This implies that the effects of the independent variables on concentration change are stronger in the longer periods, as expected.

CHAPTER VI. SUMMARY AND CONCLUSIONS

Chapter I of this dissertation contained a brief introduction to the two opposing theoretical views of how advertising affects competition. However, it was pointed out that this controversy can, in part, be resolved by separating advertising into two types, retail and national. Retail advertising tends to contain a high degree of information and, therefore, is likely to be competitive, while national advertising tends to contain a high degree of persuasion and, therefore, is more likely to be anticompetitive. Case studies of both retail and national advertising were presented, followed by an overview of this dissertation. To test the anticompetitive effects of national advertising for a broad segment of American industries, a concentration change regression model was proposed with advertising intensities (levels and changes) as the main independent variables.

Chapter II contained a review of the relevant literature. Each of ten previous studies used one of three different sources of advertising intensity data in a concentration change model. The findings of these studies were summarized.

Chapter III presented the economic rationale for the inclusion of each independent variable in the regressions used in this study. Besides levels and changes of advertising intensity, the independent variables included the initial concentration ratio, size, growth and three dummy variables for industries with significant research and development, convenience good industries and consumer good industries.

Chapter IV discussed the sample of industries used in this study and how each variable was constructed and the source of the data for each variable. LNA advertising data (consisting mainly of national advertising) were used to construct the advertising intensity variables. This time-consuming process was discussed in some detail along with the advantages of LNA data over other sources of advertising data used in previous studies.

Chapter V reported the empirical results. First, some descriptive statistics for the LNA advertising intensity variables were presented. It was noted that network TV advertising intensity is the largest and fastest-growing component of total advertising intensity, increasing from 37% in 1967 to 53% in 1982. Also, the simple correlations among the various different LNA advertising intensities were presented and discussed.

Second, some descriptive statistics for concentration change were presented. For the 269 industries in the sample, the average 4-firm concentration ratio (CR4) exhibited little change between 1963 and 1982, increasing by 0.8 percentage points. However, when the industries were categorized as consumer good or producer good industries, the producer good industries showed a concentration decrease (1.8 points), while the consumer good industries experienced an increase (5.9 points). The difference in these trends was attributed to differences in advertising and other product differentiation barriers to entry.

When the sample was classified into categories having high (H), medium (M) and low (L) levels of advertising intensity, a similar pattern was found. The average CR4 among the H industries increased 5.1 points, compared to an increase of 2.2 points for the M industries and a decrease of 0.2 points for the L industries.

Third, the regression results were presented. The main period focused upon was 1967-1982. The 1963-1982 period and subperiods were examined more briefly. These regression results were in general agreement with the descriptive statistics on concentration change. A brief summary and conclusion of the regression results for each independent variable is reported below.

Initial Concentration Ratio (ICR)

The ICR coefficient was negative and significant at the 1% level in all equations except for the 1967-1972 and 1977-1982 subperiod equations, for which ICR was still negative and significant at the 5% or 10% levels. This consistent and significant finding for ICR in concentration change models has been found in past research. Hence, when ICR is low, concentration increases are more likely than when ICR is high.

Size (S)

The S coefficient also was always negative and significant at the 1% or 5% levels, except for the 1963-1967 and 1977-1982 subperiod equations. Hence, it appears that industry size, *ceteris paribus*, has a deconcentrating effect, as larger size allows for the existence of more optimal-sized firms. In past research, Mueller and Hamm (1974), Wright (1978), Scherer (1979), Mueller and Rogers (1980, 1984) and Rogers (1982) also used size as an independent variable in a concentration change model. In these previous studies, the coefficient of S has been consistently negative, but not always significant.

Growth (G)

Growth (like ICR) is one of the two independent variables most often used in past concentration change studies. These past results have been mixed (both for sign and significance of the coefficients). However, the expected sign of G is ambiguous since there are economic arguments that G can both positively and negatively affect concentration change.

Rogers (1982) offers an explanation for these mixed results. He argues that growth will have a negative effect on concentration change if growth allows net entry of firms into an industry, ceteris paribus, reducing concentration. However, if little net entry takes place (due to barriers to entry) or net entry is included as another independent variable, the G coefficient will tend to be positive as large firms expand more efficiently than smaller firms as an industry grows.

For this study, the G coefficient was always negative and significant at the 1% or 5% levels for 1963-1982 and 1967-1982. Not surprisingly, the results were mixed for the subperiod analyses. Therefore, in the longer periods of this study, it appears that G does have a negative effect on concentration change as G allows for net entry of firms into an industry and/or existing smaller firms grow more rapidly than existing large firms.

Research and Development Dummy Variable (RD)

The RD coefficient was found to be consistently negative and significant at the 1% level except for the 5-year subperiod equations. This is in agreement with the findings of Mukhopadhyay (1985). Thus, it appears that RD has a negative effect on concentration change.

Convenience Good Dummy Variable (CONV)

CONV was used by Porter (1974) as an independent variable in a profit rate model, tested for a cross-section of industries. However, this study was the first to use CONV in a concentration change model. The expected CONV coefficient was positive because advertising is hypothesized to be more effective at product differentiation and image building for convenience type consumer goods.

The findings of this study are consistent with this hypothesis. The CONV coefficient is positive and significant at the 1% level when CONS and advertising intensity levels are excluded. But CONV becomes insignificant when CONS or advertising intensity levels are included, probably due to multicollinearity.

Consumer Good Dummy Variable (CONS)

CONS was included in some equations for 1963-1982 and 1967-1982. When advertising intensity levels were excluded, the CONS coefficients were positive and significant at the 1% level. The t-statistics fell some when advertising intensity levels were included (due to multicollinearity), but CONS remained significant at the 1% or 5% levels. As in past research, CONS has a strong positive and significant effect on concentration change. This is attributed to the product differentiation barrier to entry of consumer good industries (in which advertising plays an important role in creating this product differentiation).

Advertising Intensity (Levels and Changes)

LNA data were used to construct the advertising intensity variables (levels and changes). It was hypothesized that the advertising intensity variables constructed from these data would have positive effects on concentration change because: (1) LNA data are heavily represented by national advertising; (2) there exist various real and pecuniary scale advantages in advertising; (3) some forms of advertising cost so much (especially network TV) that it creates an absolute cost barrier to entry; (4) large firms benefit by a number of restrictive practices in advertising; (5) there exist a number of advertising characteristics that favor larger firms; and (6) larger firms are the favorite customers of advertising agencies and receive preferential treatment. Furthermore, since these factors apply especially well to network TV, the network TV advertising intensity coefficients (levels and changes) were expected to be larger than those for other types of advertising intensities.

The regression results support the above hypotheses; it appears that advertising intensity (levels and changes) does have a positive and significant effect on concentration change for the period 1967-1982. For 1967-1982, total, electronic and network TV advertising intensities (levels and changes) were always positive (except for the squared term of the quadratic form, which was always negative as expected) and generally significant at the 1% or 5% levels. Five basic points can be concluded from the advertising intensity results.

First, the advertising intensity level and change variables had very low simple correlation coefficients, implying that the two do not move together and that both could be used together as independent variables in an equation without multicollinearity problems.

Second, the regression results for the quadratic form of advertising intensity levels did fit the data well, implying that advertising intensity levels increase concentration, but at a decreasing rate. The reasoning for testing a quadratic function is that in some industries (as moderately high oligopoly), firms may advertise beyond the optimal amount.

Third, it was hypothesized that network TV advertising intensities (levels and changes) would have stronger effects on concentration change than other types of advertising intensities. This hypothesis was supported by the findings. Network TV advertising intensity (both level and changes) generally had larger coefficients than their total or electric advertising intensity counterparts. As for the significance, network TV advertising intensity change usually had larger t-statistics than total and electric advertising intensity changes, while total and electric advertising intensity levels usually had larger t-statistics than network TV advertising intensity level.

Fourth, the total and electronic advertising intensity level coefficients remained positive and significant (usually at the 5% level) even when a consumer dummy variable (CONS) was included in the equation.

CONS was included to capture some non-advertising created product differentiation effects on concentration change. However, due to multicollinearity between CONS and the advertising intensity variables, when the two are used together, the level of significance was reduced for both variables. Nevertheless, these positive and significant coefficients of the total and electronic advertising intensity levels with CONS included yield stronger evidence that advertising intensity levels increase concentration.

Fifth, from the subperiod analyses (especially the 5-year periods), if any pattern can be concluded from the advertising intensity levels and their effect on concentration change, it is that advertising intensity has not ceased to have an impact on increasing concentration, as Scherer (1980) hypothesized. Instead, the effects of advertising intensity levels (especially for network TV) on concentration change seem to be getting increasingly larger in each successive 5-year period since 1967.

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