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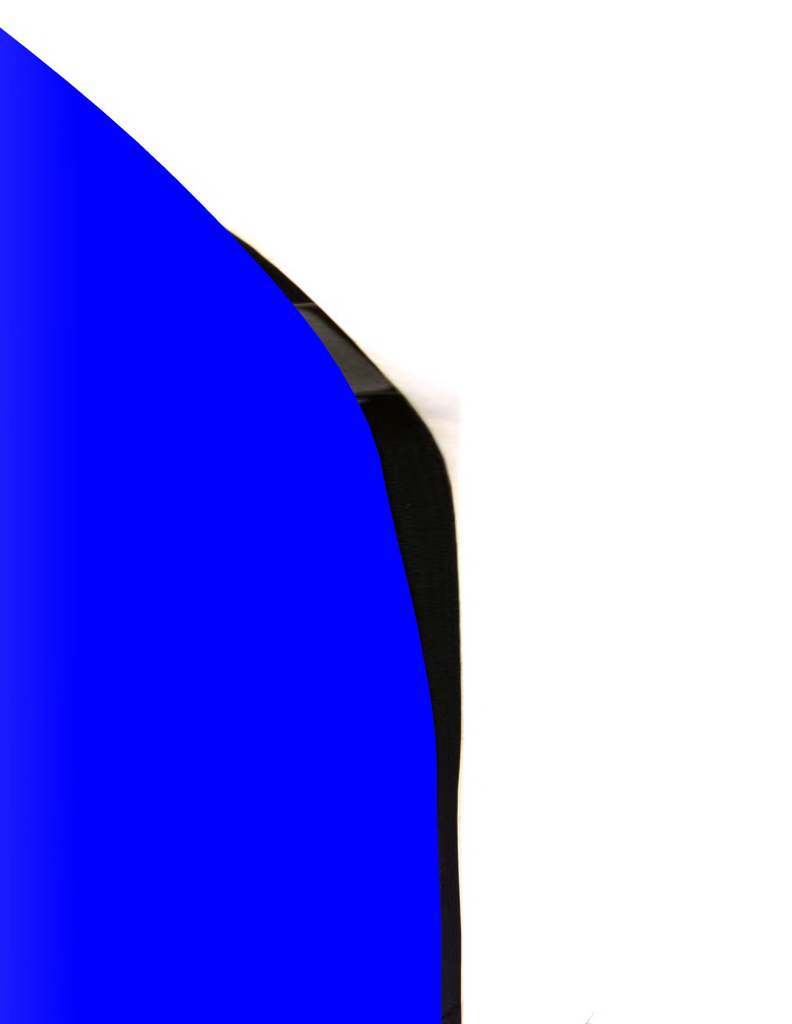
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1979

ADVERTISING INTENSITY AND MARKET CONCENTRATION
WITHIN SELECTED PRODUCT CATEGORIES

By

Kent Michael Lancaster

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ABSTRACT

ADVERTISING INTENSITY AND MARKET CONCENTRATION WITHIN SELECTED PRODUCT CATEGORIES

By

Kent Michael Lancaster

Despite the lack of any clear evidence or theory that advertising is either a source or a consequence of market concentration, that uncertainty is not reflected in recent and separate policy proposals and decisions that assume advertising both restricts and stimulates competition. The question therefore deserves further consideration.

A review of this literature disclosed: (1) the existence of five contradictory theories regarding the relationships between advertising and market concentration as well as between advertising and other aspects of market structure, market conduct and market performance, (2) the lack of any clear evidence as to which theory correctly specifies the nature of the relationships between advertising and market concentration, (3) some clear evidence that increasing returns to advertising messages do not exist for single brands, (4) contradictory indirect evidence of scale economies due to industry or firm advertising intensity, and (5) conflicting evidence as to the existence of pecuniary scale economies due to media rate structures, especially network television advertising rates, which may favor large, multi-product, multi-industry advertisers at the expense of their smaller rivals.

Several specific shortcomings of previous theories and methods were identified including: (1) use of the advertising-sales ratio, (2) insufficient attention to the relative distribution of advertising expenditures among the firms within an economically relevant market, (3) aggregation of advertising expenditures in a single index which disguises the likely differential impact on consumer behavior of separate advertising media categories and (4) use of small industry samples at high, three and four-digit, IRS and SIC levels of aggregation.

This study attempted to overcome these limitations by: (1) providing a theoretical basis for the use of absolute advertising expenditures instead of advertising-sales ratios as the correct measure of advertising intensity, (2) empirically comparing the relationship to sales and to market share of three different measures of advertising, (3) testing directly for technical or pecuniary scale economies in firm and in brand total advertising expenditures and separate advertising media category expenditures, (4) providing a theoretical basis for examining the share of advertising among the brands in an industry and testing these relationships both within and across industries, (5) examining and comparing brand, firm and industry level advertising media expenditures and total advertising expenditures available from syndicated trade sources from 1970 through 1975 and (6) examining sales and market share data available from a leading trade journal from 1970 through 1975 for a large number of firms and brands within 19 narrowly defined and economically relevant consumer non-durable product categories.

Nine specific hypotheses were tested using linear and log linear multiple regression techniques and the following major findings are supported:

- (1) There are, on average, strong diseconomies of scale in total advertising expenditures at both the firm and the brand levels of aggregation.
- (2) In the ready-to-eat cereal category, there appears to be slight economies of scale in total advertising expenditures at the firm level of aggregation, but not at the brand level of aggregation.
- (3) There appear to be economies in total advertising expenditures for more than one brand. That is, diseconomies in advertising are much greater at the brand level of aggregation than they are at the firm level of aggregation.
- (4) There are strongly diminishing returns to individual advertising media expenditures such as network television, spot television, magazines, network radio, newspaper Sunday supplements and outdoor.
- (5) There appear to be significant economies to advertising more than one brand using network television or using spot television. That is, diseconomies in network television advertising or in spot television advertising are often much greater at the brand level of aggregation than they are at the firm level of aggregation.

- (6) The relationship between brand total advertising share and brand market share is positive and significant in each product category.
- (7) The relationship between brand network television advertising share and brand market share is positive and significant in each product category.
- (8) In four of 11 product categories for which brand level data are available, network television advertising shares clearly explained significantly more of the variation in brand market share than the share of any other advertising media category. These product categories include Toilet Soaps, Deodorants, Shampoos and Rinses, and Cereals.
- (9) The potential exists for regression results based on brand market shares and advertising-sales ratios to lead researchers to infer increasing returns or to infer economies of scale in advertising expenditures, when, in fact, there are strongly diminishing returns or diseconomies of scale in advertising.

To Marilyn,
For raising Lana and Michelle.

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Finally, I am greatly indebted to my wife, Marilyn, for typing several drafts of the manuscript and especially for cheerfully assuming my share of the domestic duties for too many years.

None of them, of course, are responsible for any deficiencies in the final manuscript.

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CHAPTER I

INTRODUCTION

Economists have been debating the merits and the demerits of advertising since the turn of this century. And the debate has intensified within the past 25 years. On the positive side economists have argued that advertising: informs consumers of available goods, comparative prices, relative product quality and where products can be obtained; provides an incentive for heavy advertisers to maintain high product quality; permits the realization of production scale economies; allows innovators to tap large markets rapidly; subsidizes a variety of mass communications media; mitigates business cycles and stabilizes the economy; displays high aesthetic quality and urges product images that are as valuable to consumers as physical product attributes.¹

But the catalog of suspected social costs of advertising looms much larger by comparison. Here economists have argued that advertising: wastes resources; creates false wants; urges consumers to buy products of little individual or social value; gives rise to industries characterized by only a few large sellers; deters the entry of new firms; expenditures of the few large firms within an industry cancel each other out; raises prices to consumers; allows heavy advertisers to

¹See for example, Fred M. Scherer, Industrial Market Structure and Economic Performance (Chicago: Rand McNally, 1970), Chapter 14.

reap monopoly profits and accentuates business cycles.²

This study addresses itself to the relationships between advertising and the level of competition within an industry. Particularly, it empirically examines the question of whether advertising within consumer non-durable product categories leads to market concentration (the share of an economically relevant market held by a few top firms in the market).

There are some who argue that market concentration, a proxy for monopoly power, does not directly affect economic performance.³ From this perspective the question of advertising's role in the rise of market concentration is moot. But the traditional view has been that industrial concentration poses a serious threat to consumer welfare. Since advertising may be a contributing factor in the rise of industrial concentration it too may threaten consumer welfare. Accordingly, approximately 25 empirical studies concerning the relationships between advertising and market concentration have been published in as many years.

Yet still others have argued that the issue has been blown far out of proportion to its merit and that more substantial issues, such as inflation, unemployment, energy and the environment, should occupy economists' limited time.⁴

² Ibid.

³ See for example, Harold Demsetz, The Market Concentration Doctrine (Washington, D.C.: American Enterprise Institute, 1973), and John S. McGee, In Defense of Industrial Concentration (New York: Praeger, 1971).

⁴ See David G. Tuerck's "Forward," in Stanley Ornstein, Industrial Market Structure and Advertising Intensity (Washington, D.C.: American Enterprise Institute for Public Policy Research, 1977).

Nevertheless, the issue has become something more than a mere academic exercise. The contradictory views of economists now permeate a number of past and present public policy proposals and public policy decisions despite the lack of agreement on a unified theory of advertising's economic impact, the lack of a sufficiently adequate and complete data base and the lack of consistent substantive conclusions upon which to base such policy proposals and policy decisions.

For example, in 1967 and in 1968 the Federal Trade Commission successfully attacked product extension mergers in FTC v. Procter and Gamble Co.⁵ and in General Foods Corporation v. FTC⁶ in part because the acquired firms would be able to lower their advertising costs substantially since media rate structures, especially network television rate structures, appeared to favor large, multi-product, multi-industry advertisers at the expense of their smaller actual and potential rivals. And a 1968 White House task force on antitrust policy proposed a Concentrated Industries Act that suggested that restrictions on advertising expenditures might be used.^⑦

In 1972 the Federal Trade Commission charged that heavy advertising in the concentrated ready-to-eat cereal market by the Kellogg Company, General Mills, Inc., General Foods Corporation and the Quaker

⁵ 386 U.S. 568 (1967).

⁶ 386 F. 2d 936 (3d. Cir. 1967), cert. denied, 391 U.S. 919 (1968).

⁷ U.S. White House Task Force on Antitrust Policy. The Report of the White House Task Force on Antitrust Policy, July 5, 1968. (In U.S. Congress. Congressional record. (Daily ed.) v. 115 (1969) no. 87, p. S5642-S5659).

Oats Company results in high entry barriers and allows the major cereal makers to maintain a shared monopoly.⁸

In 1976 an FTC administrative law judge ruled that Borden's promotional efforts for ReaLemon resulted in the brand's dominance in the reconstituted lemon juice market in violation of the FTC Act.⁹ The H. J. Heinz Company has charged Campbell Soup Company with predatory advertising leading to monopoly.¹⁰

On the other hand, a positive view of advertising's economic effects has also been exhibited by the Federal Trade Commission. In 1976 the FTC proposed a trade regulation rule that would revoke bans on prescription eye-glass advertising, that are imposed by many states, because such bans restrict the flow of price information to consumers, increase search costs and increase eye-glass prices.¹¹ And in 1978 the Commission proposed a similar trade regulation rule that would ban the advertising restrictions of the American Medical Association because such restrictions cause substantial injury to the public by depriving consumers of the free flow of information concerning the availability of health care services.¹²

The theories, research and conclusions of some economists have even found their way into the reasoning and decisions of state supreme

⁸Docket No. 8883, Federal Trade Commission, April 1972; pp. 7-9.

⁹Borden, Inc., Case, Docket No. 8978, Federal Trade Commission, August 1976, p. 67.

¹⁰H. J. Heinz Company v. Campbell Soup Company, Civil Action No. 76-1306 (W. D. Pa. 1967), p. 10 of plaintiff's complaint.

¹¹"Advertising of Ophthalmic Goods and Services," Federal Register, Vol. 41, January 16, 1976, p. 2399.

¹²See, "FTC judge: Doctors Should Be Free To Advertise," Advertising Age (December 4, 1978) p. 4.

courts and District Courts in connection with First Amendment cases that attempt to remove state and/or professional association restrictions on the advertising of prescription drugs, eyeglasses, lawyer fees and abortion services.¹³

The available evidence supports a number of conflicting points of view on the relationships between advertising and market concentration. For example, some researchers have found a significant positive relationship between advertising and market concentration,¹⁴ while others have found a slightly negative relationship.¹⁵ Other researchers have found an upward trend in market concentration among industries with high television advertising intensities,¹⁶ while others have found no

¹³See for example, *Bigelow v. Virginia*, 421 U.S. 809 (1975), *Patterson Drug Co. v. Kingery*, 305 F. Supp. 821 (W D Va. 1969), *Terminal-Hudson Electronics v. Department of Consumer Affairs*, 407 F. Supp. 1075, *Virginia State Board of Pharmacy et al. v. Virginia Citizens Consumer Council, Inc. et al.*, 44 U.S.L.W. 4686, (also see Brief of Appellants, Brief of Appellees and Brief for Association of National Advertisers, Inc. Amicus Curia for S. Ct. Dkt., No. 74-895), *John R. Bates and Van O'Steen v. State Bar of Arizona* (97 Sup. Ct. 2691) and *Linmark Associates, Inc. v. Township of Willingboro* (97 Sup. Ct. 1641).

¹⁴See for example, H. M. Mann, J. A. Henning and James W. Meehan, Jr., "Advertising and Competition: An Empirical Investigation," Journal of Industrial Economics 16 (November 1967): 34-5.

¹⁵See for example, Lester G. Telser, "Advertising and Competition," Journal of Political Economy 72 (December 1964): 532-562.

¹⁶See for example, John M. Blair, Economic Concentration, Structure, Behavior and Public Policy (New York: Harcourt Brace Jovanovich, Inc., 1972), pp. 308-334. Also see, Michael E. Porter, "Interbrand Choice, Media Mix and Market Performance," American Economic Review 66: 2 (May 1976): 398-406.

economies of scale or no increasing returns favoring large network television advertisers and have therefore argued that high levels of market concentration in these industries is due to factors other than network television advertising.¹⁷

This study will present and test empirically a new paradigm which highlights underlying relationships between advertising and market concentration in an attempt to explain such seemingly conflicting conclusions. New data on brand level and firm level advertising expenditures in six separate advertising media categories and new data on brand level and firm level sales will be analyzed within 19 narrowly defined and economically relevant consumer, nondurable product categories.

¹⁷ See for example, David M. Blank, "Television Advertising: The Great Discount Illusion or Tonypandy Revisited," Journal of Business 41 (January 1968): 10-38. Also see, David M. Blank, "Tonypandy Once Again," Journal of Business 42 (January 1969): 104-112, James M. Ferguson, "Anticompetitive Effects of the FTC's Attack on Product Extension Mergers," St. John's Law Review 44 (Spring 1970): 392-415, and John L. Peterman, "The Clorox Case and Television Rate Structure," Journal of Law and Economics 11 (October 1968): 376-389 and 404-412.

CHAPTER II

REVIEW OF THE LITERATURE

Five Contradictory Theories

Advertising has been positioned within the structure-conduct-performance model in five different and sometimes contradictory ways. One theory suggests that advertising leads to anticompetitive levels of sales and of profits for the few top firms in an industry by changing consumer tastes as follows.¹⁸

- ① Companies undertake promotional efforts, such as personal selling, sales promotion, publicity, public relations and advertising when they can efficiently influence consumers, either objectively or subjectively, as to the superior ability of their products to satisfy consumer needs and wants.

- (a) The optimum promotional mix for the firm will depend on its relative cost efficiency given the nature of the product, the nature of the relevant consumer behavior associated with the product, the method of distribution, relative price, the

¹⁸ See for example, Nicholas Kaldor, "The Economic Aspects of Advertising," Review of Economic Studies 18 (1949-1950): 1-27, Joe S. Bain, Barriers to New Competition (Cambridge, Mass.: Harvard University Press, 1956), and Michael E. Porter, "Interbrand Choice, Media Mix and Market Performance," American Economic Review 66 (May 1976): 398-406.

nature of competition, the presence of uncontrollable environmental factors, and so on.

- (b) If advertising can be efficiently employed, the optimum advertising media mix will depend on the marginal productivity of each form of advertising. That is, the media mix chosen should be the most cost efficient given the nature, number, location, media usage habits, information needs and purchase habits of the consumer.

2. Information causes consumers to perceive objective or subjective differences among products and helps them to choose among alternatives.

- (a) Buyers actively or passively seek additional information when they perceive the cost of doing so will be outweighed by the benefits they perceive to be gained from an informed purchase decision.
- (b) The sources of information available to the consumer include previous experience with various brands, advice from friends, advice from relatives, advice from salesmen, neutral technical literature such as Consumers Bulletin and Consumers Report and advertising messages in any of the various mass media.
- (c) Advertising facilitates consumer choice when the perceived cost of viewing advertising messages is outweighed by the perceived benefits to be gained from an informed purchase decision.

3. Consumer choices lead to brand loyalty when products perform as expected.

4. Durable brand loyalties to existing brands raises the cost of entry because newcomers have to spend relatively more on advertising than their established rivals to overcome these brand loyalties.
5. Increasing returns to advertising messages with respect to facilitating consumer choice and reinforcing brand loyalties increases minimum efficient scale and can lead to increased market concentration if minimum efficient scale grows faster than industry demand.
6. Increasing returns to advertising messages also increase entry barriers since firms operating at less than minimum efficient scale face an absolute cost disadvantage.
7. Imperfections in the supply of advertising media time and space may also increase minimum efficient scale, hence increase market concentration, and create and maintain additional entry barriers, in varying degrees for each media type and product category, to the extent that each provides for:
 - (a) Advertising media volume discounts that create pecuniary scale economies favoring large, multi-product, multi-industry advertisers, and
 - (b) Indivisibilities in the supply of advertising time and space which require a high absolute advertising outlay threshold for a single advertising message and especially for minimum market coverage.
8. Advertising's anticompetitive influences are reinforced by imperfections in the capital markets which favor large established advertisers at the expense of their newer and smaller rivals.

9. Price elasticity of demand is decreased since there are fewer actual and potential rivals.
10. Reduced price elasticity leads to higher prices with little incentive to cut prices since market concentration can lead to collusion to reduce price competition to the joint profit maximizing level.
11. Reduced price competition in the presence of entry barriers permits companies to more closely approach higher prices and lower outputs which consistently maximize profits.
12. Excessively high profits can be paid to owners or invested in additional advertising to perpetuate market concentration and entry barriers.

This causal linkage will be referred to as the "change-of-taste" theory of advertising impact and it is depicted in Figure I below. The change-of-taste theory reasons that advertising results in restricted output, high prices, inefficient allocation of resources, long run excessive profits for monopolists and oligopolists, distortions in the distribution of wealth and reduced consumer welfare.

But an opposite view reasons that advertising, by providing consumers with product information, will result in increased competition as follows.¹⁹

¹⁹ See for example, George J. Stigler, "The Economics of Information," Journal of Political Economy 69 (June 1961): 213-225, Phillip Nelson, "Information and Consumer Behavior," Journal of Political Economy 78 (March/April 1970): 311-329, and Phillip Nelson, "The Economic Consequences of Advertising," Journal of Business 48 (April 1975): 213-241.

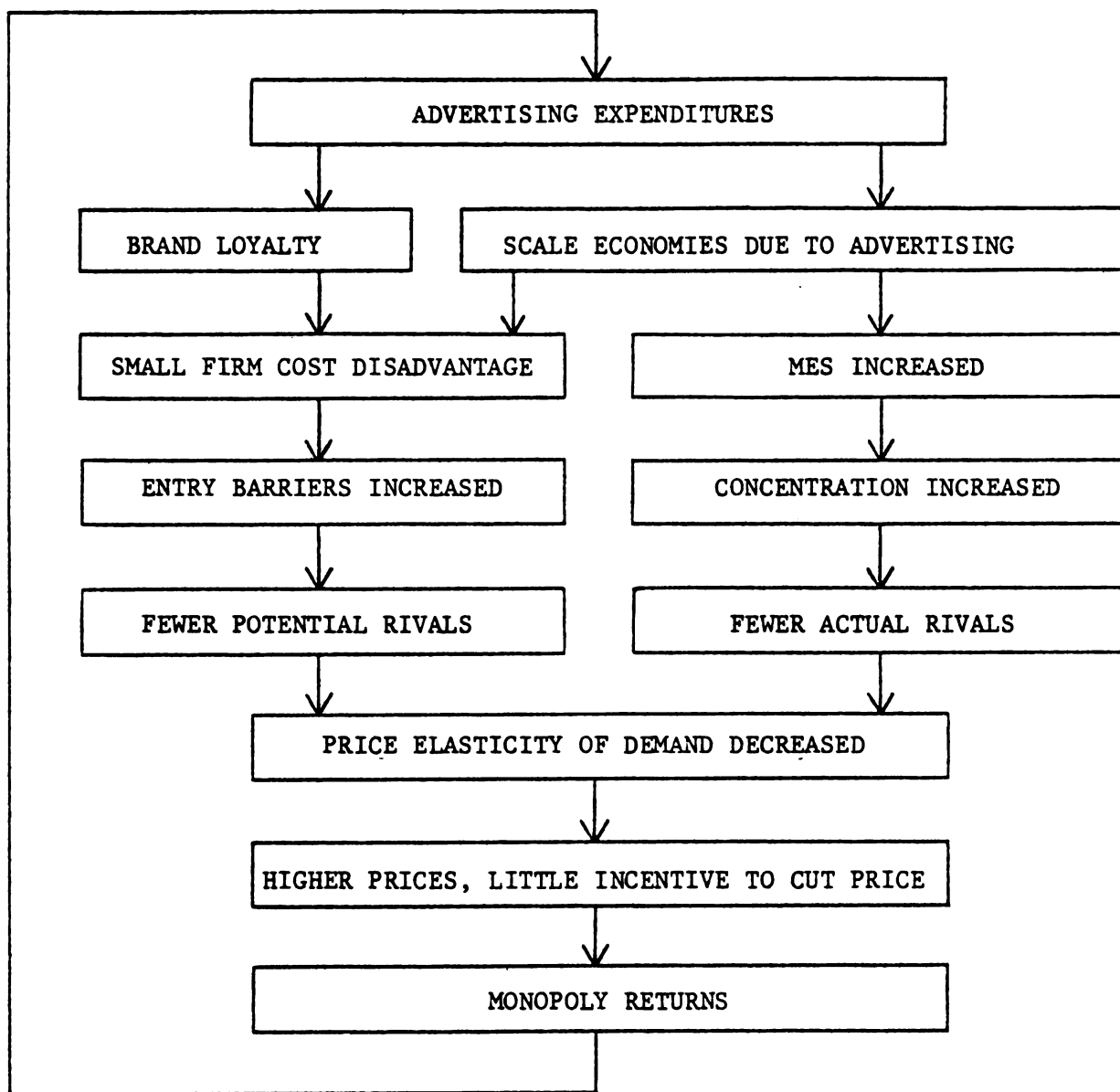


Figure I. Effects of Advertising on Competition—Advertising Decreases Competition by Changing Consumer Tastes

1. Brand advertising provides information about products, including the availability of brands, relative prices and relative product quality.
2. Since price elasticity of demand is a positive function of known alternatives, information provided by brand advertising increases consumer knowledge about available alternatives and increases price elasticity of demand.
3. Increased consumer knowledge reduces consumer search costs both individually and in the aggregate.
4. Reduced search costs increase entry by allowing previously unknown brands to gain rapid market acceptance and thereby increase consumer alternatives and product variety.

Whether market concentration would increase or decrease as a result of product information provided by advertising is indeterminant however. Nelson, the chief proponent of the advertising-as-information point of view, allowed for two opposite possibilities.²⁰ On one hand, where consumers are guided by advertising in contrast to information based on past or present sales, a new entrant can capture a share of the market through advertising, which suggests to Nelson a possible inverse relationship between advertising and concentration. Alternatively, Nelson argues that the gains from advertising are greater for the most efficient firms who grow large and thus have the greatest incentive to advertise. Consequently, large firms will prosper at the expense of their smaller rivals--advertising will increase concentration. Since

²⁰Phillip Nelson, "The Economic Consequences of Advertising," Journal of Business 48 (April 1975): 232.

both forces are offsetting, Nelson concludes that the relationship between advertising and market concentration is indeterminant a priori.

Nelson's view will be referred to as the "information" theory of advertising impact and it is illustrated in Figure II below.

A third view also suggests that advertising intensity is primarily a function of market structure and not the reverse.²¹ This view assumes that the firm's profit maximizing advertising-to-sales ratio is given by the firm's advertising elasticity of demand divided by the absolute value of the firm's price elasticity of demand. Thus, from this perspective four outcomes are possible.

1. Higher concentration accompanied by less elastic demands, which approach the industry elasticity of demand as concentration increases, can lead to greater advertising.
2. Higher concentration accompanied by less elastic demands and tacit or explicit collusion to restrict non-price competition can lead to lower advertising.
3. Higher concentration accompanied by less elastic demands and higher rates of return caused by factors other than advertising can lead to greater advertising.
4. Advertising may be greater in more concentrated markets since non-price competition is preferred in oligopolistic markets even in the absence of scale economies.

²¹See for example Douglas F. Greer, "Advertising and Market Concentration," Southern Economic Journal 39 (July 1971): 19-32, John Cable, "Market Structure, Advertising Policy, and Intermarket Differences in Advertising Intensity," Market Structure and Corporate Behavior, ed. Keith Cowling (London: Gray-Mills Publishing, Ltd., 1972), pp. 105-124, and C. J. Sutton, "Advertising, Concentration, and Competition," Economic Journal 84 (March 1974): 56-69.

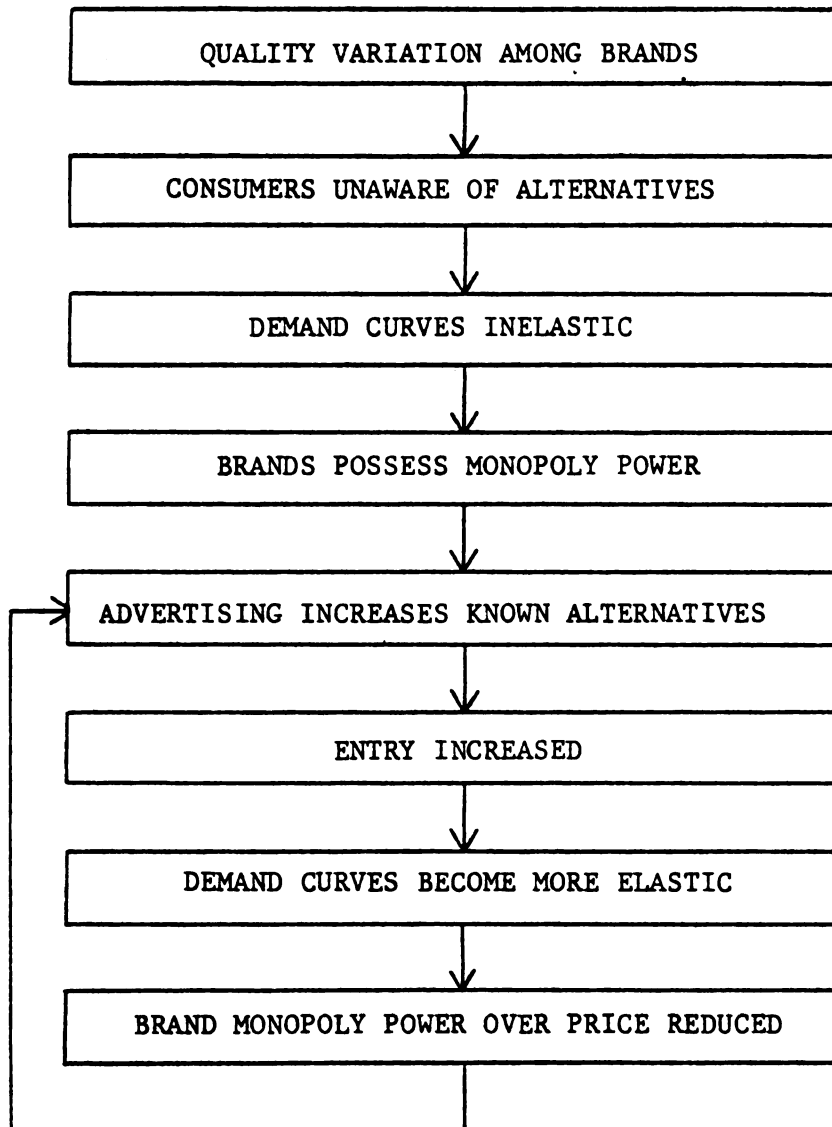


Figure II. Effects of Advertising on Competition--Advertising Increases Competition by Providing Consumers with Information

This reasoning will be referred to as the "structure-collusion" theory of advertising as a consequence of other factors and is depicted in Figure III below.

A fourth recently proposed and tested view attempted to explain a positive relationship between advertising and market concentration in the absence of support for the traditional arguments of advertising scale economies and brand loyalty.²² On one hand it is argued that:

1. Advertising, by providing information, may lead to shifts in demand and to changes in the elasticity of demand.
2. Increased demand may allow firms to exploit economies of large scale production and distribution leading to reductions in cost per unit which exceed increased advertising costs per unit.
3. If minimum efficient scale with respect to manufacturing and distribution increases faster over time than market size, increased market concentration will result.
4. Such newly enlarged firms will maintain high levels of advertising intensity.

On the other hand, it may be that an observed positive relationship between advertising and market concentration is simply a spurious one because:

1. Large firms may have larger advertising intensity simply because they serve larger, more diversified markets, have higher buyer turnover and have a higher rate of new product introductions than smaller firms, or
2. Large firms grow large because they offer higher quality per

²²See Stanley I. Ornstein, Industrial Concentration and Advertising Intensity.

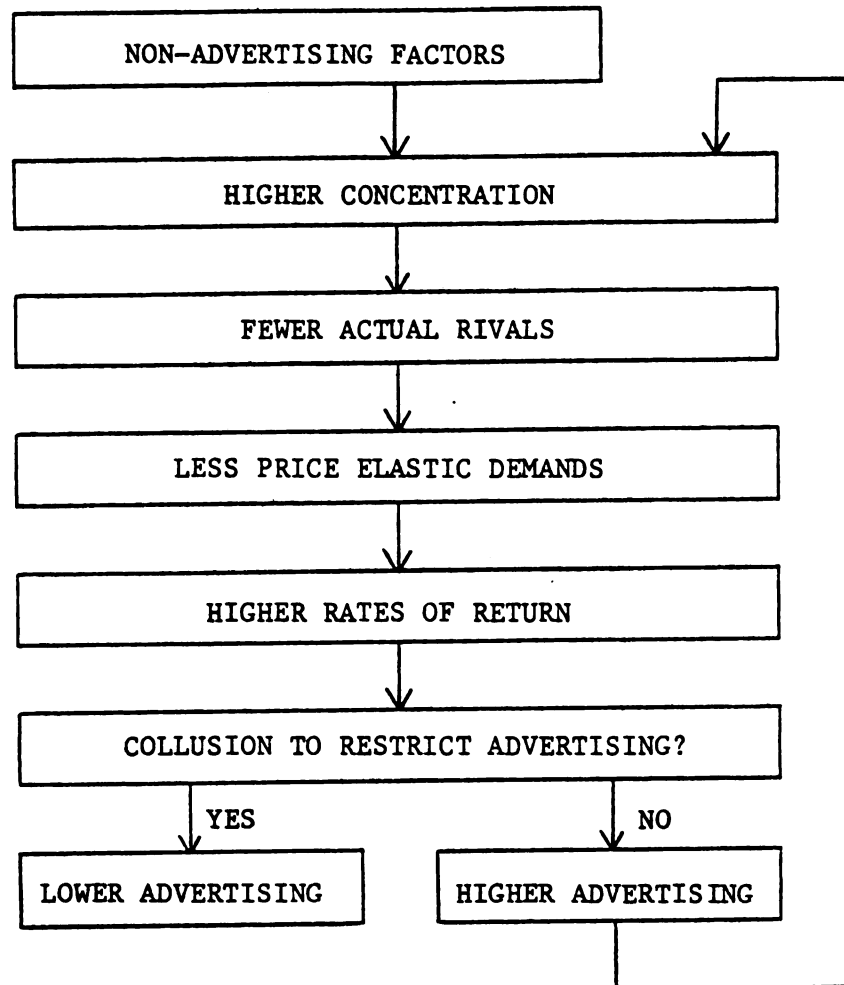


Figure III. Effects of Competition on Advertising--Advertising Intensity Depends on Market Structure and on Non-Price Collusion

unit of price leading to a high incidence of repeat sales.

Holding price constant, this makes advertising more productive for high quality producers who also happen to be large producers.

For simplicity, this essentially non-causal reasoning will be referred to as the "spurious association" theory of the relationship between advertising and market concentration.

A fifth and final view suggests that advertising intensity and market concentration interact and are jointly determined by other factors such as: (1) the margin between price and marginal cost, (2) by competitors' response to a firm's advertising strategy, (3) the advertising elasticity of demand facing industry members, (4) the depreciation rate of advertising capital, (5) the interest rate, (6) the proximity of the product to sensitive psychological drives, (7) product complexity, (8) product testability, (9) the number and the turnover rate of buyers, (10) the dynamic character of the market, (11) the rate of new product introductions, (12) the degree of satisfaction with present goods, and (13) various consumer characteristics. The proponents of this view argue that it is therefore inappropriate to test for two-way causality with single stage least squares regression equations in that such tests are biased.²³ However, any bias may or may not be small.

²³See Douglas F. Greer, "Advertising and Market Concentration," p. 32, Allyn Strickland and Leonard Weiss, "Advertising, Concentration, and Price-Cost Margins," Journal of Political Economy 84 (October 1976): 1109-1121, and Richard Schmalensee, On the Economics of Advertising (Amsterdam: North-Holland, 1972), pp. 222-226.

For clarity, this non-causal reasoning will be referred to as the "interaction" theory of the relationship between advertising and market concentration.

Empirical Evidence

Several scholars have carefully summarized and criticized the many studies which attempt to empirically test the various hypothesized relationships between advertising and market concentration suggested by each of the above frameworks.²⁴ Therefore, it is not necessary to cover all of that ground again here. For completeness, Appendix A contains a detailed list of each study dealing with advertising and market concentration which has been published since 1964. The appendix, compiled chiefly by Ornstein (1977), has been expanded and updated.²⁵ It chronologically names the author(s) of each study, it describes the sample and the period of years that each sample covers, it identifies, operationally, the nature of the dependent and the independent variables, it describes the predicted functional form of the relationship between the two variables and it reports the statistical significance of the estimated relationships.

Ornstein's analysis of this advertising/market concentration literature led him to make the following unsettling summary of the combined value of previous research.

²⁴See for example, Stanley I. Ornstein, Industrial Concentration and Advertising Intensity, and James M. Ferguson, Advertising and Competition; Theory, Measurement, Fact (Cambridge, Mass.: Ballinger Publishing Company, 1975), Chapter 5.

²⁵Stanley Ornstein, Industrial Concentration and Advertising Intensity, pp. 68-73.

The meaning of the investigations summarized here is uncertain and, as a result, makes them a poor guide toward public policy on advertising as a source of monopoly power. The theories are contradictory, suggesting positive, negative, and no relationship. The empirical evidence is conflicting and does not clarify the contradictory theories. A survey of . . . previous studies . . . shows that the studies obtain significant or insignificant results with approximately equal frequency. There seems to be little clear support for the notion that advertising is either a source or a consequence of monopoly power. General agreement is possible, however, on the lack of any clear evidence or theory.²⁶

Those who have argued that advertising leads to market concentration have often assumed increasing returns to advertising expenditures. However, the literature provides no clear or strong evidence that increasing returns to advertising exist. Quite the contrary. The available evidence suggests diminishing returns to brand advertising at every level. But there are few direct tests of increasing returns to advertising. Most researchers simply check to see if a positive relationship exists between advertising intensity and brand sales, market concentration or firm profits, and then argue, in the presence of a positive association, that there exist possible increasing returns to advertising. On the other hand, the lack of an association between advertising intensity and measures of market structure or measures of market performance can often be explained for several reasons other than the level of advertising intensity among firms in an industry.

Before examining the evidence on returns to advertising more carefully, it is important to clarify what is meant by the concepts "returns to advertising" and "economies of scale in advertising," and to distinguish these terms from two other related but distinct concepts: "returns to scale" and "economies of scale."

²⁶Ibid., pp. 37-38.

"Returns to scale" refers to the relationship between the quantity of physical outputs and the quantity of physical inputs when all inputs are increased in the same proportion. Thus, if doubling the quantity of all physical inputs more than doubles the quantity of physical output, there are increasing returns to scale. If doubling the quantity of all physical inputs exactly doubles the quantity of physical output, there are constant returns to scale. Finally, if doubling the quantity of all physical inputs less than doubles the quantity of physical outputs, then decreasing returns to scale exist.²⁷

"Economies of scale," on the other hand, refers to the relationship between average unit cost and the scale of output such that average unit production costs decrease as the scale of operation increases over some range of output. There are two chief sources of scale economies: technical and pecuniary. Increasing returns to scale, defined above, are the only technical source for scale economies. Thus, with fixed input prices combined with increasing returns to scale, doubling an outlay on inputs at fixed prices will double the quantity of inputs but will more than double output. Consequently, the average outlay on inputs per unit of output will be less for the larger output.²⁸

Economies of scale may also be derived from non-technical or pecuniary sources, such as quantity discounts, which lower the average cost of inputs as input outlays are increased.

²⁷For a detailed discussion of returns to scale see Kelvin Lancaster, Introduction to Modern Microeconomics (Chicago: Rand McNally, 1974), pp. 92-98.

²⁸For a detailed treatment of economies of scale see Kelvin Lancaster, Introduction to Modern Microeconomics, pp. 108-111.

It is technically incorrect to refer to increasing returns to one factor input, such as advertising, as economies of scale. Nevertheless, the term "increasing returns to advertising" is often used interchangeably with the term "economies of scale in advertising" to mean "decreasing average advertising cost per dollar of sales with increases in total advertising expenditures, holding the quantities of other inputs constant."²⁹ Such interchanging and, perhaps, incorrect use of terminology is a constant source of confusion in the literature. The confusion is compounded further by "a blurred distinction between (1) the marginal productivity of different physical quantities of advertising, e.g., the sales produced by a half-page versus a full-page advertisement; and (2) the marginal productivity of different amounts of money spent for advertising, e.g., the sales produced by the first \$1,000 spent for advertising versus the second \$1,000."³⁰

It is not the intent here to attempt to correct inappropriate use of terms that may exist in the literature. Rather, the term "increasing returns to advertising" will be used here to mean increasing returns either in terms of sales or in terms of intermediate consumer response, derived from a threshold advertising effect, the word of mouth flow of information due to advertising, increasing the number of advertising messages, increasing the time length or page size of advertising messages, increasing the effectiveness of advertising message content, increasing the size and expertise of the advertising message production process, etc.

²⁹James M. Ferguson, Advertising and Competition; Theory, Measurement, Fact, p. 9.

³⁰Julian L. Simon, Issues in the Economics of Advertising (Urbana: University of Illinois Press, 1970), p. 3.

On the other hand, "economies of scale in advertising" will be used here to refer to decreasing average advertising cost per dollar or unit of sale with increases in total sales. These economies can be derived, holding constant input prices, from any of the technical sources of increasing returns to advertising mentioned above, or from pecuniary sources, derived from decreasing input prices, such as advertising media volume discounts.

There are several possible sources of increasing returns to advertising messages and several possible sources of economies of scale in advertising. For example, increasing returns to advertising messages may result from:

1. A threshold effect wherein buyers remain unaware of an advertised brand until they have received a minimum level of impressions,
2. The word-of-mouth flow of information about brands, which is stimulated by advertising, may cause the proportion of buyers to increase at an increasing rate especially for those products with large numbers of potential users,
3. Increasing the frequency of advertising messages per potential prospect,
4. Increasing the time length or page size of advertising messages,
5. Increasing the effectiveness of advertising message content,
6. Increasing the size of the advertising message production process or increasing the acquisition of advertising production know-how, and

7. Store distribution induced by advertising.³¹

Technical economies of scale in advertising may result from any of the potential sources of increasing returns to advertising messages listed above. In addition, pecuniary economies of scale in advertising may also result from:

1. Media rates increasing less than proportionately with audience size,
2. Indivisibilities in the supply of advertising time and space which require a high absolute advertising outlay threshold for a single advertising message and especially for minimum market coverage.
3. Joint advertising of several products, and
4. Joint use of a family brand for several products.³²

Simon (1970) investigated returns to brand advertising messages by examining those available studies which test the relationship directly. Available evidence on proprietary drugs, cigarettes, liquor and milk revealed the proliferation of brands, suggesting diminishing returns to brand advertising. Non-sales consumer response data resulting from changing advertisement size or commercial lengths also suggest diminishing returns throughout. Direct mail response evidence indicates monotonically diminishing returns to additional advertising investment.

Therefore, Simon concluded that "There is not one single piece of strong evidence to support the belief that increasing returns exist in advertising. . . . Threshold effects and increasing returns to

³¹Ibid., Chapter 1, and Ferguson, Advertising and Competition: Theory Measurement, Fact, Chapter 4.

³²Ibid.

repetition and size constitute a monstrous myth. . . ."³³ However, Simon acknowledged that important economies may still exist for the firm using common brand names for many products, taking advantage of media volume discounts, achieving extensive retail distribution and building advertising expertise.

Several indirect tests of returns to advertising have also been conducted which use the industry advertising-sales ratio as an independent variable and either optimum firm size or firm rates of return as dependent variables. Both Ferguson (1974) and Simon (1970) summarize the results of these separate indirect tests of returns to advertising.³⁴ The test results are contradictory and the discussions of their shortcomings are difficult. Nevertheless, it would be safe to characterize the indirect evidence on returns to advertising as inconclusive. Simon suggests that the ambiguity is due to the measure of advertising intensity employed in these studies. Simon is highly critical of the use of the advertising-sales ratio and he concluded that the index was "not competent to serve as the basis for any general investigation of the economics of advertising," and, taken by itself, ". . . would almost surely lead a researcher to the wrong conclusion."³⁵

Even in the absence of increasing returns to advertising messages, several researchers have argued that economies of large scale investment in network television advertising schedules by large

³³Simon, Issues in the Economics of Advertising, pp. 21-22.

³⁴The interested reader should consult Simon, Issues in the Economics of Advertising, Appendix B, and Ferguson, Advertising and Competition; Theory, Measurement, Fact, Chapter 4.

³⁵Simon, *Ibid.*, p. 310.

multi-product, multi-industry advertisers have an anticompetitive effect. A substantial literature on this subject has accumulated over the years ever since the U.S. Senate conducted hearings in 1966 on the anticompetitive effects of network television advertising.³⁶

National advertisers can purchase television advertising time for commercial announcements either from the individual stations, known as national spot sales, or from the networks, known as network sales.

When purchases are made on the national spot basis the advertiser can place his announcements on any station desired, whereas network purchases require that the announcements be placed on a network affiliated station. The number of possible network stations, however, can vary, depending on the particular transaction.

The rates are generally based on what, through various media measurement services like Nielson and Arbitron, the size of the audience is, as indicated by ratings and estimates of the demographic qualities of the audience.

Network television advertising rates are complex and vary according to the audience size, which is usually reflected in the: (1) length of the announcement (e.g., 10, 20, 30, 40 or 60 seconds), (2) time period during the day in which the announcement is run (e.g., prime time, fringe times--early and late, day time, etc.), (3) day of the week in which the announcement is run, (4) program during or adjacent to which the announcement is run (e.g., sports, news, "All in the Family,"

³⁶U.S. Senate Committee on the Judiciary, "Hearings on Possible Anticompetitive Effects of the Sale of Network TV Advertising," 89th Congress, 2nd Session, Senate Subcommittee on Antitrust and Monopoly, 1966, parts 1 and 2.

etc.), (5) season during which the announcement is run, (6) quantity of announcements purchased, and (7) the number of affiliates purchased.

Although each of the three networks have rate cards, their rates are ultimately arrived at through negotiation. This process entails chiselling, wheeling and dealing and so on on the part of the network, to obtain the highest price possible, while the advertiser attempts to secure the lowest price possible. Negotiation can range from a single buy to the entire rate structure including demographic and geographic splits. The more flexible the schedule, the more negotiation will likely take place.

Negotiations for prime time advertising favors the networks and is usually sold out to the highest bidder. Fringe times, on the other hand, are much more susceptible to negotiation. Networks may even call advertisers to get rid of unsold time at extremely low rates in some cases.³⁷

The ultimate price an advertiser pays for a particular package is difficult to determine. Because rates are negotiated, no basis for comparison exists. And even when the facts are known, it is difficult to compare because the packages of scattered minutes of advertising differ significantly in quality. Furthermore, the value of a package will vary from one advertiser to another. The true test of comparative cost is per prospect.

But, even though network television advertising rates are negotiated, Peterman (1968) argued that "such price adjustments would modify the details of the structure but would not be likely to affect the

³⁷ Margot Teleki, "The Negotiating Game: Rate Cut or Straight," Media Scope, October 1969, p. 42.

general relationships between different parts of the rate structure."³⁸

One of the most all-encompassing articles dealing with possible discrimination in the pricing of network television advertising was written by Blake and Blum (1965). They charged that the "discriminatory and tying effects of network rate structures are masked by their own intricacy and by the complexity of the television industry."³⁹

Blake and Blum claimed that the anticompetitive effects of rate discounts affected competition within the network television industry, affected the media categories most directly competitive with network television, including spot advertising and independent broadcasting, affected independent program producers and indirectly provided artificial incentives for product and market extension mergers.⁴⁰

✓ The large volume discounts were said to contribute to a concentration of budgets in one network to reduce the average cost per unit purchased. Further, the structure tended to penalize switching from one network to another by increasing the average cost per unit. Blake and Blum contended that this was possible because of the highly progressive network discount structure. Further, these discounts allegedly took over at a point where additional expenditures in other media such as spot-TV, independent stations, radio, newspapers, magazines and outdoor advertising might have been just as effective.

³⁸ John L. Peterman, "The Structure of National Time Rates in the Television Broadcasting Industry," p. 87.

³⁹ H. M. Blake and Jack A. Blum, "Network Television Rate Practices; A Case Study in the Failure of Social Control of Price Discrimination," The Yale Law Journal 74: 8 (July 1965): 396.

⁴⁰ Ibid., p. 419.

Blake and Blum pointed to the post World War II wave of mergers as an indirect effect of network rate policies. They cited two classic cases as examples, including Procter and Gamble's attempted acquisition of Clorox and General Foods' attempted acquisition of S.O.S.

In both cases the acquired and acquiring firms were distributors of consumer goods whose marketing strategies required large advertising outlays. And in each a substantial incentive for merger was the volume discount rate structure of advertising media generally and, in particular, volume discounts in the sale of network television time. These two cases illustrate the class relation of the discount rate structure of advertising media in general, and more particularly, the discounts available to users of network television, to merger patterns in consumer goods industries.⁴¹

However, Blake and Blum admitted that these discounts were not the sole reason for merger, but rather, an artificial incentive for product and market extension mergers.

An unsigned student note in the Columbia Law Review (1965) essentially covered the same ground as the Blake and Blum article and was included in the record of the Hart Senate Subcommittee hearings on the anticompetitive affects of network television advertising (1966).⁴² The note argued that:

When . . . the discounts, though more sophisticated and complex than ordinary quantity discounts, are found to reward high volume purchasers with preferential treatment, they must be considered essentially quantitative in nature. When such discounts, moreover, are found to injure competition among both the networks and the advertisers, as well as erecting barriers to new entrants at each level, the networks should not be permitted to conceal the true nature of their discount practices.⁴³

⁴¹Ibid., pp. 425-427.

⁴²"Antitrust Implications of Network Television Quantity Advertising Discounts," (Student Note), Columbia Law Review 65 (November 1965): 1213-1255. (The article is also reprinted in U.S. Senate Committee on the Judiciary, "Hearings on Possible Anticompetitive Effects of the Sale of Network TV Advertising," 89th Congress, 2nd Session, Senate Subcommittee on Antitrust and Monopoly, 1966, pp. 459-502.)

⁴³Ibid., p. 1254, and Hearings, p. 501.

Technical Study Number 8 of the National Commission of Food Marketing (1972) describes, at some length, the inherent advantages of large-scale advertising in food manufacturing and distribution. These include volume discounts resulting in more advertising impact, better access to the more valuable prime time periods, foreclosure of smaller manufacturers "from this very productive sales producing media," and above average profits.⁴⁴

Summarizing the results of his study of concentration in 33 consumer goods industries between 1947 and 1963, Blair (1972) reports that:

While dissimilar in nearly every other respect, these diverse areas have in common one characteristic: the ability of their leading producers to exploit their differentiated products in a manner and on a scale simply not available to their smaller competitors. . . . During this period of manufacturing as a whole, increases in industry concentration were roughly matched by decreases. But among these TV-advertised fields increases outweigh decreases by more than 3 to 1. . . . There can thus be little doubt about the continuation of the upward trend in concentration among industries with high TV-advertising intensities.⁴⁵

Further, Blair looked at industries in which companies were the only users of network television advertising and found that all such industries had "very substantial" increases in concentration.⁴⁶

In a study of concentration in 166 producer and consumer goods industries between 1947 and 1970, Mueller and Hamm (1974) concluded that:

Empirical studies suggest that for many industries product differentiation represents the major barrier to entry. Such barriers

⁴⁴U.S. Federal Trade Commission, The Structure of Food Manufacturing, Technical Study Number 8, National Commission on Food Marketing, U.S. Government Printing Office, Washington, D.C., 1972, pp. 68-71.

⁴⁵Blair, Economic Concentration, Structure, Behavior and Public Policy, pp. 323-330.

⁴⁶Ibid., pp. 323.

exist because of advantages existing firms have over potential entrants or because of real or pecuniary economies of scale in achieving product differentiation. It appears that the product differentiation barrier to entry has risen in recent years as has the size of economies of scale in achieving such differentiation. This increase appears to be causally related to the emergence of network television as a preferred method of advertising for many products.⁴⁷

Porter (1976) examined the impact of network television, spot television, magazines and local newspaper advertising expenditures, all divided by sales, on profit after tax as a percent of stockholders equity in 39 consumer goods industries. Despite the small number of industries, as many as five other core variables besides advertising expenditures were included in the regression equations, including eight-firm concentration ratios, minimum efficient scale as a percent of industry sales, industry growth, a dummy variable for local or regional industries, and absolute capital requirements for production at minimum efficient scale. After examining the regression coefficients, which were greater than one and significant at the .01 level for the ratio of network television advertising to sales, Porter concluded that "These results suggest that the elevation of market power due to advertising is primarily due to the size of advertising outlays on network television and magazines, especially the former. . . . Other forms of advertising appear to have little significance for long-run market power, though they may well be central to maintaining market shares."⁴⁸

On the other hand, Blank (1968 and 1969) argued that there is no evidence of network rate discrimination that favored large advertisers

⁴⁷Willard F. Mueller and Larry G. Hamm, "Trends in Industrial Market Concentration," 1947 to 1970," Review of Economics and Statistics 56 (November 1974): 511-520.

⁴⁸Michael E. Porter, "Interbrand Choice, Media Mix and Market Performance," p. 403.

over smaller ones. He conceded that the practice of allowing volume discounts was important in the fifties, but had been eliminated as an important pricing policy by the early sixties.

Blank addressed everything written on the subject in two separate articles in 1968 and 1969, including Blake and Blum, Turner, the 1965 student note in the Columbia Law Review, Leonard, the Procter and Gamble/Clorox case, the General Foods/S.O.S. case, Technical Study Number 8 of the National Commission on Food Marketing, plus the Hart and Dingell Hearings. Blank attempted to point out the inadequacies of some of the arguments in each of these studies because they relied on published rate cards instead of empirical evidence and because of the development of participations as a dominant form of packaging announcements as opposed to sponsorship.

It should be noted that none of the original analysis from which the charges against the networks derived was based on data relating to prices advertisers actually paid for television network time. All are based on prices in published network time rate cards. However, anyone who knew anything about network pricing practices was aware of the fact that during the years in question, network rate cards had little to do with the actual prices that networks employed, both because they did not include a charge for programs and because an entirely different pricing procedure, totally unrelated to rate cards at all, was becoming an increasingly important, indeed dominant form of selling.⁴⁹

Blank demonstrated that for all CBS evening advertising in 1965 and in 1966 large advertisers paid more per commercial minute than small advertisers. Then he explained the relationship of this price to audience size and demographic characteristics. He pointed out that "in brief, the problem is that networks simply do not sell homogeneous products whose prices to different purchasers can be directly compared."⁵⁰

⁴⁹David Blank, "Television Advertising: The Great Discount Illusion," p. 16.

⁵⁰Ibid., p. 27.

He used cost-per-thousand homes reached as a crude measure of comparison and found no relationship between size of the advertiser and cost-per-thousand homes reached. And again, for the overall transition period between conventional sponsorship purchases of large advertisers compared with the participation purchases of smaller advertisers, Blank found no significant relationship between the size of the advertiser and the cost-per-thousand homes reached.

Peterman (1968) also found no support for the hypothesis that networks favored large advertisers over smaller ones in their rate structure during 1965 and most of 1966.

The networks granted several different types of discounts and, it seems, for a variety of reasons. In discussion of networks however, it is quite common to lump together all of the discounts and, noting their overall size, to consider them to be obviously unjustified. I feel that such discussions are quite misleading as are the conclusions frequently drawn from them: that the discounts should be abolished or closely regulated. No doubt improvements can be made, but it is hard to see how this can be done unless there is more understanding about the present system and of the effects which its operation has on the buyers of time.⁵¹

Riesz (1973) attempted to infer the existence of discounts and price concessions and their relationship to the size of the advertising budget by determining the extent to which various firms concentrated their network television advertising expenditures among the three networks. Riesz hypothesized that:

If the availability and magnitude of discounts and price concessions are strongly related to the total network budget size, then firms with small, medium, or large budgets should differ in the distribution of their expenditures among the three networks. The general contention that large firms obtain better buys than smaller ones

⁵¹John L. Peterman, "The Clorox Case and Television Rate Structures," p. 124.

under the time-change and participation-minute systems provides the rationale for this hypothesis.⁵²

Riesz examined the largest proportion of a firm's budget allocated to single network for 54 consumer goods industries against their total network budget for the period 1961-1965. He predicted that small firms would tend to concentrate their budgets in a single network to obtain the largest possible discount. Firms with medium sized budgets were predicted to tend to disperse their budgets among the networks as a safety measure to preclude the risk of poor programming. For the very large budget advertisers, Riesz predicted no network concentration because the firm could qualify for the maximum discount on all three networks and therefore would purchase advertising time on all three networks.

Riesz found a high degree of single network concentration for the smaller budget advertiser under \$500,000, who would not qualify for network discounts. Medium sized firms with budgets between \$500,000 and \$2.8 million had a range of concentration between 60 and 85 percent. This is the category in which the discounts were expected to be particularly operative. For the largest budget firms only 26 percent concentrated their expenditures on a single network. Thus Riesz concluded that there was no evidence of network price structures between 1961 and 1965 which favored large advertisers.

Limitations of Previous Research

The review of literature has disclosed: (1) the existence of five often contradictory theories regarding the relationships between

⁵²P. C. Riesz, "Size Versus Price, or Another Vote for Tony-pandy," Journal of Business 46 (July 1973): 397.

advertising and market concentration as well as between advertising and other aspects of market structure, market conduct and market performance, (2) the lack of any clear evidence as to which theory correctly specifies the nature of the relationships between advertising and market concentration, (3) some clear evidence that increasing returns to advertising messages do not exist for single brands, (4) contradictory indirect evidence of the existence of economies of scale due to industry and firm advertising intensity, and (5) conflicting evidence as to the existence of scale economies due to media rate structures, especially network television advertising rates, which may favor large, multi-product, multi-industry advertisers at the expense of their smaller rivals.

It will be argued below that the conflicting theories and ambiguous evidence are due to six specific limitations inherent in previous theories and research. The six limitations will be briefly listed below and a fuller discussion of each of them will follow. An attempt will be made to overcome each of these problem areas in the research that follows.

1. Previous studies which used the conveniently available advertising-sales ratio to facilitate inter-industry analysis of advertising effects failed to state advertising expenditures in a way which reflects their impact on consumer behavior, i.e., to take account of gross advertising message exposures (reach x frequency) and advertising message precision, effectiveness or quality (production costs). Therefore, if any increasing returns to advertising messages exist, advertising-sales ratio data are incompetent to detect them.

2. Furthermore, earlier research which used the advertising-sales ratio failed to state advertising outlays in a way which reflects their potential for possible scale economies and absolute outlay entry barriers. Therefore, if scale economies and entry barriers due to advertising expenditures exist, advertising-sales data will not be sufficient to detect them.
3. Previous research failed to specify, in light of the above limitations, the several possible relationships which may exist between advertising expenditures and market concentration within and across industries. Consequently, economists have been attempting to determine empirically which theory is correct, with contradictory results, when, in fact, each separate theory may be appropriate under certain narrowly defined circumstances.
4. Earlier investigations failed to account for the entire advertising media mix, depending instead on examination of network television advertising outlays alone, or on total firm or on total industry advertising expenditures. Therefore, no direct evidence exists as to the differential impact of the various forms of advertising on aspects market structure, market conduct and market performance.
5. Previous research leaves the direction of causality in doubt, which makes single equation estimates biased.⁵³
6. Earlier investigations have "been plagued by potentially large measurement error and the use of small samples highly sensitive to the inclusion or exclusion of one or two industries."⁵⁴

⁵³Ibid., p. 38.

⁵⁴Ibid.

However, despite the many shortcomings of previous research, some economists have begun to recognize these limitations, and the literature already contains suggested means of overcoming them, as described below.

Specifying Advertising Intensity To Reflect Entry Barriers and Increasing Returns

Almost all studies done with respect to the impact of advertising on competition have employed the ratio of advertising-to-sales as an independent or dependent variable to specify advertising intensity. Use of the advertising-sales ratio, which is readily available from a number of government and industry sources and which facilitates inter-industry analysis of advertising intensity, has led to conflicting findings--even using the same data. The problem, in part, lies in failure to specify the correct relation of the ratio to potential consumer response, scale economies, increasing returns, quantity discounts, and absolute advertising outlays.

Comanor and Wilson (1967) were probably the first to suggest some of the shortcomings of the advertising-to-sales ratio.

. . . it is useful to examine the absolute volume of advertising expenditures by existing firms as well as the advertising-sales ratio. The latter variable probably provided a good indication of the absolute cost disadvantage of the new entrant at small scales of entry, but is likely to be a less accurate index of the economies of scale and absolute capital requirements effects of advertising.⁵⁵

However, in their empirical work, Comanor and Wilson were forced to use average advertising expenditures per firm instead of actual

⁵⁵William S. Comanor and Thomas S. Wilson, "Advertising, Market Structure, and Performance," Review of Economics and Statistics 49 (November 1967): 428.

absolute advertising expenditures, which has a spurious positive relationship with market concentration because the average advertising expenditure per firm tends to increase as concentration increases.⁵⁶

Further major theoretical shortcomings with the use of the advertising-to-sales ratio as a measure of advertising's economic impact have been highlighted by Ferguson (1974).

. . . economies of scale due to media rate structure are a function of the level of advertising expenditures, not of the ratio of advertising to sales. Also, increasing returns to creating consumer awareness are a function of the quantity of advertising messages received by consumers, not the ratio of advertising to sales. Only if the ratio of advertising expenditures to sales is highly correlated with the levels of advertising expenditures and advertising messages will the ratio be an appropriate variable to use in a test of the effect of advertising on monopoly.⁵⁷

Whether the advertising-sales ratio is an adequate proxy of advertising expenditures, hence a measure of economies of scale due to advertising and a measure of entry barriers due to advertising, is an open empirical question that has never been tested directly in the literature. The discussion below strongly suggests that the advertising-sales ratio is not necessarily a good proxy of advertising expenditures. Ornstein (1977) elaborates:

Although previous studies have not used total advertising as the dependent variable . . . this use may be more appropriate than the use of the advertising-to-sales ratio. Much of the theory simply states that there will be more or less advertising, not that there will be higher or lower advertising intensity. Furthermore, the conventional theory on advertising as a barrier to entry implies that the absolute level of advertising expenditures is a more appropriate measure of capital requirements or economies of scale than advertising intensity. The larger the amount spent on

⁵⁶See, Stanley Ornstein, Industrial Concentration and Advertising Intensity, p. 43.

⁵⁷James M. Ferguson, Advertising and Competition; Theory, Measurement, Fact, pp. 57-58.

advertising, the greater will be the potential economies and the higher the capital requirements (if they exist).⁵⁸

Finally, Simon (1970) has provided considerable discussion and some evidence that the advertising-sales ratio can lead researchers to faulty conclusions. For example:

advertising-ratio data alone are not competent to serve as the basis for any general investigation of the economics of advertising. The behavior of advertising expenditures in the depression of the 1930s is an example of how advertising ratio data can be misleading. If one looks at the proportion of net sales spent for advertising by department (and specialty) stores from, say, 1929 to 1944, the highest ratio occurred in 1932. . . . This suggests that advertising "intensity" rose in the depths of the depression. But if one looks at the absolute amount spent for advertising by department stores, one sees that it dropped sharply from a high in 1929 to a low in 1933, and was almost as low in 1932 as in 1933. . . . This shows that the use of the ratio data alone would almost surely lead a researcher to the wrong conclusion.⁵⁹

Amplifying the reasoning above leads to the following conclusions about advertising expenditures:

1. Entry barriers and increased market concentration due to advertising are a function of brand loyalty, economies of scale, increasing returns to advertising messages and absolute advertising outlays. (See Figure I and the corresponding discussion above.)
2. Economies of scale resulting from media rate structures are a function of absolute advertising expenditures by a firm or a brand in a particular advertising media vehicle.
3. The amount of consumer awareness and brand loyalty is a function of the quantity and effectiveness of advertising messages.

⁵⁸ Stanley I. Ornstein, Industrial Concentration and Advertising Intensity, p. 43.

⁵⁹ Julian Simon, Issues in the Economics of Advertising, p. 310.

4. The quantity (reach x frequency or gross exposures) of advertising messages is a function of absolute advertising expenditures.
5. The effectiveness of advertising messages, on average, is a function of advertising production expenditures for the analysis of consumer and market research, for creative energies, for copy testing and so on.⁶⁰
6. Advertising production expenditures are a function of absolute advertising expenditures.⁶¹
7. From 3 through 6 it follows that the amount of consumer awareness and brand loyalty is a function of absolute advertising expenditures.
8. Therefore, from 1, 2 and 7 it follows that entry barriers and that increased concentration due to advertising are a function of absolute advertising expenditures.

In summary then, there appears to be no theoretical rationale for the use of the advertising-sales ratio as a proxy of advertising expenditures. The measure changes in response to changes in advertising expenditures and to changes in sales. Furthermore, holding advertising expenditures constant, the advertising-sales ratio is inversely related

⁶⁰This is a debatable premise in that it does not account for the highly publicized examples of creative insight that bring about spectacular results far out of proportion to the effort and expense that went into producing them. But it seems reasonable to assume that such examples are the exception and not the rule. There are probably an equal (or greater) number of examples where the reliance on quick and dirty creative intuition led to market disaster.

⁶¹For example, advertising agencies often receive a 15 percent commission on their clients' advertising media expenditures as compensation for creating and placing advertising messages. Thus, the larger is the total advertising expenditure, the greater will be the amount an agency receives from its commission and the more extensive will be the services which the agency provides for its clients.

to changes in sales. On the other hand, there appears to be strong theoretical support for the use of advertising expenditures unadjusted by sales since the larger is a firm's or a brand's advertising expenditures, the greater is the potential for barrier producing brand loyalty, scale economies, increasing returns to advertising messages, quantity discounts which favor large, multi-product, multi-industry advertisers and increased market concentration.

Fortunately, the proposition that the advertising-sales ratio is not a good proxy of advertising expenditures can be subject to a direct empirical test.

The Relationships Between Advertising Outlays And Market Concentration Within Product Categories

It has also been suggested that a distinction should be made between the level of advertising intensity of large firms and the level of advertising intensity of other firms within an industry.

Yang (1966) made a clear distinction between the absolute and the relative intensity of advertising stating:

The absolute advertising intensity hypothesis (implies) the assumption that the absolute volume of advertising expenditures (or the absolute level of advertising intensity) for a given industry influences its concentration ratio.⁶²

Yang also stated:

The relative advertising intensity hypothesis . . . states that the extent to which advertising affects industrial concentration

⁶²Charles Yneu Yang, "Industrial Concentration and Advertising," Hearings before Subcommittee on Antitrust and Monopoly of the Committee on the Judiciary, U.S. Senate, Part 5: Concentration and Divisional Reporting, Appendix S. Washington, D.C.: U.S. Government Printing Office, 1966, p. 2153.

depends to a large extent on the change in the advertising intensity of the dominant firms relative to the remaining firms in the industry.⁶³

Analysis of evidence led Yang to conclude that the absolute level of advertising intensity, as measured by the advertising-sales ratio, was not significantly related to concentration.⁶⁴ On the other hand, he found a significant positive relationship between the change in advertising share of the leading companies in his industry sample and the corresponding change in their market shares.⁶⁵

Yang's statistical analysis has been criticized.⁶⁶ Nevertheless, his reasoning has considerable face validity worthy of further investigation.

Subsequently, Friedland (1974) provided a more complex structure to illustrate clearly the several dimensions in the relative advertising intensity hypothesis (based on the advertising-to-sales ratio).

It assumes that industry concentration is determined by the relative intensities of large and small firms' advertising—that when large firms advertise more relative to sales than small firms, then the large firms become still larger relative to small firms, and concentration rises. Conversely, it assumes that when small firms

⁶³Ibid., p. 2154.

⁶⁴Ibid., p. 2162.

⁶⁵Ibid.

⁶⁶See for example, James M. Ferguson, Advertising and Competition; Theory, Measurement, Fact, p. 93. Although Yang finds a significant positive relationship between changes in concentration and changes in advertising share of the leading firms, Ferguson concludes that: ". . . these results are derived from an incorrectly specified regression in which both the average and the change in advertising intensity variable are included, but only the change in (and not the average) of the advertising share is included. Multicollinearity between the two advertising-intensity variables practically ensures the non-significance of their coefficients. He should have correlated the change in concentration on the change in each of the two advertising variables (excluding the level variables)."

advertise more relative to sales than large firms, then the small firms grow more rapidly than the large firms, and concentration falls. Thus, when large firms' advertising is intensive but small firms' advertising is light, it predicts high concentration. When large firms do not advertise intensely but small firms do, it predicts low concentration. Column 4 (below) reflects these predictions.

Column 3 is derived from Columns 1, 2 and 4. In Line A, all firms have high advertising-sales ratios, so the industry's advertising-sales ratio is also high. Line D presents the analogous case for low ratios. In Line B, the largest firms advertise intensely while the smaller firms spend a small fraction of their sales dollars on advertising. Since Column 4 indicates that concentration is above average in this industry, one weights the large firms' ratio more heavily. This suggests that industry-advertising intensity is medium-high. Similarly in Line C, small firms advertise more intensely than large firms and concentration is below average. One therefore weights the smaller firms' advertising more heavily; again one expects medium-high advertising intensity for the whole industry.⁶⁷

PREDICTIONS OF INDUSTRY CONCENTRATION ON THE BASIS OF THE
DISTRIBUTION OF ADVERTISING AMONG THE FIRMS IN THE INDUSTRY

	1	2	3	4
	Advertising of largest four firms	Advertising of all smaller firms	Average industry ad- vertising	Expected Level of four-firm concentration
A	High	High	High	Medium
B	High	Low	Medium-high	High
C	Low	High	Medium-high	Low
D	Low	Low	Low	Medium

When average industry advertising is medium high, concentration is expected to be either high or low, depending on the intra-industry advertising intensities. On the other hand, when concentration is medium, average industry advertising can likewise be either high or low depending on the respective advertising intensities. This underscores the significance of the relative advertising intensity hypothesis and

⁶⁷T. S. Friedland, "Possible Resolution of the Advertising--Concentration Debate," Quarterly Review of Economics and Business 14 (Spring 1974): 125.

explains why many studies regressing market concentration on average industry advertising intensities (Column 4 by Column 3 in Friedland's paradigm above) have not found a positive and significant statistical relationship,⁶⁸ while studies segmenting industries into homogeneous groups on the basis of large firm advertising intensity (Column 4, Rows A and B by Column 1, Rows A and B in Friedland's paradigm above) have found a significantly positive statistical relationship.⁶⁹

Friedland's simple paradigm has two shortcomings however. It confuses actual levels of market concentration with changes in market concentration and actual levels of advertising intensity with changes in advertising intensity. And it is based on the advertising-to-sales ratio. Nevertheless, each of these shortcomings can be easily overcome and the model can be usefully extended beyond market concentration to provide a powerful link between each of the five separate theories outlined above.

Friedland's discussion of his paradigm intermixes levels of advertising intensity and levels of market concentration with changes in advertising intensity and changes in market concentration. This problem is easily overcome by simply assuming, as Friedland apparently did implicitly, that each of the four Columns in his model refer to the level of advertising intensity or to the level of market concentration at a point in time and, further, that movement from one of the four Rows to another Row reflects the predicted change in outcome. For example,

⁶⁸See for example, Lester G. Telser, "Another Look at Advertising and Concentration," Journal of Industrial Economics 18 (November 1969): 85-94.

⁶⁹See for example, H. M. Mann, J. A. Henning and James W. Meehan, Jr., "Advertising and Market Concentration: An Empirical Investigation."

assuming a market situation characterized by Row D in period t , Friedland's model would predict that a change in the relative distribution of advertising intensity among the firms in the industry, such as that characterized by Columns 1, 2 and 3 of Row B, would bring about an increase in concentration so that Column 4 of Row B would characterize the outcome in period $t+1$.

Friedland's paradigm is also based on the advertising-sales ratio as a measure of advertising intensity as is typical of research of this type to date, except for Yang, who used advertising shares as a measure of relative advertising intensity. However, Yang's specification may be the correct one.

It was argued above that if the effects of advertising on competition are to be accurately assessed, advertising should be measured in absolute dollars instead of with the advertising-sales ratio. This respecification would more nearly reflect scale economies due to media rate structures, increasing returns to advertising messages and the absolute large size of advertising expenditures. However, absolute advertising expenditures are not comparable across industries. Advertising shares of firms or brands within an economically relevant market, on the other hand, are comparable across markets because they reflect the proportion of total market advertising accounted for by a particular firm or brand. Therefore, the advertising share variable, which reflects the intra-industry distribution of absolute advertising outlays is expected to provide a better (unbiased) estimate of the impact of advertising on competition within an industry than is the ratio of advertising-to-sales. However, advertising shares do not take into

consideration the differences in the absolute level of advertising expenditures between markets.

Friedland's relative advertising intensity paradigm can be usefully modified then, by substituting advertising shares in Columns 1 and 2 of his original model (see above), instead of using advertising-sales ratios. This substitution will change the relative intensities of Rows A and D to reflect the relative equality of advertising shares among the top and all other firms in an industry. The difference in the absolute level of advertising between industries A and D is still reflected in the average industry advertising intensity of Column 3, as originally specified by Friedland. Modified, the paradigm then becomes:

TABLE I

PREDICTIONS OF INDUSTRY CONCENTRATION ON THE BASIS OF THE DISTRIBUTION OF ADVERTISING AMONG THE FIRMS IN THE INDUSTRY

	1 Advertising <u>Share</u> of Larger Firms	2 Advertising <u>Share</u> of All Smaller Firms	3 Average Industry A/S Ratio	4 Expected Level of Market Concentration
A	Medium	Medium	High	Medium
B	High	Low	Medium-High	High
C	Low	High	Medium-High	Low
D	Medium	Medium	Low	Medium

The respecified model highlights: (1) the direct relationship which is expected between the advertising share of the top firms in an industry (Column 1) and market concentration (Column 4), (2) the expected lack of relationship between the advertising-to-sales ratio (Column 3) and market concentration (Column 4), and (3) the inverse

relationship which should exist between the advertising share of all smaller firms in an industry (Column 2) and market concentration (Column 4).

Friedland's reasoning can also be extended beyond market concentration to illustrate how each of the five separate theories outlined above are not necessarily incompatible. That is to say, the relative advertising intensity hypothesis is useful toward understanding the narrow conditions under which each separate theory is appropriate.

✓ The term "advertising" is used loosely in both the change-of-taste theory (see Figure I above) and the information theory (see Figure II above). Neither theory explicitly states whose advertising expenditures are involved. Each model tacitly assumes different kinds of advertising expenditures. The change-of-taste theory defines the expected impact of advertising outlays of the single large firm or of a group of large firms within an industry. The advertising-as-information theory addresses itself to the advertising outlays of all market participants and, further, appears to assume relative advertising equality among market participants. That is to say, because of the advertising by all market participants, consumers know of each market alternative equally. Therefore, the two models, which suggest opposite outcomes in terms of monopoly power over price, are not necessarily incompatible. The information approach addresses itself to the outcome anticipated when all market participants advertise equally in terms of message frequency and in terms of message effectiveness. But as soon as one or a few market participants violate that implicit assumption and advertise more heavily or more effectively than other market

participants, the change-of-taste model should predict the outcome. Thus, it is more likely that more consumers will know more about the one or the few market alternatives that are more heavily advertised or more effectively advertised. Therefore, the demand curves for these more heavily or more effectively advertised brands should become less elastic and tend to lead to more discretion over price.

The question then, is not which theory is correct, but rather, what is the relative distribution of advertising impact, either in terms of message frequency or in terms of message effectiveness or both, among market alternatives? When the distribution of advertising impact is spread relatively equally among the market participants, so that the consumers know equally of all of the market alternatives, Nelson's information model should explain the outcome: industry advertising increases the number of known alternatives, there is no small firm cost disadvantage due to advertising, advertising should facilitate entry, the presence of more actual and potential rivals should increase the price elasticity of demand and lead to lower prices and firms should earn normal returns. On the other hand, when the distribution of advertising impact is spread unevenly among the market participants, so that more consumers know more of one or of a few market alternatives, the Kaldor, Bain and Comanor and Wilson change-of-taste theory should explain the outcome: increasing returns and economies of scale due to advertising favor large firms at the expense of their smaller rivals and may increase minimum efficient scale and market concentration, increase brand loyalty, put small firms at a cost disadvantage and increase entry barriers, resulting in fewer actual and potential rivals and lower

price elasticity of demand leading to supra-normal profits for heavy advertisers.

A complete model then would combine the two separate theories, which suggest opposite outcomes, with the relative advertising intensity hypothesis as illustrated in Figure IV below.

The third theory, which suggests that non-advertising factors which influence entry barriers and market concentration can lead to higher or lower advertising, depending on the existence of collusion to restrict non-price competition, can also be incorporated without affecting the relationships suggested by the information and change-of-taste theories. The structure-collusion theory has therefore also been added to Figure IV below. The fourth and fifth theories cannot be incorporated usefully or explicitly into the previous discussion or into Figure IV. The spurious association theory suggests that advertising and market concentration may be related in the absence of traditional arguments for scale economies and entry barriers due to advertising because advertising may help large firms exploit economies of large scale production and distribution, cope with buyer turnover and large diversified markets. Furthermore, the spurious association theory suggests that large firms may have gotten large because of superior product quality and it therefore pays to advertise heavily a superior product. The interaction theory argues that advertising and market concentration interact and that they are jointly determined by other factors, such as the number and turnover rate of buyers, consumer characteristics and so on.

Unfortunately, it is no easier a task to test empirically any of the inter-relationships suggested by Figure IV below than it would be to

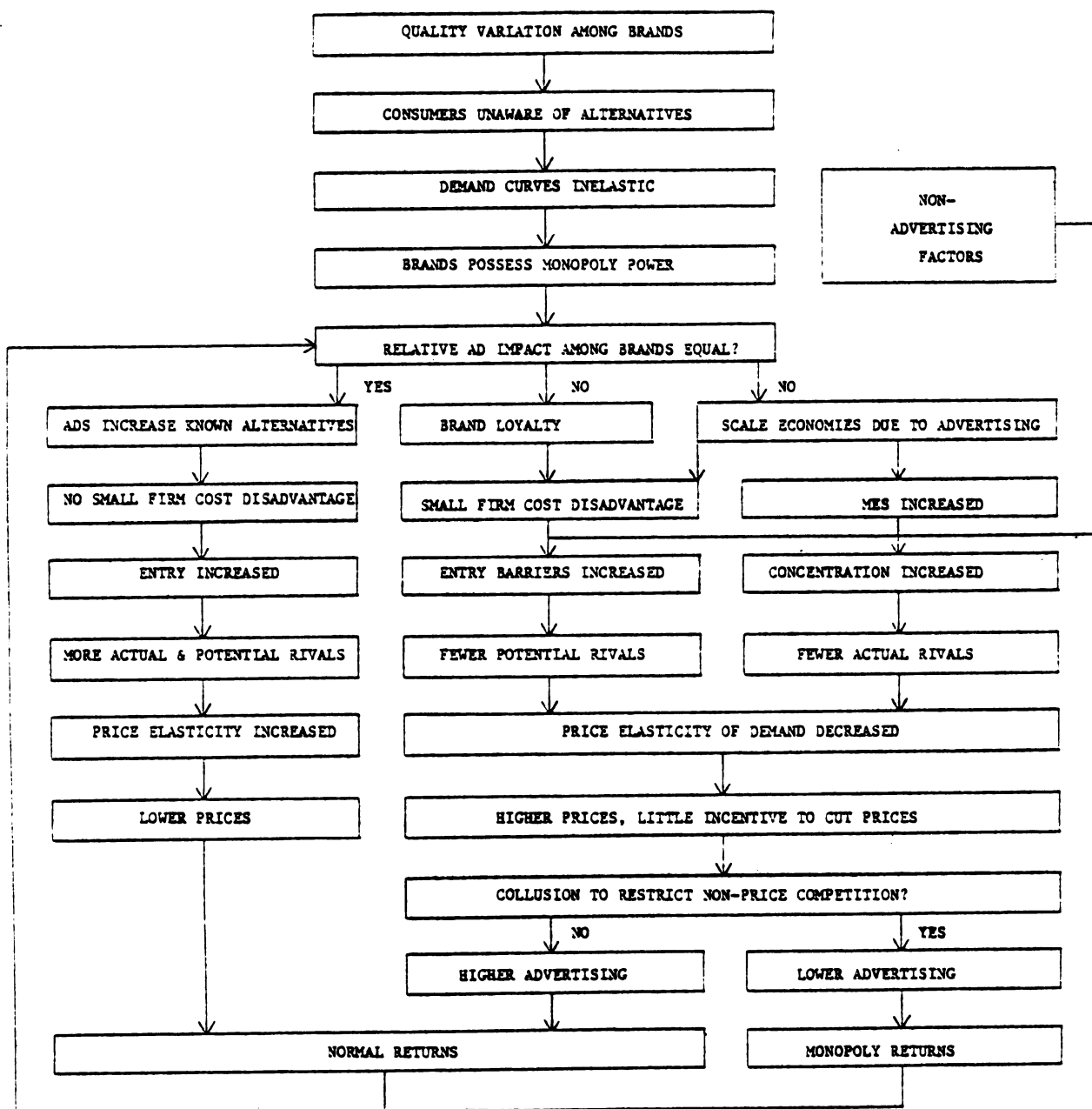


Figure IV. Several Possible Relationships Between Advertising and Competition

test the inter-relationships among elements of each of the separate theories. However, the discussion above, which is based on an understanding of the relative distribution of advertising among the firms in an industry, does suggest the conditions which may be necessary for a particular model to explain the circumstances which characterize a particular market structure, market conduct and market performance relative to advertising as well as the impact that changes in market circumstances are likely to have on market structure, market conduct and market performance.

Accounting for the Advertising Media Mix

There are two principal reasons why it may be inappropriate to aggregate advertising expenditures in a single index such as the advertising-sales ratio: (1) some advertising media categories may be more persuasive in content and therefore more conducive to consumer inertia (brand loyalty) and decreased competition while other advertising media categories may be more informative and conducive to consumer disloyalty and increased competition, and (2) some advertising media rate structures may favor large, multi-product, multi-industry advertisers at the expense of their smaller rivals while other advertising media may not favor large advertisers. Each of these possibilities will be discussed below more fully.

Informative versus Persuasive Advertising

Several economists have attempted to distinguish between informative and persuasive advertising, arguing that each type affects

economic performance differently.⁷⁰ On one hand, persuasive or goodwill advertising is thought to have anti-competitive effects to the extent that it encourages buyer inertia and brand loyalty which increases entry barriers. On the other hand, informative advertising discourages satisfaction with habitual or uninformed behavior in the marketplace and therefore stimulates competition by facilitating entry. There is some limited empirical evidence that the distinction may be valid.

A recent study by Resnik and Stern (1977) published in the marketing literature showed that even with food, personal care products and the like, only 23.5 percent of commercials sampled included one or more information cues such as price, quality and performance.⁷¹

Boyer (1974) found a significant differential impact between informative versus persuasive advertising after dividing a sample of industries into two distinct groups: (1) consumer goods manufacturers, who undertake primarily persuasive advertising, and (2) retail and service trades, whose advertising is characterized as chiefly informative.⁷² While Boyer found a strong positive correlation between advertising intensity and industry profitability in the consumer goods manufacturing sector, no such relationship existed in the retail and service

⁷⁰See for example, Kenneth D. Boyer, "Informative and Goodwill Advertising," The Review of Economics and Statistics 56 (November 1974): 541-548, and Fred M. Scherer, Industrial Market Structure and Economic Performance, Chapter 14.

⁷¹See Alan Resnik and Bruce L. Stern, "An Analysis of Information Content in Television Advertising," Journal of Marketing 41 (January 1977): 50-53.

⁷²Kenneth D. Boyer, "Informative and Goodwill Advertising," p. 543.

sector. Boyer thus recommends that the heterogeneous nature of advertising should be recognized when undertaking research and formulating policy.

Another approach to drawing a distinction between informative and persuasive advertising is to consider the distribution of advertising expenditures among media, as Scherer (1970) did with 1965 U.S. advertising expenditures.

Newspaper advertising, accounting for nearly 30 percent of total outlays, is preponderantly of an informative character, although (as any erstwhile home seller knows) even classified ads are written in persuasive fashion. However unwelcome it may be to the deluged recipient, direct mail advertising plays a largely informative role, as do many of the advertisements in business and farm periodicals. The information content of radio and television commercials is also not zero, despite a seemingly magnetic attraction toward that value. Even outdoor billboards sometimes supply wanted information, as travelers who sought gasoline or lodging in the early sign-less days of the U.S. interstate highways can testify. If a horseback generalization must be hazarded, it would be that half of all advertising expenditures cover messages of a primarily informative character, while the other half serve largely to persuade.⁷³

But since 1965, the relative distribution of advertising expenditures among the various media has changed as Table II illustrates below. It appears that the persuasive advertising media, which Scherer suggested might include radio, television and outdoor, have increased in importance relative to the more informative media, such as newspapers, magazines, business and trade publications and direct mail. And if a horseback generalization must be hazarded, to use Scherer's phrase, it would be that more than half of all advertising is now persuasive while less than half is now informative.

⁷³Fred M. Scherer, Industrial Market Structure and Economic Performance, p. 326.

TABLE II

U.S. ADVERTISING EXPENDITURES IN 1965 AND IN 1975

Medium	Millions of Dollars		Percent	
	1965	1975	1965	1975
Newspapers				
Classified ads	1,200	a		
Local display	2,400	7,221		
National display and other	857	1,221		
Magazines				
Farm publications				
Business and trade publications				
Television				
Network	1,237	2,306		
Local	412	1,334		
Spot	866	1,623		
Radio				
Network	60	83		
Local	589	436		
Spot	268	1,461		
Direct Mail				
Outdoor billboards and signs				
Miscellaneous				
TOTAL				

Sources: Printers' Ink, February 24, 1967, pp. 9-10; Jules Backman, Advertising and Competition (New York: New York University Press, 1967), pp. 30 and 161-179; Neil H. Borden, The Economic Effects of Advertising (Chicago: Irwin, 1942), pp. 52-58; Fred M. Scherer, Industrial Market Structure and Economic Performance (Rand McNally, 1970), p. 326; and Robert J. Cohen, "Advertising volume to top \$36.5 billion in 1977," Advertising Age, December 27, 1976, pp. 3 and 46.

^aA separate breakdown for 1975 is not available.

If the informative-persuasive advertising distinction is valid, as theory and evidence suggest it might be, then research into the effects of advertising on competition should attempt to clearly distinguish between the two. And if particular advertising media can be characterized as either primarily informative or primarily persuasive, aggregating advertising expenditures across advertising media (as each of the studies included in Appendix A has done) is inappropriate. For example, research might support the change-of-taste theory of advertising effects in industries which rely heavily upon more "persuasive" media while research might support the information theory of advertising effects in industries which rely heavily upon more "informative" media.

Network Television Advertising

In addition to the chiefly persuasive character of the medium, several researchers have singled out imperfections in the supply of network television advertising as being particularly conducive to entry barriers and increased market concentration in the manner outlined in the change-of-taste theory of advertising impact above.

Some researchers have argued that network television volume discounts favor large multi-product, multi-industry advertisers at the expense of their smaller rivals.⁷⁴ In contrast, other researchers have presented cost-per-thousand household evidence which suggests that large advertisers do not receive a lower cost-per-thousand households reached

⁷⁴See John M. Blair, Economic Concentration, Structure, Behavior and Public Policy, pp. 308-334.

than their smaller counterparts.⁷⁵ But since network advertising rates are largely negotiated, with rate cards serving merely as a starting point, and since the ideal measure of the relative value of advertising time to advertisers is cost-per-prospect reached and not merely cost-per-thousand, this issue may never be satisfactorily resolved because such proprietary data is not likely to become readily available.

Still other researchers have argued that since there are no perfect substitutes for television advertising within some industries, indivisibilities in the supply of network television advertising time, which are similar across the three major networks, require network advertisers to use a large portion of the network station lineup which precludes a gradual buildup of scale. On one hand, this requires large absolute capital outlays on the part of the network advertisers attempting to effectively compete on a national scale. On the other hand, television advertisers in the same product category who are too small to effectively utilize the networks are at a great cost disadvantage since network rates can range from 10 to 70 percent of the sum of the rates of the individual stations in the network lineup.⁷⁶

A major limitation of studies attempting to focus directly on the relationship of network television advertising expenditures to market concentration has been, among other things, a failure to take into consideration the relative importance of network television

⁷⁵See David M. Blank, "Television Advertising: The Great Discount Illusion on Tonypandy Revisited," James M. Ferguson, "Anticompetitive Effects of the FTC's Attack on Product Extension Mergers," and John L. Peterman, "The Clorox Case and Television Rate Structure."

⁷⁶See Michael E. Porter, "Interbrand Choice, Media Mix and Market Performance," p. 403.

advertising given a firm's or brand's entire advertising media mix, depending instead on examination of network television advertising outlays alone. Since it is likely that a high correlation exists between network television advertising expenditures and other advertising media expenditure, omitting other elements of a firm's or brand's advertising media mix could seriously overstate the relative importance of network television advertising.⁷⁷

Causality

Five theories suggest three conflicting causal linkages between advertising intensity and market concentration: (1) advertising intensity affects market structure, (2) market structure affects advertising intensity and (3) advertising intensity and market structure interact and are jointly determined by other factors. And, the empirical evidence is compatible with a number of conflicting interpretations. None of the three kinds of evidence needed to support causal inferences exist, including: (1) concomitant variation, (2) time order of occurrence of variables and (3) the elimination of other possible causes.⁷⁸ Previous empirical research has found both significant and non-significant relationships between measures of advertising intensity and measures of market concentration with about equal frequency. Most of

⁷⁷ See for example, Blair, Economic Concentration, Structure, Behavior and Public Policy, pp. 308-334. For a detailed discussion of other shortcomings of Blair's 1972 study, see James M. Ferguson, Advertising and Competition; Theory, Measurement, Fact, pp. 97-98.

⁷⁸ For a complete discussion of the kinds of evidence needed to infer causality, see Gilbert A. Churchill, Jr., Marketing Research: Methodological Foundations (Hinsdale, Illinois: The Dryden Press, 1979), pp. 67-73.

the research is cross sectional and not time series. And so many other factors influence market structure and advertising intensity that it is unlikely that the separate effects of either variable can be satisfactorily isolated with the limited data currently available.

This study addresses itself to the change-of-taste, the theory of Kaldor, of Bain and of Comanor and Wilson, but it argues for measures of advertising intensity that fit the theory. Nevertheless, the empirical analysis of cross sectional data with single equation estimation takes the hypothesis of this study far short of the distance required to infer causality.

Measurement Error and Sample Size

Three primary shortcomings in the data bases used in previous research are: (1) small samples, (2) aggregated measures of advertising intensity and of industry concentration and (3) non-constant error.

Except for Ornstein's (1977) study, previous research has relied heavily upon relatively small samples, which introduces large potential error that could be avoided with much larger samples. Therefore, the use of large samples, both within and across industries, can help further reduce the potential measurement error found in previous investigations.

Another source of measurement error found in earlier studies arises from the insensitivity of measures of advertising intensity and of industry concentration at high, three and four-digit IRS and SIC levels of aggregation.

It turns out that assigning firms to SIC industries and the IRS industries both involve severe statistical problems owing to errors in measurement and aggregating data whose net effect is

indeterminate, with the measurement errors biasing correlation downward and the aggregation errors biasing it upward.⁷⁹

Ideally, brand level advertising expenditures and brand level sales within narrowly defined and economically relevant markets can effectively overcome these shortcomings.

Finally, previous studies have relied heavily upon measures of total industry sales and of total industry advertising, which introduces the possibility of non-constant error terms (heteroscedasticity) into the estimation in violation of the ordinary least squares assumption of constant error (homoscedasticity). The problem arises due to the highly skewed distribution of the size variables across industries--a few industries have very large size values while other industries have relatively small size values. This problem has been reduced by some researchers who have transformed the sales and the advertising variables into logarithms.⁸⁰

If this body of literature is to advance beyond its present inconclusive state, it was recommended above that future analysis of the relationships between advertising intensity and market concentration should be conducted both across and within economically relevant markets. But this introduces the potential size bias outlined above both within and across product categories. Therefore, it is necessary to transform the advertising and the sales data in a way that eliminates the potential for size bias in both instances. The advertising share variable introduced above accomplishes this goal.

⁷⁹For an excellent discussion of the limitations of IRS and SIC data, see Stanley Ornstein, Industrial Concentration and Advertising Intensity, pp. 16-18.

⁸⁰Ibid., pp. 43-44.

CHAPTER III

RESEARCH HYPOTHESES

The literature review and the discussion of the shortcomings of previous research suggested three general propositions which can be tested directly: (1) whether the advertising-sales ratio is a good proxy of advertising expenditures, (2) whether there exist technical or pecuniary scale economies due to advertising, and (3) whether network television is a more important source of scale economies than other advertising media categories.

Earlier research relied almost exclusively on the conveniently available advertising-to-sales ratio as a measure of advertising intensity which was comparable across industries. But it was argued above that the use of the advertising-sales ratio was theoretically incorrect because it did not necessarily correlate with potential barriers to new firm entry due to advertising, with increasing returns to advertising messages, with scale economies due to media volume discounts and with high absolute advertising outlay entry barriers.

Only if the advertising-sales ratio is highly correlated with advertising expenditures is it appropriate to use to test the effect of advertising on competition. The discussion above strongly suggests that the advertising-sales ratio is not necessarily a good proxy of advertising expenditures. Therefore, there should be little or no correlation

between the corresponding advertising-sales ratios and advertising expenditures for product categories, firms or brands. It is important to test this proposition directly, for the first time, because if there is little or no correlation between the two measures, previous research, which relied heavily on the ratio of advertising-to-sales, was biased and probably understated the impact of advertising on competition.

If the above reasoning is correct, Hypothesis I below should not be rejected.

Hypothesis I

Within the consumer non-durable goods sector of the economy, there is no correlation between advertising-sales ratios and advertising expenditures for product categories, for firms or for brands.

Those who have argued that advertising leads to market concentration usually assume that there are increasing returns to advertising messages or that there are economies-of-scale due to media volume discounts which favor heavy advertisers and which increase minimum efficient scale within an industry faster than industry size increases. There is some evidence that increasing returns to advertising messages do not exist for single brands and there is contradictory indirect evidence concerning the existence of economies-of-scale due to advertising intensity. There is also conflicting evidence as to the existence of scale economies due to network television rate structures. If the existence of technical or pecuniary scale economies due to advertising cannot be demonstrated, advertising cannot, by itself, directly lead to market concentration. If advertising and market concentration are

related in the absence of technical or pecuniary scale economies due to advertising, it must be due to factors other than advertising which influence the level of industry advertising or influence the level of market concentration.

Hypotheses II and III below are direct tests of the existence of technical or pecuniary scale economies due to firm or brand total advertising expenditures or due to firm or brand expenditures in particular advertising media categories.

Hypothesis II

Within the consumer non-durable goods sector of the economy, a production function with firm or brand sales (in units or in dollars) as an output and with total firm or total brand advertising expenditures as inputs, will exhibit economies of scale in advertising.

Hypothesis III

Within the consumer non-durable goods sector of the economy, a production function with firm or brand sales (in units or in dollars) as an output and with six separate advertising media expenditures as inputs in: (1) network television, (2) spot television, (3) magazines, (4) newspaper Sunday supplements, (5) outdoor and (6) network radio, will exhibit economies of scale in advertising.

It was argued above that the correct measure of advertising to use in assessing the impact of advertising on competition is firm or brand advertising expenditures unadjusted by sales. However,

advertising expenditures are not comparable across industries and they introduce size bias and possible heteroscedasticity, while advertising shares are comparable across industries and contain essentially the same information. But advertising shares cannot take into account differences in the absolute level of advertising across industries.

Furthermore, it seems reasonable to assume that total advertising expenditures as well as selected advertising media expenditures vary across product categories with respect to their relationship to market share. On the other hand, it is also maintained that all advertising expenditures, or at least some advertising media expenditures, consistently contribute to market share across product categories. Therefore, at the outset, it is important to test the hypothesis that no differences exist across product categories with respect to the relationship between a brand's market share and that brand's share of: (1) all product category advertising or (2) product category advertising in particular media. This reasoning leads to Hypotheses IV and V.

Hypothesis IV

Across product categories within the consumer non-durable goods sector of the economy, differences exist with respect to the relationship between a brand's market share and a brand's share of all product category advertising media expenditures.

Hypothesis V

Across product categories within the consumer non-durable goods sector of the economy, differences exist with respect to the relationship between a brand's market share and a

brand's share of product category expenditures in each of the following six separate advertising media: (1) network television, (2) spot television, (3) magazines, (4) newspaper Sunday supplements, (5) outdoor and (6) network radio.

If differences are found across product categories with respect to the relationship of market share to total advertising share or to advertising media shares, then it would be incorrect to pool the industry sample or to make general statements as to the contribution to market share of all advertising or of particular advertising media. Each industry should be examined separately. Therefore, if advertising creates and maintains entry barriers or if there are increasing returns to advertising messages or if there are scale economies due to media volume discounts, then a brand's share of product category advertising should be positively related to a brand's market share. This reasoning suggests that if advertising contributes to entry barriers and to technical or to pecuniary scale economies, Hypothesis VI below should be accepted.

Hypothesis VI

Within a product category in the consumer non-durable goods sector of the economy, there is a positive relationship between a brand's market share and a brand's share of all product category advertising expenditures.

It was further argued that aggregation of advertising expenditures in a single index could be misleading because some advertising media categories may be more persuasive in content and therefore may be

more conducive to consumer inertia, to brand loyalty and to decreased competition, while other advertising media categories may be more informative and conducive to consumer disloyalty and to increased competition. In addition, some advertising media rate structures, such as network television rate schedules, may favor large, multi-product, multi-industry advertisers at the expense of their smaller rivals, while other advertising media may not give heavy advertisers a rate advantage. Therefore, Hypothesis VII, which extends Hypothesis VI to include advertising media shares instead of total advertising shares, should also be supported.

Hypothesis VII

Within a product category in the consumer non-durable goods sector of the economy, there is a positive relationship between a brand's market share and a brand's share of product category expenditures in each of the following six separate advertising media: (1) network television, (2) spot television, (3) magazines, (4) newspaper Sunday supplements, (5) outdoor and (6) network radio.

Assuming that total advertising shares and some individual media shares are positively related to market share and, assuming further, that differences exist in these overall relationships across product categories, then the next step is to directly examine the relative effectiveness of particular media categories within each economically relevant market. Since it has been suggested that certain advertising media, particularly network television advertising, are important contributors to market concentration, then within each product category we

should reject the hypothesis that the relationship between each advertising media share and market share is equal. This reasoning leads to Hypothesis VIII.

Hypothesis VIII

Within a product category, in the consumer non-durable goods sector of the economy, differences exist in the relationship between a brand's market share and a brand's share of expenditures in each of the following six separate advertising media: (1) network television, (2) spot television, (3) magazines, (4) newspaper Sunday supplements, (5) outdoor and (6) network radio.

If Hypothesis VIII is accepted, then it will be possible to directly compare the relationship of network television advertising shares to market shares with the relationship of the shares of all other media categories combined to market shares. This reasoning leads to Hypothesis IX.

Hypothesis IX

Within a product category in the consumer non-durable goods sector of the economy, a brand's share of network television advertising expenditures will explain more of the variation in a brand's market share than will a brand's share of expenditures in all other advertising media categories combined.

And finally, if it turns out that advertising-sales ratios are not highly correlated with advertising expenditures as expected in Hypothesis I above, then it might be instructive to duplicate the

regression equations used to test Hypotheses II through IX above using advertising-sales ratios instead of advertising expenditures. The regression results derived from using advertising-sales ratios could then be directly compared with the regression results obtained from using advertising expenditures to determine the direction and the magnitude of any differences which might exist. The results of this undertaking might, for the first time, shed some light on how previous research, which was conducted without the luxury of advertising expenditures at narrow and economically relevant levels of aggregation, may or may not have led researchers to the wrong conclusions. No a priori hypotheses regarding the nature and the scope of these differences are possible however.

CHAPTER IV

METHODOLOGY

Market shares and advertising expenditures, by media type, at the brand, firm and product category level were gathered for 19 consumer non-durable product categories. Table III below lists the product categories by name, the years for which compatible advertising and market share data are available and the number of firms and brands for which these data apply.

The brand level market share data were obtained from approximately 50 issues of Advertising Age from 1971 through 1976. Advertising Age obtained some of the product category data from its own sources, and the remaining data were acquired from Maxwell Associates of Richmond, Virginia.

Advertising expenditures matching the available market shares, including product category total advertising expenditures, were obtained from: LNA Class/Brand Year-to-Date Expenditures (New York: Leading National Advertisers, Inc., January-December, 1970-1975).

LNA prepares its own Publishers Information Bureau, Inc. (PIB) Magazine Advertising Analysis for general consumer magazines and for nationally distributed newspaper Sunday supplements. Expenditures are based on current one-time gross rates before discounts. The broadcast expenditure data LNA publishes are obtained from Broadcast Advertisers

TABLE III
INDUSTRY SAMPLE BREAKDOWN

	LNA* Code	Product Categories	1970	1971	1972	1973	1974	1975	Firm	Brand
1.	D112	Lip and eye beauty products	X	X	X	X	X	X	18	00
2.	D113	Perfumes	X	X	X	X	X	X	24	00
3.	D114	Makeup	X	X	X	X	X	X	17	00
4.	D115	Manicure preparations	X	X	X	X	X	X	12	00
5.	D121	Toothpaste, mouthwash		X	X	X	X	X	9	15
6.	D122	Toilet Soap			X	X	X	X	6	16
7.	D123	Feminine hygiene products			X		X	X	7	00
8.	D124	Deodorants		X	X	X	X	X	10	14
9.	D125	Shaving cream		X	X	X	X	X	7	7
10.	D141	Hair treatment		X	X	X	X	X	10	26
11.	D142	Shampoo Rinses			X	X	X	X	13	27
12.	F122	Cereals			X	X	X	X	7	47
13.	F310	Beer		X	X	X	X		19	00
14.	F320	Wine	X	X	X	X	X		24	00
15.	G112	Cigars	X	X	X	X	X		14	29
16.	G330	Restaurants			X	X	X		27	00
17.	G531	Pet foods				X	X		21	35
18.	H412	Detergents, light			X	X	X	X	4	8
19.	H413	Detergents, heavy			X	X	X	X	4	21

*Note that the first letter of the LNA code will be converted to its corresponding numeric value (i.e., D=4, F=6, G=7 and H=8) to facilitate all subsequent analysis and discussion.

Reports, Inc. (BAR), which monitor every broadcast minute during the year for the three major television and radio networks.

Average commercial minute costs for each program are provided to BAR by each network, based on the total revenues for each program before deduction of the agency commission. These rates are combined with the monitored brand activity to produce brand expenditures.⁸¹

BAR monitors 260 television stations in 75 top markets one full week per month.

BAR also contracts with a major advertising agency to provide commercial rates for each monitored station. These rates are a composite of this agency's experience in buying on these stations. Rates are individualized for each quarter hour, every day of the week, and are up-dated monthly. BAR combines the one-week data for 75 markets, projects it to monthly figures and produces national estimated brand expenditures.⁸²

LNA publishes outdoor advertising expenditures in cooperation with the Institute of Outdoor Advertising and the Outdoor Advertising Association of America. Outdoor expenditures represent national, poster and paint advertising in plant operator markets over 100,000 population.

For each of the 19 product categories for which brand and firm level market shares were available, corresponding media expenditures, by year, were obtained from LNA. Advertising media expenditures for each product category, firm and brand obtained from LNA include: (1) six media total advertising expenditures, (2) total magazine advertising expenditures, (3) total newspaper Sunday supplement advertising expenditures, (4) total network television advertising expenditures, (5) total spot television advertising expenditures, (6) total network

⁸¹LNA Class/Brand Year-to-Date Expenditures (New York: Leading National Advertisers, Inc., January-December, 1974), p. ii.

⁸²Ibid.

radio advertising expenditures and (7) total outdoor advertising expenditures.

Other researchers have obtained brand level local newspaper advertising expenditures from: Expenditures of National Advertisers in Newspapers (New York: Bureau of Advertising of the American Newspaper Publishers Association, 1967 and 1968).⁸³ However, publication of the data ceased after 1970. And since the market share data available for this research covers the years 1970 through 1975, and since market share data for only one product category is available at the brand level for 1970 (see Table III above) and for only six product categories at the firm level for 1970, newspaper advertising expenditures have not been included. The implications of this omission are outlined in Chapter VI, Limitations, below.

Pearson product moment correlations will be sufficient to directly examine the relationship between advertising sales ratios and advertising expenditures at the product category, firm and brand levels of aggregation. A significant positive correlation coefficient would be sufficient to reject the null hypothesis (Hypothesis I above). However, in the event that the null hypothesis is rejected, the degree to which the advertising-sales ratio serves as a proxy for advertising expenditures is not testable. Rather, it is a matter for subjective interpretation upon which reasonable persons could disagree.

Cobb-Douglas production functions will be estimated and will be checked for scale economies in accordance with Hypotheses II and III above. The logarithm of sales will be used as the dependent variable

⁸³See the technical appendix for Michael E. Porter, "Interbrand Choice, Media Mix and Market Performance."

and the constant term and the logarithm of the absolute amounts of total advertising expenditures and each separate advertising media expenditure will be used as independent variables.

The following equations will be estimated for each product category at the brand and at the firm levels of aggregation:

$$\log(S_i) = \log(a) + b_1 \log(A_{1i}) + e_i, \quad (1)$$

$$\begin{aligned} \log(S_i) = \log(a) + b_2 \log(A_{2i}) + b_3 \log(A_{3i}) + b_4 \log(A_{4i}) \\ + b_5 \log(A_{5i}) + b_6 \log(A_{6i}) + b_7 \log(A_{7i}) + e_i, \end{aligned} \quad (2)$$

Where:

S_i = total firm or brand sales,

i = brand or firm level observations, where $i = 1, 2, \dots, n$,

a = constant or intercept,

A_{1i} = firm or brand total advertising expenditures,

A_{2i} = firm or brand magazine advertising expenditures,

A_{3i} = firm or brand newspaper Sunday supplement advertising expenditures,

A_{4i} = firm or brand network television advertising expenditures,

A_{5i} = firm or brand spot television advertising expenditures,

A_{6i} = firm or brand network radio advertising expenditures,

A_{7i} = firm or brand outdoor advertising expenditures,

b_j = simple and multiple regression coefficients, where

$j = 1, 2, \dots, 7$, and

e_i = residual, error or disturbance term.

The simple and multiple regression analysis will ignore the time series nature of the data at the likely expense of an unknown degree of

serial correlation. The unequal number of years for most product categories, and missing years for some brands within product categories, presents some difficult analytical problems. Therefore, a pooled cross-sectional time series analysis will be employed.

Hypotheses II and III predict economies-of-scale to firm and brand advertising expenditures with sales as an output and total advertising expenditures and separate advertising media expenditures as inputs. The coefficient(s) of the independent variable(s) derived from estimating simple and multiple regression equations (1) and (2) above must be checked to see if they equal one or (in the case of multiple advertising media expenditures) sum to one. If the coefficients equal (or sum to) one, there are constant average advertising costs per dollar or per unit of sales with increases in total sales; if (the sum of) the coefficient(s) is/are greater than one, there are economies of scale in advertising and if the (sum of the) coefficient(s) is/are less than one, there are diseconomies of scale in advertising.

A further useful property of the Cobb-Douglas production function is that each coefficient can be interpreted as the elasticity of sales with respect to the corresponding total or separate advertising media expenditures. Thus, if total advertising is increased by one percent, and all other inputs are held constant, sales will increase by b_1 percent. The same reasoning applies to the relationship between sales and each of the separate advertising media expenditures.

To test the remaining hypotheses, the brand advertising media expenditure totals were divided by the corresponding industry advertising media expenditure totals to obtain each brand's share of that product category's media or total advertising expenditures. An example

of the procedure is illustrated in Table IV below with 1974 advertising expenditures for Budweiser beer, manufactured by Anheuser-Busch, Inc.

TABLE IV
BUDWEISER-BEER INDUSTRY ADVERTISING SHARES:
AN EXAMPLE

Advertising Expenditure Category	Budweiser Media Expenditures ⁸⁴	Beer Industry Media Expenditures ⁸⁵	Budweiser- Beer Indus- try Media Shares
Six Media Total	\$ 6,755,600	\$ 89,415,000	.0755
Magazines	478,000	3,666,300	.1303
Newspaper Sunday Supplements	00	36,000	.0000
Network Television	5,587,700	26,552,200	.1690
Spot Television	1,023,500	54,713,000	.0187
Network Radio	675,900	1,010,100	.6691
Outdoor	90,600	3,437,400	.0263

Simple and multiple linear regression analysis will be utilized to estimate the relation between brand market shares and total advertising shares and between brand market shares and individual media shares. Each of these relationships will be estimated across the 11 product categories with brand level data (pooled) as well as within each of the 11 product categories.

Total and individual media advertising shares will be regressed on brand level market shares as follows:

$$Y_i = a + b_1 X_{1i} + e_i, \quad (3)$$

$$Y_i = a + b_2 X_{2i} + b_3 X_{3i} + b_4 X_{4i} + b_5 X_{5i} + b_6 X_{6i} + b_7 X_{7i} + e_i, \quad (4)$$

⁸⁴Ibid., p. 191.

⁸⁵Ibid., p. 193.

$$Y_i = a + b_4 X_{4i} + b_8 X_{8i} + e_i. \quad (5)$$

Where:

Y = brand market share,

i = brand level observations, where $i = 1, 2, \dots, n$,

a = constant or intercept,

X_{1i} = brand total advertising share,

X_{2i} = brand magazine advertising share,

X_{3i} = brand newspaper Sunday supplement advertising share,

X_{4i} = brand network television advertising share,

X_{5i} = brand spot television advertising share,

X_{6i} = brand network radio advertising share,

X_{7i} = brand outdoor advertising share,

X_{8i} = brand share of all advertising media expenditures except
network television advertising expenditures.

b_j = simple and multiple regression coefficients, where $j =$
1, 2, ..., 8, and

e_i = residual, error or disturbance term.

To test Hypothesis IV, which suggests that differences are likely to exist across all product categories with respect to the relationship between a brand's market share and a brand's share of total advertising expenditures, an overall F ratio will be computed. Adjusting for sample sizes and degrees of freedom, the overall F ratio will be based on a comparison of the error sums of square for the pooled simple regression, total advertising share model (see Equation 3 above) with the total of the error sums of square for each of the 11 separate

simple regression, total advertising share models (also see Equation 3 above).⁸⁶

Similarly, to test Hypothesis V, which extends Hypothesis IV to include six separate advertising media shares instead of total advertising shares, an overall F ratio will again be computed. Again, adjusting for sample sizes and degrees of freedom, the overall F test will be based on a comparison of the error sums of square for the pooled multiple regression, advertising media share model (see Equation 4 above) with the total of the error sums of square for each of the 11 separate multiple regression, advertising media share models (also see Equation 4 above).

If total advertising shares or individual advertising media shares vary systematically across product categories with respect to their relationship to market share, as indicated by a significant overall F ratio, it would be misleading to use ordinary least squares on the pooled sample. An F statistic which rejects the null hypothesis would suggest additional analysis taking into consideration differences in parameters which occur when moving from one product category to another.

The t ratio is appropriate to test for positive and significant total advertising share regression coefficients within each of the 11 product categories suggested by Hypothesis VI (see Equation 3 above). Likewise, the t statistic is also appropriate to test for positive and significant advertising media share regression coefficients within each

⁸⁶For a fuller discussion of the test, see Jan Kmenta, Elements of Econometrics (New York: The MacMillan Company, 1971), pp. 373-374. This test allows for all regression parameters to change when moving from one product category to another.

of the 11 product categories suggested by Hypothesis VII (see Equation 4 above).

To test Hypothesis VIII, that within a product category not all advertising media share regression coefficients are equal, an F statistic will be computed, adjusted for sample sizes and degrees of freedom, by comparing the error sums of square for the reduced total advertising share model (see Equation 3 above) within a product category with the error sums of square for the full six media share model (see Equation 4 above) within the same product category.⁸⁷ A significant F ratio would indicate that within that product category not all advertising media shares affect market share equally. It is then appropriate to proceed to identify which of the six advertising media shares within a product category are the most strongly associated with market share.

To test Hypothesis IX, that network television advertising shares are more strongly associated with market share than are the shares of all other advertising media expenditures combined, an F test will again be computed for each product category after respecifying the multivariate equation to include only two independent variables: the network television advertising share and the share of all other advertising media expenditures combined (see Equation 5 above). This F test essentially determines whether within a product category the network television advertising share regression coefficient equals the regression coefficient of the share of all advertising media

⁸⁷For the specific test used, see Fred N. Kerlinger and Elazer J. Pedhazur, Multiple Regression in Behavioral Research (New York: Holt, Rinehart and Winston, Inc., 1973), pp. 233-237 and Harry H. Kelejian and Wallace E. Oates, Introduction to Econometrics: Principles and Applications (New York: Harper and Row, 1976), pp. 178-181.

expenditures combined. Adjusting for sample sizes and degrees of freedom, this F statistic will be computed for each product category by comparing the error sums of square for the reduced total advertising share model (see Equation 3 above) for that product category with the error sums of square for the full, two-media share model (see Equation 5 above) for the same product category.⁸⁸ A significant F ratio would indicate that within that product category network television advertising share explains significantly more of the variation in market share than the share of all other advertising media expenditures combined.

Finally, in the unlikely event that advertising-sales ratios are highly correlated with advertising expenditures, as expected in Hypothesis I above, then it might be useful to duplicate the regression equations used to test Hypotheses II through IX above using advertising-sales ratios instead of advertising expenditures or the logarithm of advertising expenditures. Therefore, total and individual media advertising-to-sales ratios will be regressed on brand level market shares as follows:

$$Y_i = a + b_1 X_{1i} + e_i, \quad (6)$$

$$Y_i = a + b_2 X_{2i} + b_3 X_{3i} + b_4 X_{4i} + b_5 X_{5i} + b_6 X_{6i} + b_7 X_{7i} + e_i, \quad (7)$$

Where:

Y = brand market share,

i = brand level observations, where i = 1, 2, ..., n.

a = constant or intercept,

⁸⁸For the specific test used see, Harry H. Kelejian and Wallace E. Oates, Introduction to Econometrics: Principles and Applications, pp. 178-181 and Fred N. Kerlinger and Elazer J. Pedhazur, Multiple Regression in Behavioral Research, pp. 233-237.

X_{1i} = brand total advertising-to-sales ratio,

X_{2i} = brand magazine advertising-to-sales ratio,

X_{3i} = brand newspaper supplement advertising-to-sales ratio,

X_{4i} = brand network television advertising-to-sales ratio,

X_{5i} = brand spot television advertising-to-sales ratio,

X_{6i} = brand network radio advertising-to-sales ratio,

X_{7i} = brand outdoor advertising-to-sales ratio,

b_j = simple and multiple regression coefficients, where

$j = 1, 2, \dots, 7$, and

e_i = residual, error or disturbance term.

The results of this comparison might shed some light on how previous research, which relied heavily on the advertising-sales ratio, may or may not have led researchers to the wrong conclusions. However, no a priori hypotheses regarding the direction and the magnitude of these differences are feasible.

CHAPTER V

EMPIRICAL RESULTS

Advertising-Sales Ratios Versus Advertising Expenditures

Hypothesis I, which predicts no correlation between advertising-sales ratios and advertising expenditures, clearly was rejected. Table V below presents the correlation coefficients, coefficients of determination, significance levels and sample sizes based on pooled estimates across 16 of the 19 product categories and on estimates for each of the 16 separate product categories at the product category, firm and brand levels of aggregation.

Advertising-sales ratios appear to most closely parallel advertising expenditures at the industry level of aggregation, while the relationship deteriorates substantially at the firm and at the brand level of aggregation.

Although Hypothesis I clearly is rejected, the question that the statistics in Table V must still address concerns whether the advertising sales ratios is a "good" proxy of advertising expenditures. This is an important question, since a high correlation between the two measures of advertising has been implicitly assumed to exist in practically all of the research to date dealing with the economic effects of advertising. If the correlation between the two measures of advertising, which apparently has never been estimated directly due to lack

TABLE V
CORRELATION COEFFICIENTS BETWEEN ADVERTISING-SALES
RATIOS AND ADVERTISING EXPENDITURES

Product Category/Aggregation Level	R	R ²	Alpha	N
<u>Pool*</u>				
Industry	.60	.36	.01	67
Firm	.14	.02	.01	615
Brand	.17	.03	.01	686
<u>4112--Lip and Eye Beauty Products</u>				
Industry	.96	.93	.01	6
Firm	-.01	.00	.45	75
<u>4113--Perfumes</u>				
Industry	.87	.75	.01	6
Firm	.39	.15	.01	101
<u>4114--Makeup</u>				
Industry	.77	.59	.03	6
Firm	.49	.24	.01	56
<u>4115--Manicure Preparations</u>				
Industry	.99	.98	.01	6
Firm	.04	.01	.40	36
<u>4121--Toothpaste and Mouthwash</u>				
Industry	.79	.63	.05	5
Firm	.62	.38	.01	30
Brand	.34	.11	.01	62
<u>4122--Toilet Soap</u>				
Industry	-.47	.22	.26	4
Firm	.44	.20	.02	20
Brand	.26	.07	.02	53

TABLE V--Continued

Product Category/Aggregation Level	R	R ²	Alpha	N
<u>4123--Feminine Hygiene Products</u>				
Industry	.68	.47	.25	3
Firm	.68	.47	.01	19
<u>4124--Deodorants</u>				
Industry	.52	.27	.18	5
Firm	.09	.01	.27	41
Brand	.16	.02	.11	52
<u>4125--Shaving Cream</u>				
Industry	.29	.08	.31	5
Firm	.91	.84	.01	25
Brand	.40	.16	.01	27
<u>4141--Hair Treatment</u>				
Industry	.99	.98	.01	5
Firm	.09	.01	.27	40
Brand	.20	.04	.01	100
<u>4142--Shampoo and Rinses</u>				
Industry	-.15	.02	.42	4
Firm	.33	.11	.01	47
Brand	.14	.02	.08	93
<u>6122--Cereals</u>				
Industry	-.98	.97	.01	4
Firm	-.40	.16	.01	31
Brand	.41	.17	.01	156
<u>7330--Restaurants</u>				
Industry	.99	.98	.04	3
Firm	.50	.25	.01	66

TABLE V--Continued

Product Category/Aggregation Level	R	R ²	Alpha	N
<u>7531--Pet Foods</u>				
Industry	N/A	N/A	N/A	2
Firm	.38	.14	.02	28
Brand	.27	.07	.01	64
<u>8412--Detergents, Light</u>				
Industry	.14	.02	.42	4
Firm	.72	.52	.01	13
Brand	.18	.03	.16	29
<u>8413--Detergents, Heavy</u>				
Industry	.91	.84	.12	3
Firm	.31	.10	.15	12
Brand	.09	.01	.21	76

*Note: Four product categories were deleted from the pooled correlations. Product categories 6310 (Beer), 6320 (Wine) and 7112 (Cigars) reported sales in barrels, gallons and units respectively. Therefore, advertising sales ratios for these product categories are not comparable to those of other product categories. Product category 4125 (Shaving Cream) is reported above separately, but is not included in the pooled correlations because its advertising-sales ratios are unusually high in comparison to other product category advertising-sales ratios. For example, when product category 4125 is included, the pooled product category correlation drops .33 to .27, the pooled firm correlation increases .02 to .16 and the pooled brand correlation remains .17, and all are still significant at the .01 level.

of sufficient data, is low, previous conclusions may have been based on a poor or biased estimate of advertising.

But Table V does not allow the luxury of an easy conclusion. Nevertheless, some generalizations seem apparent. The correlation is always less than one at every level of aggregation, which means that the advertising-sales ratio is certainly not a perfect proxy of advertising expenditures. Across the 16 product categories a positive and significant .60 correlation between the two measures of advertising exists at the industry level of aggregation. Only half of the 16 separate product category correlation coefficients are significant at least to the .10 level. Of these, one correlation coefficient is significantly negative at $-.98$ (see 6122, Cereals, in Table V above), while all other correlation coefficients are positive with four greater than .90 and the other three greater than .77.

Since the pooled industry correlation coefficient is greater than .50, it seems safe to conclude that the advertising-sales ratio is, on average, a fair to good proxy of advertising expenditures. But that interpretation is subject to dispute. In some specific product categories the ratio can be an excellent proxy of advertising expenditures, exhibiting very high, positive correlations. But, in still other product categories, it can be extremely poor, exhibiting very high, negative correlations.

At the firm and at the brand levels of aggregation, however, it must be concluded that the advertising-sales ratio is, on average, a very poor proxy of advertising expenditures. For firms, the pooled correlation coefficient equals .14 and is significant at the .01 level and

for brands the pooled correlation coefficient equals .17 and is significant at the .01 level.

At the firm level of aggregation ten of the 16 correlation coefficients are positive and significant at least to the .05 level and range from .33 (see 4142, Shampoo and Rinses, in Table V above) to .91 (see 4125, Shaving Cream, in Table V above). But the correlation coefficient equals $-.40$ in one product category (see 6122, Cereals, in Table V above) and is significant at the .01 level. Again, the variation in the correlation between the two measures of advertising at the firm level indicates that the advertising-sales ratio, on average, is a poor proxy of advertising expenditures. But, at the firm level, the advertising-sales ratio can be a good proxy of advertising expenditures in many product categories and it can be a very poor proxy in still other product categories.

Seven of the 11 product categories for which brand level data are available exhibit correlation coefficients between advertising-sales ratios and advertising expenditures that are positive and significant at least to the .10 level. These correlation coefficients range from .14 (see 4142, Shampoo and Rinses, in Table V above) to .41 (see 6122, Cereals, in Table V above). At the brand level of aggregation none of the significant correlation coefficients are negative. Interestingly, the cereal industry correlation coefficient is significantly positive at the brand level of aggregation, but is significantly negative at both the firm and the industry levels of aggregation.

In summary, it appears that there is a wide range in the correlation between advertising-sales ratios and advertising expenditures at the industry level of aggregation, but the average correlation is

moderately high. At progressively narrower levels of aggregation the range in the correlation is progressively narrower, but the average correlation is low.

One could speculate that if the correlations improve at progressively greater levels of aggregation, then perhaps the correlations are very good at three and four-digit IRS and SIC levels of aggregation. That is the level at which the bulk of previous research on the effects of advertising on competition has occurred.

Given the large variation in the relationship between advertising expenditures and advertising-sales ratios, it would be useful to compare the regression results below, that will be used to test the remaining hypotheses, with regression results derived from using advertising-sales ratios instead of advertising expenditures and advertising shares. Such a comparison might shed light on the question of whether the use of advertising-sales ratios in previous research has led researchers to the wrong conclusions.

Economies of Scale in Firm and Brand Advertising

Table VI below lists 60 regression equations obtained from regressing firm or brand sales (in units or in dollars), in logarithmic form, on total or separate advertising media expenditures in logarithmic form. The rows of Table VI contain one simple and one multiple regression equation at the firm level of aggregation for each of 19 available product categories. Table VI also contains one simple and one multiple regression equation at the brand level of aggregation for each of 11 product categories for which brand level data are available. The columns of Table VI include: (1) the years for which the data are

TABLE VI

REGRESSIONS OF FIRM OR BRAND SALES (LOG) ON FIRM OR BRAND ADVERTISING EXPENDITURES (LOG)
FOR 19 PRODUCT CATEGORIES, 1970-1975

Year(s)	Lconstn	Lnetwkt	Lspotv	Lmagazn	Lnetrd	Lnewspr	Loutdr	Ltotadv	R ²	F	N
<u>4112--Lip and Eye Beauty Products</u>											
1970-5 Firms	7.864 ^a (.3518)	-.1087 (.0299)	.0790 (.0292)	-.0245 (.0564)	.0621 ^b (.0304)	.1094 ^a (.0344)	-----		.28	6.80 ^a	75
1970-5 Firms	4.534 ^a (.6549)							.4895 ^a (.1147)	.18	18.20 ^a	75
<u>4113--Perfumes</u>											
1970-5 Firms	7.260 ^a (.1556)	.0334 ^a (.0091)	.0280 ^a (.0099)	.0135 (.0197)	.0419 ^a (.0141)	.0186 ^c (.0099)	-.0231 (.0313)		.37	9.45 ^a	101
1970-5 Firms	4.623 ^a (.3640)							.4719 ^a (.0626)	.36	56.72 ^a	101
<u>4114--Makeup</u>											
1970-5 Firms	6.804 ^a (.2676)	.0346 ^c (.0203)	.0402 ^b (.0196)	.0702 ^b (.0340)	-.0195 (.0464)	.0244 (.0180)	-----		.44	8.05 ^a	56
1970-5 Firms	5.076 ^a (.3896)							.3683 ^a (.0701)	.33	27.60 ^a	56

TABLE VI--Continued

Year(s)	Lconstn	Lnetwkt	Lspotv	Lmagazn	Lnetrd	Lnewspr	Loutdr	Ltotadv	R ²	F	N
<u>4115--Manicure Preparations</u>											
1970-5 Firms	3.869 ^a (.6476)	.0450 (.0317)	.0020 (.0222)	.6575 ^a (.1686)	-----	.0173 (.0258)	-----	.6690 (.1212)	.43	6.02 ^a	36
1970-5 Firms	3.535 ^a (.6476)							.6690 (.1212)	.47	30.45 ^a	36
<u>4121--Toothpaste and Mouthwash</u>											
1971-5 Brands	7.069 ^a (.0975)	.0628 ^a (.0136)	.0002 (.0200)	.0382 ^a (.0088)	-.0164 (.0122)	-.0088 (.0114)	-----		.57	14.94 ^a	62
1971-5 Brands	5.320 ^a (.2298)							.3425 ^a (.0357)	.60	91.85 ^a	62
1971-5 Firms	4.744 ^a (.4999)	-.0099 (.0216)	.4911 ^a (.0914)	.0171 (.0137)	-.0197 ^c (.0116)	-.0099 (.0112)	-----		.72	12.88 ^a	30
1971-5 Firms	4.916 ^a (.4798)							.4224 ^a (.0703)	.56	36.09 ^a	30
<u>4122--Toilet Soap</u>											
1972-5 Brands	6.903 ^a (.1475)	.0464 ^a (.0109)	.0548 ^b (.0246)	-.0003 (.0123)	.0155 (.0152)	.0039 (.0170)	-----		.53	10.75 ^a	53
1972-5 Brands	6.186 ^a (.2724)							.1838 ^a (.0447)	.24	16.84 ^a	53

TABLE VI--Continued

Year(s)	Lconstn	Lnetwkt	Lspotv	Lmagazn	Lnetrd	Lnewspr	Loutdr	Ltotadv	R ²	F	N
<u>4122--Toilet Soap--Continued</u>											
1972-5 Firms	5.389 ^a (.9665)	.4491 ^a (.1267)	-.0673 (.1139)	-.0069 (.0086)	.0026 (.0084)	.0194 ^c (.0095)	-----		.52	5.13 ^a	20
1972-5 Firms	3.362 ^a (.9757)							.6601 ^a (.1416)	.54	21.70 ^a	20
<u>4123--Feminine Hygiene Products</u>											
1972-5 Firms	7.799 ^a (.5298)	.0394 (.0385)	-.0436 (.0487)	.0036 (.0660)	.0634 (.0667)	.0448 (.0363)	-----		.32	1.22	19
1972-5 Firms	3.908 ^a (1.254)							.5697 ^a (.1962)	.33	8.42	19
<u>4124--Deodorants</u>											
1971-5 Brands	6.894 ^a (.1615)	.0548 ^a (.0177)	.0368 (.0287)	.0099 (.0152)	.0018 (.0141)	.0192 (.0160)	-----		.39	6.06 ^a	52
1971-5 Brands	5.155 ^a (.3584)							.3422 ^a (.0556)	.43	37.81 ^a	52
1971-5 Firms	6.642 ^a (.2710)	.0479 ^b (.0226)	.1050 ^b (.0508)	.0165 (.0160)	.0098 (.0131)	.0361 ^a (.0145)	-----		.53	7.96 ^a	41
1971-5 Firms	4.810 ^a (.4051)							.4081 ^a (.0612)	.53	44.46 ^a	41

TABLE VI--Continued

Year(s)	Lconstn	Lnetwkt	Lspotv	Lmagazn	Lnetrd	Lnewspr	Loutdr	Ltotadv	R ²	F	N
<u>4125--Shaving Cream</u>											
1971-5 Brands	6.968 ^a (.1403)	-.0081 (.0267)	.0453 ^a (.0169)	.0072 (.0102)	.0430 ^a (.0129)	-----	-----		.53	6.30 ^a	27
1971-5 Brands	4.631 ^a (.8696)							.3948 ^a (.1431)	.23	7.60 ^a	27
1971-5 Firms	8.106 ^a (.7783)	-.1806 (.1249)	.0606 ^a (.0078)	-.0091 ^b (.0044)	.0722 ^a (.0060)	.0100 (.0138)	-----		.94	66.31 ^a	25
1971-5 Firms	3.770 ^a (.8187)							.5368 ^a (.1318)	.41	16.57 ^a	25
<u>4141--Hair Treatment</u>											
1971-5 Brands	6.805 ^a (.1948)	.0481 ^a (.0096)	.0170 (.1459)	.0265 ^a (.0089)	.0064 (.0460)	.0340 ^b (.0145)	-----		.42	13.87 ^a	100
1971-5 Brands	5.207 ^a (.2208)							.3020 ^a (.0370)	.40	66.29 ^a	100
1971-5 Firms	6.985 ^a (.2137)	.0681 ^a (.0133)	.0485 (.0332)	.0201 (.0147)	.0077 (.0339)	.0583 ^a (.0221)	.0238 (.0355)		.72	14.78 ^a	40
1971-5 Firms	5.225 ^a (.2819)							.3395 ^a (.0461)	.58	54.04 ^a	40

TABLE VI--Continued

Year(s)	Iconstn	Lnetwkt	Lspotv	Imagazn	Lnetrd	Lnewspr	Loutdr	Ltotadv	R ²	F	N
<u>4142--Shampoo and Rinses</u>											
1972-5 Brands	7.200 ^a (.1425)	.0500 ^a (.0109)	-.0255 (.0234)	-.0018 (.0111)	.0256 ^c (.0137)	.0442 ^a (.0177)	-----		.32	8.38 ^a	93
1972-5 Brands	5.504 ^a (.2649)							.2605 ^a (.0444)	.27	34.38 ^a	93
1972-5 Firms	7.200 ^a (.1724)	.0467 ^a (.0150)	.0067 (.0037)	.0243 ^c (.0142)	.0149 (.0104)	.0400 ^a (.0131)	-----		.57	11.17 ^a	47
1972-5 Firms	5.652 ^a (.2948)							.2856 ^a (.0460)	.46	38.45 ^a	47
<u>6122--Cereals</u>											
1972-5 Brands	7.281 ^a (.1148)	.0322 ^a (.0078)	.0289 ^b (.0138)	.0179 ^a (.0057)	.0035 (.0100)	-.0017 (.0067)	.0651 ^a (.0223)		.29	10.28 ^a	156
1972-5 Brands	6.796 ^a (.0992)							.0891 ^a (.0159)	.16	31.27 ^a	156
1972-5 Firms	2.248 ^a (.3427)	.6489 ^a (.0478)	.2554 ^a (.0536)	-.0231 (.0458)	-.0031 (.0065)	-.0156 ^b (.0663)	.0045 ^a (.0083)		.95	81.19 ^a	31
1972-5 Firms	.4140 (.4146)							1.081 ^a (.0595)	.91	329.53 ^a	31

TABLE VI--Continued

Year(s)	Lconstn	Lnetwkt	Lspotv	Lmagazn	Lnetrd	Lnewspr	Loutdr	Ltotadv	R ²	F	N
<u>6310--Beer</u>											
1971-4 Firms	4.574 ^a (.6134)	.0033 (.0091)	.4132 ^a (.0764)	.0136 (.0091)	.0361 ^b (.0169)	-----	-.0820 (.0645)		.48	12.29	71
1971-4 Firms	3.067 ^a (.4709)							.5550 ^a (.0734)	.45	57.05 ^a	71
<u>6320--Wine</u>											
1970-4 Firms	6.996 ^a (.2150)	.0596 ^a (.0220)	.0317 (.0213)	.0298 (.0184)	.0677 (.0545)	-.0124 (.0393)	.0135 (.0219)		.39	5.27 ^a	55
1970-4 Firms	4.326 ^a (.2429)							.4647 ^a (.0450)	.66	106.58 ^a	55
<u>7112--Cigars</u>											
1970-4 Brands	8.545 ^a (.0985)	.0264 ^a (.0103)	.0270 ^a (.0102)	.0065 (.0104)	.0133 (.0155)	-.0189 ^c (.0112)	.0775 ^a (.0193)		.38	10.47 ^a	106
1970-4 Brands	7.133 ^a (.2952)							.2142 ^a (.0536)	.13	15.97 ^a	106
1970-4 Firms	8.482 ^a (.1187)	.0182 (.0143)	.0824 ^a (.0157)	.0210 (.0179)	-.0188 (.0196)	.0050 (.0145)	.0550 ^a (.0185)		.64	13.75 ^a	53
1970-4 Firms	6.393 ^a (.4480)							.3907 ^a (.0787)	.32	24.66 ^a	53

TABLE VI--Continued

Year(s)	Lconstn	Lnetwkt	Lspotv	Lmagazn	Lnetrd	Lnewspr	Loutdr	Ltotadv	R ²	F	N
<u>7330--Restaurants</u>											
1972-4 Firms	8.558 ^a (.1539)	.0252 ^a (.0095)	.0157 ^c (.0084)	-.0002 (.0103)	.0519 ^a (.0160)	.0768 ^a (.0303)	.0233 (.0162)		.55	12.02 ^a	66
1972-4 Firms	7.151 (.1874)							.1852 ^a (.0319)	.34	33.59 ^a	66
<u>7531--Pet Foods</u>											
1973-4 Brands	7.375 ^a (.1424)	.0272 ^a (.0106)	.0369 ^b (.0158)	.0260 ^a (.0100)	-----	-.0021 (.0099)	.0636 ^b (.0330)		.43	9.10 ^a	64
1973-4 Brands	5.062 ^a (.3697)							.3911 ^a (.0603)	.40	42.03 ^a	64
1973-4 Firms	6.224 ^a (.7019)	.0418 ^a (.0130)	.2357 ^a (.1162)	.0034 (.0109)	-----	.0133 (.0129)	.0533 ^a (.0256)		.77	14.83 ^a	28
1973-4 Firms	4.162 ^a (.3712)							.5442 ^a (.0594)	.76	83.80 ^a	28
<u>8412--Detergents, Light</u>											
1972-5 Brands	6.238 ^a (1.131)	.0384 (.0246)	.1672 (.1956)	.0396 ^a (.0142)	-----	.0117 (.0344)	-----		.54	7.14 ^a	29
1972-5 Brands	3.983 ^a (.7302)							.5335 ^a (.1135)	.44	22.07 ^a	29

TABLE VI--Continued

Year(s)	Iconstn	Lnetwkt	Lspotv	Imagazn	Lnetrd	Lnewspr	Loutdr	Ltotadv	R ²	F	N
<u>8412--Detergents, Light--Continued</u>											
1972-5 Firms	2.535 ^a (.7971)	.5043 ^a (.0853)	.3170 ^b (.1271)	-.0001 (.0078)	-----	.0025 (.0060)	-----		.94	32.67 ^a	13
1972-5 Firms	2.846 ^a (.3984)							.7342 ^a (.0572)	.93	164.47 ^a	13
<u>8413--Detergents, Heavy</u>											
1972-5 Brands	5.829 ^a (.5947)	.0471 ^a (.0123)	.2454 ^a (.1002)	.0122 (.0115)	.0087 (.0159)	.0244 (.0168)	-.0386 (.0443)		.51	12.26 ^a	76
1972-5 Brands	4.164 (.3034)							.5308 ^a (.0483)	.61	120.42 ^a	76
1972-5 Firms	6.739 ^a (1.139)	.1022 (.1174)	.1223 (.2796)	.0280 ^a (.0082)	-.0413 ^a (.0068)	.0075 (.0085)	-.0135 (.0115)		.95	19.46 ^a	12
1972-5 Firms	4.724 ^a (.9941)							.5183 ^a (.1373)	.58	14.23 ^a	12

Note: Standard errors in parentheses; "a" indicates .01 level of significance; "b" indicates .05 level of significance; "c" indicates .10 level of significance and "-----" indicates no expenditures for product category. Product categories 6310 (Beer), 6320 (Wine) and 7112 (Cigars) reported sales in barrels, gallons and units respectively. All other product category sales are in dollars.

available and the level of aggregation, (2) the log of the constant or intercept and its standard error, (3) the regression coefficient and its standard error for the logarithm of each of six separate advertising media categories including, in order: network television, spot television, magazines, network radio, newspaper Sunday supplements and outdoor, (4) the regression coefficient and its standard error for the log of total advertising expenditures, (5) the simple and multiple coefficient of determination, (6) the F ratio and (7) the sample size.

In 18 of the 19 product categories (the exception is 6122, Cereals), no support exists for accepting Hypotheses II and III above, both of which predict economies of scale in firm or brand advertising expenditures with sales as an output and total advertising expenditures as inputs. The coefficient of the log of total advertising expenditures is always considerably less than one. And the sum of the coefficients of the log of separate advertising media expenditures is also always considerably less than one. Therefore, strong diseconomies of scale in advertising expenditures exist in each of these 18 product categories at the firm level of aggregation and in 11 product categories at the brand level of aggregation.

The ready-to-eat cereal industry (6122) is an interesting exception. At the brand level, strong diseconomies of scale in total advertising expenditures exist. But, at the firm level, slight economies of scale in total advertising outlays exist.

But, except for Heavy Detergents (8413), there does appear to be clear economies to having more than one brand since the total advertising expenditure coefficient and the sum of the six separate advertising media coefficients at the firm level of aggregation are always

greater than the corresponding coefficients at the brand level of aggregation. That is, in ten out of the 11 product categories for which both brand and firm level data are available, diseconomies of scale in advertising are greater at the brand level of aggregation than they are at the firm level of aggregation. But only in one instance (see 6122, Cereals, in Table VI above) does there appear to be economies of scale in total advertising outlays at the firm level of aggregation. For example, the results in Table VI indicate that in Cereals (6122) a firm with one percent greater advertising expenditures than another firm will, on average, have 1.081 percent higher sales. But a brand with one percent greater advertising expenditures than another brand in the cereal industry will, on average, have only .0891 percent higher sales. In the Toilet Soap industry (4122), a firm with one percent greater advertising expenditures than another firm will, on average have .6601 percent greater sales. But a brand with one percent greater advertising expenditures than another brand in the Toilet Soap industry will, on average, have only .1838 percent higher sales.

But the brand and firm level results are relatively similar in several product categories such as Toothpaste and Mouthwash (4121), Deodorants (4124), Shampoos and Rinses (4142), Cigars (7112), Petfoods (7531) and Light Detergents (8412). For example, a Light Detergent firm with one percent higher total advertising expenditures than another firm will, on average, have .7342 percent higher sales. And a Light Detergent brand with one percent greater advertising expenditures than another brand will, on average, have .5335 percent greater sales.

On the other hand, there appears to be slight diseconomies to having more than one brand in the Heavy Detergent industry (8413). For

example, a Heavy Detergent firm with one percent greater total advertising than another firm will, on average, have .5183 percent higher sales. But a Heavy Detergent brand with one percent greater total advertising than another brand will, on average, have .5308 percent greater sales.

There are also no economies of scale in individual advertising media expenditures. Network television advertising expenditures exhibit the highest regression coefficients at the firm level of aggregation, followed by spot television advertising. All other media categories exhibit strong diseconomies of scale in advertising and, in some instances, exhibit negative coefficients. However, individual advertising media expenditure coefficients are always less than one.

For example, the firm level network television advertising regression coefficient equals .4491 and is significant at the .01 level for Toilet Soaps (4122). But at the brand level, the corresponding coefficient equals .04 and is significant at the .01 level. Thus, for Toilet Soaps, there appears to be definite economies to advertising more than one brand on network television, but there are always diminishing returns.

The same reasoning applies to Cereals (6122). The firm level network television advertising regression coefficient equals .64 and is significant at the .01 level, while the corresponding brand level coefficient equals .03 and is significant at the .01 level. Likewise, for Light Detergents (8412), the network television advertising regression coefficient equals .50 and is significant at the .01 level while the corresponding brand level coefficient equals .03, but is not significant.

In five product categories spot television advertising expenditures also exhibit relatively large coefficients at the firm level of aggregation and relatively small coefficients at the brand level of aggregation. The firm spot television advertising coefficient equals .49 and is significant at the .01 level for Toothpastes and Mouthwash (4121), while the corresponding brand coefficient equals .002 and is not significant. For Cereals (6122), the firm spot television advertising coefficient equals .25 and is significant at the .01 level, while the corresponding brand coefficient equals .02 and is significant at the .05 level. For Beer (6310) the spot television advertising regression coefficient equals .41 and is significant at the .01 level. But no brand level expenditure data is available for the Beer category. For Pet Foods (7531), the firm level spot television advertising regression coefficient equals .23 and is significant at the .01 level, while the corresponding brand coefficient equals .03 and is significant at the .05 level. Finally, for Light Detergents (8412), the spot television advertising regression coefficient equals .31 and is significant at the .05 level, while the corresponding brand level coefficient equals .16 but is not significant. On the other hand, there appears to be clear diseconomies to advertising more than one Heavy Detergent brand on spot television. For example, the firm spot television advertising coefficient equals .12 and is not significant while the corresponding brand coefficient equals .24 and is significant at the .01 level. However, there are always diminishing returns.

The regression coefficients for magazines, network radio, newspaper and outdoor suggest strong diseconomies of scale in advertising at both the firm and the brand levels of aggregation. And slightly

negative but statistically significant coefficients appear to exist in two product categories each for network radio advertising expenditures (4121 and 8413) and for newspaper Sunday supplement advertising expenditures (6122 and 7112). However, these negative coefficients may be due to the fact that few firms or brands use these media categories, resulting in several zero observations for non users. Since zero was set to the arbitrarily small number 10^{-4} (the log of zero is actually negative infinity), the average value for these lightly used media categories will be negative and therefore may appear to exhibit negative returns.

Relative Advertising Intensity

Several estimated regression equations are also listed in Table VII below. These predict market shares with advertising shares. The rows of Table VII contain one simple and one multiple regression equation for each of the 11 product categories for which brand level data are available. In addition, one simple and one multiple regression equation for the entire (pooled) sample of product categories is presented in the two bottom rows of the table. The columns of Table VII include: (1) the four-digit product category code, (2) the constant or intercept and its standard error, (3) the regression coefficients and their standard errors for the share of each of six advertising media categories including, in order: network television, spot television, magazines, network radio, newspaper Sunday supplements and outdoor, (4) an aggregated measure of total advertising share and its standard error, (5) the simple and multiple coefficient of determination, (6) the F ratio, (7) the sum of the squared error and (8) the sample size.

TABLE VII

REGRESSIONS OF BRAND MARKET SHARES ON BRAND ADVERTISING SHARES (SIX MEDIA)
FOR 11 PRODUCT CATEGORIES, 1970-1975

Code	Constnt	Netwktv	Spottv	Magazns	Netrdlo	Newsprr	Outdoor	TotAdvg	R ²	F	SSE	N
4121	.0061 (.0072)	.8773 ^a (.1699)	.4507 ^a (.1646)	.0461 (.0698)	-.0483 ^c (.0255)	-.1770 ^b (.0872)	-----		.7626	35.99 ^a	.0679	62
4121	.0036 (.0073)							1.3173 ^a (.1099)	.7053	143.62 ^a	.0843	62
4122	.0169 ^b (.0081)	.6795 ^a (.0818)	-.0816 (.0893)	.0904 (.0801)	.0547 ^a (.0208)	-.0581 (.0449)	-----		.6659	18.73 ^a	.0500	53
4122	.0086 (.0090)							.8248 ^a (.1124)	.5135	53.84 ^a	.0729	53
4124	.0171 (.0077)	.7987 ^a (.0832)	-.1505 ^b (.0631)	.0590 (.0651)	-.0255 (.0243)	-.0095 (.0321)	-----		.7100	22.53 ^a	.0482	52
4124	.0149 ^c (.0084)							.7502 ^a (.0883)	.5908	72.18 ^a	.0681	52
4125	.0548 ^c (.0313)	1.2019 ^b (.5269)	-.0480 (.3704)	-.3175 (.4987)	.1833 ^a (.0655)	-----	-----		.5216	5.99 ^a	.0795	27
4125	.0412 (.0374)							1.8879 ^b (.8105)	.1783	5.42 ^b	.1366	27
4141	.0109 ^a (.0027)	.3611 ^a (.0612)	.0459 (.0496)	.0870 ^b (.0371)	-.0593 (.1577)	-.0054 (.2711)	-----		.5465	22.66 ^a	.0337	100

TABLE VII--Continued

Code	Constnt	Netwktv	Spottv	Magazns	Netrdio	Newsppr	Outdoor	TotAdvg	R ²	F	SSE	N
4141	.0115 ^a (.0024)							.4991 ^a (.0456)	.5492	119.41 ^a	.0335	100
4142	.0068 ^a (.0025)	.6485 ^a (.0529)	-.0410 (.0503)	.0994 ^b (.0439)	.0049 (.0197)	.0143 (.0162)	-----		.7532	53.10 ^a	.0229	93
4142	.0047 ^c (.0025)							.7857 ^a (.0551)	.6904	202.99 ^a	.0287	93
6122	.0078 ^a (.0017)	.4740 ^a (.0591)	.1311 ^a (.0466)	-----	.0065 (.0107)	.0301 (.0196)	.0309 ^a (.0095)		.4490	20.23 ^a	.0220	156
6122	.0098 ^a (.0017)							.5780 ^a (.0630)	.3532	84.11 ^a	.0258	156
7112	.0205 ^a (.0035)	.2627 ^a (.0483)	-.0190 (.0422)	.0441 (.0617)	-----	.0106 (.0298)	.2069 ^a (.0269)		.6953	45.65 ^a	.0627	106
7112	.0132 ^a (.0042)							.6480 ^a (.0752)	.4163	74.18 ^a	.1202	106
7531	.0088 ^a (.0025)	.3510 ^a (.0760)	.0677 (.0691)	.0181 (.0141)	-----	-.0283 (.0371)	.0219 (.0347)		.5632	14.95 ^a	.0074	64
7531	.0058 ^a (.0022)							.5359 ^a (.0656)	.5180	66.64 ^a	.0083	64
8412	.0162 (.0104)	.4110 ^a (.0912)	.2141 (.1495)	.3119 ^b (.1215)	-----	-.0088 (.0308)	-----		.8133	26.14 ^a	.0170	29

TABLE VII--Continued

Code	Constnt	Netwktv	Spottv	Magazns	Netrdio	Newsppr	Outdoor	TotAdvg	R ²	F	SSE	N
8412	.0096 (.0082)							.9080 ^a (.0884)	.7962	105.49 ^a	.0186	29
8413	.0063 ^c (.0035)	.4743 ^a (.0489)	.0416 (.0495)	.3174 ^a (.0273)	.0098 (.0114)	.0464 (.0384)	-.0393 (.0275)		.8980	101.31 ^a	.0255	76
8413	-.0055 (.0063)							1.0068 ^a (.0950)	.6024	112.14 ^a	.0995	76
Pool	.0107 ^a (.0016)	.5972 ^a (.0288)	.0055 (.0270)	.1656 ^a (.0204)	.0291 ^a (.0086)	-.0085 (.0133)	.0731 ^a (.0156)		.5417	159.77 ^a	.9139	818
Pool	.0082 ^a (.0016)							.8447 ^a (.0291)	.5067	838.26 ^a	.9836	818

Note: Standard errors in parentheses; "a" indicates .01 level of significance; "b" indicates .05 level of significance; "c" indicates .10 level of significance and "-----" indicates either no expenditures for product category or variable did not meet minimum F value for stepwise inclusion. The sales figures for Cigars (7112) are reported in units, not dollars. All other product category sales figures are reported in dollars. But that difference should not affect the results here since market share figures in units should not differ significantly from the corresponding market share figures in dollars.

Support was found for the hypothesis that differences exist across product categories, even within the consumer non-durable goods sector of the economy, between a brand's market share and: (1) a brand's share of all product category advertising (Hypothesis IV), and (2) a brand's share of product category expenditures in each of the six separate advertising media (Hypothesis V). The test of the null hypothesis for equal parameters for all product categories resulted in an overall F value of 164.05 for the reduced model with total advertising shares as the independent variable and an overall F value of 115.63 for the model with the separate media shares as independent variables. It can therefore be misleading to use ordinary least squares on the pooled data. Instead, each product category should be examined separately.

Hypothesis VI, which states that there is a positive relationship between a brand's market share and a brand's share of all advertising expenditures, is strongly supported. The coefficient for total advertising is positive and significant at least at the .05 level in each of the 11 product categories. The total advertising coefficient actually exceeds 1.00 in three product categories (Toothpaste, Mouthwash, 4121; Shaving Cream, 4125 and Heavy Detergents, 8413) and is slightly below .50 in only one instance (Hair Treatments, 4141).

There were 54 opportunities to test Hypothesis VII, which states that there is a positive relationship between a brand's market share and a brand's share of expenditures in each of six separate advertising media. But the hypothesis received support at least to the .10 level in only 22 of these instances. Two media share coefficients in the same product category (see network radio and newspaper Sunday supplements in Toothpaste, Mouthwash, 4121, in Table VII above) were actually negative

at the .05 level, while the remaining 30 coefficients were not significantly different from zero. At least one media share coefficient in each product category failed to reject the null hypothesis. One product category had only one positive media share coefficient significantly different from zero at the .01 level (see Pet Foods, 7531, in Table VII above), and only one product category had three positive media share coefficients significantly different from zero at the .01 level (see Cereals, 6122, in Table VII above). Each of the remaining product categories had two media share coefficients significantly different from zero at least at the .10 level.

Interestingly, in each sampled product category, the network television advertising share coefficient was positive and significant-- at the .01 level in ten of the 11 industries and at the .05 level in the remaining industry. No other media category rejected the null hypothesis as conclusively. In fact, the null hypothesis was positively rejected for magazine advertising shares only four times out of ten opportunities. Spot television positively rejected the null hypothesis three times out of 11 opportunities. Network radio and outdoor each positively rejected the null hypothesis twice out of 8 and 4 opportunities respectively. The research hypothesis found no positive support out of ten opportunities for newspaper Sunday supplements.

Hypothesis VIII states that within each product category differences exist in the relationship between a brand's market share and a brand's share of expenditures in each of the six separate advertising media. The hypothesis was assessed by testing for the equality of regression coefficients within each product category. This was accomplished by computing F statistics based on comparing the error sums of

square for the reduced total advertising share model within each product category with the error sums of square for the full six media share model within the same product category. The appropriate F statistics are displayed in Table VIII below.

TABLE VIII
RESULTS OF TESTS FOR EQUALITY OR REGRESSION COEFFICIENTS
WITHIN PRODUCT CATEGORIES

Product Category	F Ratio	Product Category	F Ratio
4121	3.38 ^b	6122	6.48 ^a
4122	5.38 ^a	7112	22.89 ^a
4124	4.73 ^a	7531	1.76
4125	5.26 ^a	8412	0.73
4141	0.14	8413	40.05 ^a
4142	5.60 ^a		

Note: "a" indicates F ratio significant at the .01 level, "b" indicates F ratio significant at the .05 level.

Table VIII indicates that the null hypothesis was not rejected in three product categories (Hair Treatment, 4141; Pet Foods, 7531 and Light Detergents, 8412). From this it can be concluded that in the remaining eight product categories examined, not all media shares are equally associated with market share--some media shares are more strongly associated with market share than others. Furthermore, since some of the regression coefficients are significantly different in eight of the 11 product categories examined, an interaction between some media shares is indicated--a potentially fruitful possibility for future research.

Network Television Advertising Shares

Hypothesis IX states that network television advertising shares are more strongly related to market share than the share of all other advertising media combined. The hypothesis was tested both indirectly and directly. Since the relative contribution of each of the media shares were not significantly different in three of the product categories (see product categories 4141, 7531 and 8412 in Table VIII above), the null hypothesis cannot be rejected here. The hypothesis can be tested for the remaining eight product categories however.

Stepwise multiple regression was employed, since the first media share entered into the estimated equations will be a good indicator that the variable explains more of the variation in the market share than those media shares not yet entered into the equation. In addition, an indication of the relative importance of the media share can be verified by examining its beta weight (standardized regression coefficient) in relation to all others estimated in the equation.

In five of the remaining eight product categories then (see 4121, 4122, 4124, 4142 and 6122 in Table VII above), network television advertising shares were entered into the regression equation first. And the corresponding beta weights suggest that network television advertising shares are indeed the most important variables in the final estimated equations. In the remaining three product categories (see 4125, 7112 and 8413 in Table VII above), network television advertising shares were entered secondly into the estimated equations after network radio, outdoor and magazines respectively. And the corresponding beta weights further suggest that in these product categories network television advertising shares are also second in importance. Therefore, it

is concluded that although network television advertising shares are positively and significantly related to market shares in every product category sampled, in only five of these product categories can it be suggested that network television advertising shares are the most important contributors to market share.

The estimated regression equations useful for testing Hypothesis IX directly are listed in Table IX below and the test results for the research hypothesis are presented in Table X below. Table IX is organized in the same manner that Table VII above is organized except that only two independent variables (network television advertising shares and five-media advertising shares) are included in the regression equations instead of six separate advertising media shares.

Table X lists the F statistics which test for the equality of regression coefficients within each product category. The F ratio was computed, after adjusting for sample sizes and degrees of freedom, by comparing the error sums of square for the reduced total advertising share model (see Column 12 of Table VII above) with the error sums of square for the full, two-media advertising share model (see Column 7 of Table IX below).

Once again, in every product category, the network television advertising share regression coefficient is positive and significant at the .01 level (see Column 3 of Table IX below). On the other hand, the five-media advertising share regression coefficient is positive and significant at the .01 level in five product categories and is positive and significant at the .05 level in one product category. The five-media advertising share regression coefficient is not significantly

TABLE IX

REGRESSIONS OF BRAND MARKET SHARES ON BRAND ADVERTISING SHARES (TWO MEDIA) FOR 11 PRODUCT CATEGORIES, 1970-1975

CODE	CONSTNT	NETWKTV	5MEDIA	R ²	F	SSE	N
4121	.0033 (.0074)	.8884 ^a (.1734)	.4342 ^a (.1532)	.7094	72.06 ^a	.0831	62
4122	.0154 ^c (.0089)	.6669 ^a (.0881)	.0170 (.1159)	.5682	32.89 ^a	.0647	53
4124	.0196 ^a (.0074)	.7826 ^a (.0816)	-.1564 ^c (.0894)	.6881	54.05 ^a	.0519	52
4125	.0516 (.0351)	1.7749 ^a (.5403)	-.5817 (.5758)	.3385	6.14 ^a	.1099	27
4141	.0106 ^a (.0025)	.3662 ^a (.0587)	.1323 ^a (.0486)	.5419	57.39 ^a	.0340	100
4142	.0769 ^a (.0025)	.6452 ^a (.0511)	.0420 (.0686)	.7300	121.68 ^a	.0251	93
6122	.0093 ^a (.0017)	.4277 ^a (.0594)	.1596 ^a (.0520)	.3739	45.68 ^a	.0250	156
7112	.0105 ^a (.0041)	.2207 ^a (.0552)	.4956 ^a (.0750)	.4673	45.18 ^a	.1096	106
7531	.0075 ^a (.0023)	.3795 ^a (.0538)	.0868 (.0796)	.5516	37.52 ^a	.0077	64
8412	.0074 (.0086)	.4227 ^a (.0907)	.5353 ^a (.1293)	.7980	51.35 ^a	.0184	29
8413	.0028 (.0049)	.8049 ^a (.0625)	-----	.6909	165.46 ^a	.0774	76

Note: Standard errors in parentheses, "a" indicates multiple regression coefficients and F ratios are significant at the .01 level; "b" indicates .05 level of significance, "c" indicates .10 level of significance and "-----" indicates that the variable did not meet the minimum F value for stepwise inclusion.

TABLE X

RESULTS OF TESTS FOR EQUALITY OF REGRESSION COEFFICIENTS
WITHIN PRODUCT CATEGORIES

Product Category	F Ratio	Product Category	F Ratio
4121	0.85	6122	4.89 ^b
4122	6.33 ^b	7112	9.96 ^a
4124	15.29 ^a	7531	4.75 ^b
4125	5.83 ^b	8412	0.28
4141	1.42	8413	20.84 ^a
4142	12.91 ^a		

Note: "a" indicates F ratio significant at the .01 level, "b" indicates F ratio significant at the .05 level.

different from zero in the remaining five product categories (see Column 4 of Table IX above).

In ten of the 11 product categories (the exception is 7112), network television advertising shares appear to be more important in explaining market share than the share of all other advertising media categories combined as indicated by stepwise multiple regression and by an examination of standardized regression coefficients. However, in three of these product categories the two advertising media coefficients are not significantly different (see 4121, 4141 and 8412 in Table X above).

From these results it might be concluded that in seven of the 11 product categories (4122, 4124, 4125, 4142, 6122, 7531 and 8413), network television advertising shares are the most important media shares associated with market share. However, with the six-media regression equations (see Table VII above) the indirect tests of Hypothesis IX discussed above indicated that in two of the remaining seven product categories (4125 and 8413) that stepwise multiple regression and that an

examination of standardized regression coefficients revealed that network television shares were, in fact, second in importance to network radio advertising shares and magazine advertising shares respectively. Furthermore, no significant differences were found among the six separate advertising media share coefficients in product category 7531 although significant differences were found in the two-media model for that product category. This leaves only four product categories (Toilet Soap, 4122; Deodorants, 4124; Shampoo, Rinses, 4142 and Cereals, 6122) in which it is clearly correct to state that network television advertising shares explain significantly more of the variation in market share than the share of any other advertising media category.

It appears then that a direct test of research Hypothesis IX, while preferable to an indirect test using stepwise inclusion and standardized regression coefficients as indices of relative media share importance, can be misleading. This suggests that separate media advertising expenditures should be employed whenever available.

As a further test of this proposition, the F ratio was again computed for each product category after adjusting for degrees of freedom and sample sizes by comparing the relative efficiency (sums of squared error) of the reduced two-media share regression equation employed here (see Column 7 of Table IX) with the relative efficiency (sums of squared error) of the six-media share regression equation above (see Column 12 of Table VII). The results are listed in Table XI below.

Table XI suggests that in seven product categories the six media regression model has significantly less unexplained variation than the two variable equation, while in the remaining four product categories it cannot be said that the two models are significantly different.

TABLE XI

RESULTS OF TESTS COMPARING THE RELATIVE EFFICIENCY OF THE
TWO-MEDIA SHARE MODEL WITH THE SIX-MEDIA SHARE MODEL

Product Category	F Ratio	Product Category	F Ratio
4121	4.30 ^a	6122	6.82 ^a
4122	4.60 ^a	7112	25.18 ^a
4124	1.20	7531	0.78
4125	4.39 ^b	8412	1.02
4141	0.28	8413	28.09 ^a
4142	2.81 ^b		

Note: "a" indicates F ratio significant at the .01 level, "b" indicates F ratio significant at the .05 level.

Therefore, the six media share model is the appropriate choice since it provides more information than the two media share model and is generally more efficient.

Advertising-Sales Ratios and Economies of Scale in Advertising

The results in Tables VII and IX, which predict market shares on the basis of advertising shares, are in essential agreement with the results in Table VI, which predict the log of sales on the basis of the log of advertising expenditures. For example, the pooled equation in Table VII indicates that a company which has a four percent as opposed to a three percent share of the advertising expenditures of all brands will, on average, have a .84 percent higher share of product category sales. That seems to imply increasing advertising costs as the sales of the firm increase. And, except for the cereal industry, Table VI, which presents the results of direct tests of economies of scale in

advertising, also indicates strongly decreasing returns to advertising at both the brand and the firm levels of aggregation.

But, since it was indicated in Table V above that there is a low correlation between the advertising-sales ratio and advertising expenditures, further analysis using advertising-sales ratios instead of the log of advertising expenditures or advertising shares might provide additional insight. In particular, a comparison of regression results using advertising-sales ratios with comparable regression results using the log of advertising expenditures or advertising shares might help determine whether previous use of the advertising-sales ratio has led economists to erroneous conclusions. Therefore, Table XII below was created to examine how the regression results might differ using advertising-sales ratios instead of the log of advertising expenditures or advertising shares. Table XII is organized in the same manner as each of the previous regression tables.

The coefficient for total advertising expenditures-to-sales is always negative--a finding that previous researchers would have interpreted as suggesting increasing returns or economies of scale in advertising since advertising intensity decreases as market share increases. But this interpretation contradicts the direct tests of economies of scale in advertising reported above. Furthermore, it suggests that the use of the advertising-sales ratio can indeed lead researchers to the wrong conclusions. For example, the pooled total advertising-sales equation in Table XII indicates that a firm with a four percent as opposed to a three percent advertising-sales ratio will, on average, have a .03 percent lower share of product category sales.

TABLE XII

REGRESSIONS OF BRAND MARKET SHARES ON BRAND ADVERTISING-SALES RATIOS (SIX MEDIA)
FOR TEN PRODUCT CATEGORIES, 1970-1975

Code	Constnt	Netwktv	Spottv	Magazns	Netrdio	Newsppr	Outdoor	Tot A/S	R ²	F	SSE	N
4121	.0658 ^a (.0146)	.0234 (.1274)	-----	1.362 ^c (.8200)	-1.373 (1.037)	-12.63 ^b (6.533)	-----		.0767	1.18	.2644	62
4121	.0773 ^a (.0143)							-.0466 (.0871)	.0047	.28	.2850	62
4122	.0594 ^a (.0130)	.1332 (.1369)	-.1052 ^c (.0622)	-.6265 (1.137)	2.822 (2.152)	-6.268 (18.26)	-----		.1224	1.31	.1315	53
4122	.0721 ^a (.0103)							-.0719 (.0595)	.0278	1.46	.1457	53
4124	.0784 ^a (.0103)	.1550 ^b (.0739)	-.3272 ^a (.1070)	-.3946 (.2541)	-1.116 ^a (.4150)	-----	-----		.2592	4.11 ^a	.1233	52
4124	.0861 ^a (.0106)							-.0685 ^b (.0346)	.0727	3.92	15.43	52
4125	.1692 ^a (.0204)	-.3989 ^b (.1806)	-.8635 ^b (.3501)	-.6966 (1.486)	201.7 ^a (46.55)	-----	-----		.6192	8.94 ^a	.0633	27
4125	.1889 ^a (.0257)							-.4941 ^a (.1618)	.2715	9.32 ^a	.1211	27

TABLE XII---Continued

Code	Constnt	Netwkrv	Spotrv	Magazns	Netrdio	Newsppr	Outdoor	Tot A/S	R ²	F	SSE	N
4141	.0313 ^a (.0036)	-.0097 (.0226)	-.0448 ^c (.0240)	.0139 (.0501)	25.05 (18.01)	2.284 (1.709)	-----		.1006	2.10 ^c	.0669	100
4141	.0333 ^a (.0036)							-.0206 (.0133)	.0238	2.39	.0726	100
4142	.0327 ^a (.0039)	.0589 ^c (.0353)	-.0684 ^b (.0305)	-.1104 ^c (.0663)	-.1889 (.1696)	-.3735 (1.050)	-----		.1098	2.14 ^c	.0827	93
4142	.0343 ^a (.0039)							-.0232 ^b (.0114)	.0431	4.10 ^b	.0889	93
6122	.0274 ^a (.0020)	-.0386 ^c (.0233)	-.0494 ^c (.0286)	-.0794 (.1213)	1.638 ^c (.9827)	-.2614 (.3920)	110.0 ^b (55.26)		.1176	3.31 ^a	.0353	156
6122	.0284 ^a (.0019)							-.4933 ^a (.1381)	.0765	12.76 ^a	.0369	156
7531	.0229 ^a (.0026)	.0866 ^c (.0491)	-.1803 ^a (.0580)	-.1505 (.2306)	-----	-.3631 ^b (.1513)	282.3 ^a (73.28)		.3527	6.32 ^a	.0111	64
7531	.0227 ^a (.0026)							-.0420 ^b (.0215)	.0576	3.79 ^b	.0162	64
8412	.0774 ^a (.0113)	.1632 ^b (.0729)	-.6707 ^a (.2193)	5.628 ^a (1.176)	-----	-7.737 (23.85)	-----		.5965	8.87 ^a	.0368	29
8412	.0852 ^a (.0120)							-.0484 (.0367)	.0605	1.73	.0858	29

TABLE XII--Continued

Code	Constnt	Netwktv	Spottv	Magazns	Netrdio	Newsppr	Outdoor	Tot A/S	R ²	F	SSE	N
8413	.0452 ^a (.0110)	.3261 (.2172)	-.2865 ^a (.1167)	1.120 ^c (.6873)	-2.792 (6.376)	-12.16 (18.12)	18.57 (98.15)		.1004	1.28	.2253	76
8413	.0510 ^a (.0086)							-.0762 (.0617)	.0193	1.45	.2456	76
Pool	.0471 ^a (.0023)	.0487 ^a (.0201)	-.1128 ^a (.0225)	-.0740 (.0549)	-.3057 (.1913)	-.7278 ^b (.3301)	8.474 (64.81)		.0479	5.91 ^a	1.6975	712
Pool	.0480 ^a (.0023)							-.0324 ^a (.0105)	.0131	9.42 ^a	1.7596	712

Note: Standard errors in parentheses; "a" indicates .01 level of significance; "b" indicates .05 level of significance; "-----" indicates either no expenditures for product category or variable did not meet minimum F value for stepwise inclusion. Although brand level advertising expenditures are available for Cigars (7112), that product category has not been included in the analysis above since Cigar sales figures are reported in units and would therefore not be comparable to the reported dollar sales ratios of other product categories. It might also be helpful to recall that the advertising-sales ratios for Shaving Cream (4125) are unusually high (see Table V above) which would explain the atypical results for that product category in Table XII above.

That implies that advertising intensity decreases as market share increases, or, increasing returns or economies of scale in advertising.

An alternate explanation of this result often advanced is that the probability of collusion to restrict both price and non-price competition increases as market concentration increases, therefore, at high levels of market concentration (large market shares) advertising intensity should decrease.

Nevertheless, no matter which explanation is employed, results derived from using advertising-sales ratios are ambiguous and compatible with at least two conflicting interpretations. The potential is great for advertising sales-ratios to lead researchers to the wrong conclusion.

CHAPTER VI

LIMITATIONS

Several problems are inherent in the use of data and analysis of the type employed in this study. A description of the sources and the methodology used to obtain the market share data published by Advertising Age are not available. Further, LNA and Advertising Age industry definitions differed in a few cases. Consequently, one of the two sources required some modification to make the relevant market definitions compatible.

More importantly, there are several possible sources of specification error. LNA advertising expenditure data do not include volume discounts which enable large multi-product and multi-industry advertisers to receive more time or space per dollar per brand than smaller advertisers. LNA data also do not allow for cooperative allowances to retailers. Such an omission will likely understate local media advertising expenditures such as spot television. Spot radio and newspaper advertising expenditure data are not available and therefore they have not been included in the regression equations which is an additional source of specification error.

Further, LNA advertising media expenditures represent billed media costs and not necessarily the full cost of advertising, which may include preparation or production costs in addition to those costs

covered by the advertising agency's commission. Porter (1976), for example, could find no systematic data on preparation cost other than an estimate of 6.9 percent for newspapers.⁸⁹ Amplifying the problem, Porter stated:

. . . while the cost of preparation is rightly part of total advertising costs, we made use only of the relative share of outlays on the various media here. To the extent that preparation cost as a percent of total cost varies by medium, the true media shares in any given industry would be mismeasured by our procedure. However, there is no reason to suspect that the ratio of preparation cost to media cost varies across industries, and certainly not systematically across industries. Thus, our inability to measure preparation costs should not bias our results.⁹⁰

However, Vernon and Nourse (1973) did attempt to take into consideration advertising preparation costs because of substantial differences they found in production costs across media. Vernon and Nourse state:

These data [National Advertising Investments, published by LNA] are estimates obtained by audit and are thought to represent at least 90% of total national expenditures. The expenditure figures given however, are for time and space charges only--no allowance is made for talent and production costs incurred by the advertiser. To compensate for this omission the following "talent and production factors" published by a leading advertising trade journal were applied to each expenditure:

For newspapers	1.069
For magazines	1.115
For outdoor	1.144
For network TV	1.640
For spot TV	1.130 ⁹¹

⁸⁹Porter, "Interbrand Choice, Media Mix, and Market Performance," p. 3 of the technical appendix.

⁹⁰Ibid.

⁹¹J. M. Vernon and R. E. M. Nourse, "Profit Rates and Market Structures of Advertising Intensive Firms," Journal of Industrial Economics 22 (September 1973): 15.

Therefore advertising media expenditures will be distorted when production cost factors are not taken into consideration.

Finally, failure to include other core variables associated with market share is an additional source of specification error. Other core variables included in related research can be outlined briefly for completeness, although operational definitions and justification of their inclusion is outside the scope of this paper. Yang (1966), for example, included the following independent variables in his regression equations, in addition to various measures of advertising intensity:

1. Rate of industry growth
2. Profit
3. Capital Requirements
4. Innovation
5. Economies of scale, and
6. Mergers.⁹²

Mueller and Hamm (1974) included a slightly different set of independent variables in addition to dummy measures of advertising intensity. These included:

1. Beginning level of concentration
2. Industry growth
3. Size of the industry, and
4. Net firm entry.⁹³

Finally, Greer (1971) examined two more core variables in addition to many of those listed above, including:

1. Relative price change in ratio form, and
2. Disposable income elasticity of demand.⁹⁴

The statistical relationship between these variables and market concentration is strong and should therefore be considered for inclusion

⁹²Yang, "Industrial Concentration and Advertising."

⁹³Mueller and Hamm, "Trends in Industrial Market Concentration: 1947 to 1970," p. 515.

⁹⁴Greer, "Advertising and Market Concentration."

as core variables in future research into the relative impact of advertising media expenditures on market concentration.

Given the small sample size, the problem of serial correlation, which may understate the estimated variances but which cannot be estimated with pooled data, may be impossible to eliminate for two reasons. First, assuming autoregressive disturbances of the first order, one annual observation per variable and per brand would be lost after taking the quasi first differences to re-estimate the serially independent error term. Further, one degree of freedom would also be lost after estimating the lagged correlation, ρ . And since there are, at most, six observations per brand, per year, estimating a three-parameter equation (network TV share, 5-media share and ρ , for example) to account for serial correlation, given the present data, is out of the question.⁹⁵ And the problem would be further compounded if a distributed lag model, such as those designed to account for the duration of advertising's effect on sales, were to be estimated as well.⁹⁶ Ideally, therefore, at least ten years of data per brand should be obtained before correcting for the possible presence of serial correlation.

On the other hand, it might also be suspected that multicollinearity is a serious problem tending, in this situation, to counteract the exaggeration of R^2 , t and F statistics resulting from the

⁹⁵For a more complete treatment of the problems of estimating when residuals are autoregressive of the first order, see G. S. Maddala, Econometrics (New York: McGraw-Hill Book Co., 1977), pp. 277-284.

⁹⁶For an excellent discussion of the estimating problems which are associated with distributed lag models designed to account for the duration of the advertising effect on sales, see Darrel G. Clark, Cumulative Advertising Effects: Sources and Implications (Massachusetts: Marketing Science Institute, 1977), pp. 31-65.

presence of serial correlation. However, Klein's rule of thumb for the case of two independent variables (see Table IX above) indicates that multicollinearity is not a serious problem.⁹⁷

⁹⁷ A description of Klein's test for determining the seriousness of multicollinearity can be found in G. S. Maddala, Econometrics, p. 185.

CHAPTER VII

SUMMARY, CONCLUSIONS AND IMPLICATIONS

Summary

Economists have been debating the merits and the demerits of advertising since the turn of this century. Many contradictory theories have been advanced which attempt to explain the impact of advertising on market structure, market conduct and market performance. Within the structure-conduct-performance framework, the impact of advertising on market concentration, a proxy for monopoly power, has received considerable attention both theoretically and empirically. But the only clear ground for agreement emerging from the literature is the lack of any clear evidence or theory that advertising is either a source or a consequence of monopoly power.

Some theorists have argued that market concentration is not necessarily a threat to consumer welfare. And still others have argued that even if market concentration does threaten consumer welfare, advertising's contribution toward market concentration is of little consequence and the importance of the issue has been greatly exaggerated.

But although economic theory and empirical research is uncertain as to the impact of advertising on market concentration, that uncertainty is not reflected in recent and separate policy proposals and policy

decisions which assume that advertising both restricts and stimulates competition. The question therefore deserves further investigation.

The review of literature disclosed: (1) the existence of five contradictory theories regarding the relationships between advertising and market concentration as well as between advertising and other aspects of market structure, market conduct and market performance, (2) the lack of any clear evidence as to which theory correctly specifies the nature of the relationships between advertising and market concentration, (3) some clear evidence that increasing returns to advertising messages do not exist for single brands, (4) contradictory indirect evidence of scale economies due to industry and firm total advertising intensity, and (5) conflicting evidence as to the existence of pecuniary scale economies due to media rate structures, especially network television advertising rates, which may favor large, multi-product, multi-industry advertisers at the expense of their smaller rivals.

Several specific shortcomings of previous research were identified including: (1) use of advertising-sales ratios which are conveniently available from many secondary sources, (2) insufficient attention to the relative distribution of advertising expenditures among the firms within an economically relevant market, (3) aggregation of advertising expenditures in a single index which disguises the likely differential impact on consumer behavior of separate advertising media categories and (4) use of small industry samples at high, three and four-digit, IRS and SIC levels of aggregation.

This study attempted to overcome these limitations by: (1) providing a theoretical basis for the use of absolute advertising expenditures instead of advertising-sales ratios as the correct measure of

advertising within and across industries, (2) empirically comparing the relationship to sales and to market share of three different measures of advertising, (3) testing directly for technical or pecuniary scale economies in firm and in brand total advertising expenditures and in separate advertising media expenditures, (4) providing a theoretical basis for examining the share of advertising among the brands in an industry and testing these relationships both within and across industries, (5) examining brand, firm and industry advertising media expenditures and total advertising expenditures available from syndicated trade sources from 1970-1975 and (6) examining sales and market share data available from a leading trade journal from 1970 through 1975 for a large number of firms and brands within 19 narrowly defined and economically relevant consumer, non-durable product categories.

Conclusions

Nine specific hypotheses were tested using linear and log linear multiple regression techniques and the following findings are supported:

1. There is a wide range across product categories in the correlation between product category advertising-sales ratios and product category advertising expenditures (from $-.98$ to $+.99$) but, on average, the correlation is moderately high ($+.60$).
2. There is a narrow range across product categories in the correlation between firm and brand advertising-sales ratios and firm and brand advertising expenditures (from $-.40$ to $+.91$ for firms and from $+.14$ to $+.41$ for brands) but, on average, the correlation is low ($+.14$ for firms and $+.17$ for brands).

3. There are, on average, strong diseconomies of scale in total advertising expenditures at both the firm and the brand levels of aggregation.
4. In the ready-to-eat cereal category, there appears to be slight economies of scale in total advertising expenditures at the firm level of aggregation but not at the brand level of aggregation.
5. There appear to be economies of scale in advertising more than one brand. That is, diseconomies in total advertising are much greater at the brand level of aggregation than they are at the firm level of aggregation.
6. There are strong diseconomies of scale in individual advertising media expenditures such as network television, spot television, magazines, network radio, newspaper Sunday supplements and outdoor at both the firm and the brand levels of aggregation.
7. There appear to be significant economies to advertising more than one brand using network television or using spot television. That is, diseconomies in network television advertising or in spot television advertising are often much greater at the brand level of aggregation than they are at the firm level of aggregation.
8. The relationship between brand total advertising share and brand market share differs significantly across product categories.
9. The relationship between brand advertising media shares and brand market share differs significantly across product categories.

10. The relationship between brand total advertising share and brand market share is positive and significant in each of the 11 product categories for which brand level data are available.
11. The relationship between brand network television advertising share and brand market share is positive and significant in each of the 11 product categories for which brand level data are available.
12. The relationship between market share and the six separate advertising media shares differs significantly across eight of the 11 product categories for which brand level data are available.
13. In four of the 11 product categories for which brand level data are available, network television advertising shares clearly explain significantly more of the variation in market share than is explained by the share of any other advertising media category. These product categories include Toilet Soaps, Deodorants, Shampoos and Rinses, and Cereals.
14. The six-media regression equation has significantly less unexplained variation than the two-media model, which contains network television advertising share and the share of all other advertising expenditures combined, in seven of the 11 product categories for which brand level data are available.
15. The potential exists for regression results based on brand market shares and brand advertising-sales ratios to lead researchers to infer increasing returns to advertising expenditures or to infer economies of scale in advertising

expenditures, when, in fact, there are strongly diminishing returns or diseconomies of scale in advertising.

Several limitations of this research make these results more tentative and instructive than conclusive. The advertising expenditure data do not allow for potential volume discounts, for cooperative advertising allowances to retailers, for spot radio and newspaper advertising expenditures, and for production costs in addition to those costs covered by the advertising agency's commission. Other factors which are potentially more important sources of market concentration within a market also have not been included, such as the rate of industry growth, profit, capital requirements, innovation, economies of scale, mergers, beginning level of concentration, industry size, net firm entry, relative prices and price elasticities. Statistically, several of the usual linear assumptions have been violated as well. For example, specification error exists due to the omission of other relevant variables, serial correlation may be present due to the pooling of time-series data and the possibility of multicollinearity exists in the six-media regression equations.

Implications for Theory

It was argued above that the relative advertising intensity hypothesis could explain how the change-of-taste, the information and the structure-collusion theories of advertising impact are not necessarily incompatible. The relative distribution of advertising among the firms and among the brands in an industry, as measured by advertising shares, suggests the narrow conditions which may be necessary for advertising to have pro or anticompetitive effects on market structure,

market conduct and market performance as well as the structure-conduct-performance conditions which may influence the level and distribution of advertising in an industry. This reasoning was partially supported by evidence since it was found that both total advertising shares and network television advertising shares were positively and significantly related to market share in every product category for which brand level data are available.

Those who have argued that advertising decreases competition and leads to market concentration have assumed that increasing returns to advertising expenditures or that pecuniary economies of scale in advertising expenditures increase minimum efficient scale over time within an industry faster than industry size increases. There appears to be no basis for assuming increasing returns to brand advertising expenditures or for assuming pecuniary economies of scale in brand advertising expenditures. And, with one exception, there appear to be strong diseconomies of scale in firm advertising expenditures as well. However, there do appear to be slight economies in firm advertising expenditures in the ready-to-eat cereal category. So the possibility that technical or pecuniary economies of scale in advertising expenditures exist cannot be completely dismissed. Furthermore, there appear to be economies to advertising more than one brand in that returns to brand advertising expenditures diminish much more strongly than returns to firm advertising expenditures diminish. This raises the further proposition, not tested here, that there are increasing returns to multi-product, multi-industry advertising expenditures. Thus, the change-of-taste theory of advertising impact has some, though not strong or clear, support.

In addition, those who have argued that there are increasing returns to advertising expenditures have argued that these are due primarily to increasing returns to network television advertising messages and to network television advertising volume discounts. But there is no evidence of technical or pecuniary economies of scale in network television advertising outlays within product categories. There do appear to be economies to advertising more than one brand using network television or using spot television in that returns to brand network television advertising expenditures or returns to brand spot television advertising expenditures diminish much more strongly than do returns to the corresponding firm expenditures. Again, this raises the proposition, not tested here, that there are increasing returns to multi-product, multi-industry network television advertising expenditures or multi-product, multi-industry spot television advertising expenditures.

Implications for Methodology

Almost all previous research dealing with the economic effects of advertising has relied heavily upon advertising-sales ratios. But it was argued above that there is no theoretical basis for using advertising-sales ratios within or across industries. Only if the advertising-sales ratio is highly correlated with levels of advertising expenditure within or across industries would it be appropriate to use to test the effects of advertising on competition. The results above indicate that there is a wide range in the correlation between industry advertising sales ratios and industry advertising expenditures (from $-.98$ to $+.99$) but, on average, the correlation is moderately high ($.60$). If this can be interpreted as a "good" proxy of advertising

expenditures, then inter-industry advertising-sales ratios should not lead researchers to the wrong conclusions. But regressions using inter-industry advertising-sales ratios were not estimated here.

On the other hand, the average correlation between advertising-sales ratios and advertising expenditures is very low at the firm and the brand levels of aggregation (.14 and .17 respectively). Therefore, intra-industry advertising-sales ratios should not be used in future research as they are, taken by themselves, very likely to mislead researchers.

For example, brand market shares were regressed on brand advertising-sales ratios. On the one hand, the results support the change-of-taste theory of advertising impact in that there appear to be increasing returns or pecuniary economies of scale in advertising expenditures. This clearly contradicts the two previous conclusions that there are no technical or pecuniary economies of scale in advertising--conclusions based on the same data base but using, instead, logs of brand advertising expenditures or brand advertising shares. On the other hand, the advertising-sales ratio results also support the structure-collusion theory in that advertising intensity decreases as market share increases because increasing market shares increase the probability of collusion to restrict non-price competition.

Implications for Future Research

The previous discussion suggests several possible directions for future research. First, the relative advertising intensity hypothesis, which attempts to integrate the change-of-taste, the information and the structure-collusion theories of advertising impact via intra-industry advertising shares, should be subjected to a more

rigorous inter-industry analysis. The research here was confined chiefly to a narrow sector of the economy, namely to consumer, non-durable goods. A sample of industries including several professions, several durable goods and several industrial goods and services and so on, would provide the wide range of industries necessary to cover the variety of possible effects advertising has on market structure, market conduct and market performance.

Secondly, the research results here suggest possible scale economies for multi-product, multi-industry advertisers since diseconomies of scale in advertising appear to be greater at the brand level of advertising than at the firm level of advertising. Further analysis which ignores traditional industry boundaries could assess multi-product, multi-industry economies of scale in advertising. Research assessing this proposition is currently underway by this author using the data base included in Appendix C below and focusing on firms operating in more than one product category. The log of total firm sales, irregardless of product categories, is being used as the dependent variable and the log of firm total advertising expenditures and the log of firm advertising media expenditures, irregardless of product category, are being used as the independent variables. The results will provide a direct test of economies of scale in advertising by multi-product, multi-industry advertisers.

Thirdly, this research was confined chiefly to intra-industry analysis, although some inter-industry analysis was included. The results suggest that advertising behaves quite differently at each level of analysis. For example, the correlation between advertising-sales ratios and advertising expenditures is moderately high at the industry

level of aggregation, but is very low at the firm and at the brand levels of aggregation. And, further, diseconomies of scale in advertising appear to be much greater at the brand than at the firm level of aggregation. Therefore, future research should attempt to carefully delineate the relationships between advertising and market structure, market conduct and market performance at each level of aggregation and should attempt to estimate empirically each of these relationships.

Implications for Public Policy

Several researchers have suggested that public policy reflects opposite assumptions about the impact of advertising on market structure, market conduct and market performance. For example, Ornstein (1977) writes:

How advertising can be part of the competitive process for some goods but not for others--or how such a distinction can be made in practice--is yet to be explained. Until it is explained, the FTC may be characterized as exhibiting a puzzling ambivalence toward advertising. The commission can recognize, as it has in the investigation of advertising by pharmacists, that competition, including advertising competition, promotes consumer welfare. Or it can revert, as it threatens to do in the RealLemon and cereals cases, to its long tradition of protecting competitors at the expense of competition and of consumer welfare.⁹⁸

This research attempted to explain how advertising can indeed be part of the competitive process for some products and not for others depending on the relative distribution of advertising among the firms in an industry (see Figure IV and the corresponding discussion above). Based on this theory, the Federal Trade Commission does not necessarily exhibit a puzzling ambivalence toward advertising but, rather, it exhibits a flexible policy which reflects the heterogeneous nature of

⁹⁸ Ornstein, Industrial Concentration and Advertising Intensity, p. 66.

advertising and the complex and varied effects advertising appears to have on market structure, market conduct and market performance.

This research included only those industries characterized by heavy advertising in which advertising is particularly suspect of having anti-competitive effects. It does not include industries in which advertising is usually thought to foster competition. With this clearly in mind, if one were asked to identify product categories and media categories that should be examined more closely by policy makers based on this limited research, such a recommendation would have to include ready-to-eat cereals and network television respectively--ready-to-eat cereals because of evidence of economies of scale in firm advertising, and network television because it is the most important advertising media in the ready-to-eat cereal product category and in three other product categories including Toilet Soaps, Deodorants and Shampoos and Rinses and because there appear to be definite economies to advertising more than one brand on network television. But this conclusion is merely an assurance that the Federal Trade Commission has pursued the potentially most fruitful and important product categories and advertising media in its role of protecting competition and consumer welfare since the Commission has long been looking carefully at the role of advertising in the ready-to-eat cereal industry and has recently reopened an investigation of network television advertising sales practices.

Finally, this research suggests that the Commission may find its limited resources productively applied to the question of pecuniary scale economies for multi-product, multi-industry advertisers, particularly those which rely heavily on network television advertising

since this research has revealed that there are economies to advertising more than one brand and that there are economies to advertising more than one brand on network television. The analysis here was confined to narrowly defined and economically relevant markets. But it may be useful for the Commission to get outside of the traditional concept of the economically relevant market and to examine possible pecuniary scale economies in advertising for multi-product firms operating in more than one economically relevant market.

APPENDICES

APPENDIX A

A SURVEY OF CONCENTRATION-ADVERTISING INTENSITY STUDIES^a

Study	Sample	Period	Dependent Variable	Independent Variable	Functional Form	Statistical Significance
Olser (1964) ^b	42 IRS three-digit consumer goods industries	1947, 1954 and 1958	Four-firm concentration	Advertising-sales ratio	Linear	Insignificant in each year; first differences also insignificant
Olser (1966) ^c	20 IRS three-digit consumer goods industries	1948 and 1958	Change in concentration	Change in advertising-sales ratio and change in advertising-sales ratio	Linear, quadratic, log linear	Significant, positive linear relationship between advertising and concentration
Olser, Henning and Meegan (1967) ^d	14 SIC four-digit industries	1954, 1958 and 1963	Four-firm concentration	Average dominant firm advertising-sales ratio	Linear	Significant in each year
Olser (1968) ^e	85 trades (Great Britain)	1958	Advertising-sales ratio	Three-firm advertising concentration	Linear	Insignificant
Olser (1969) ^f	26 four-digit SIC industries	1958	Four-firm concentration	Average dominant firm advertising-sales ratio	Linear	Insignificant
Olser and Meegan (1969) ^g	Mann et al. sample	1954-1963	Change in four-firm concentration	Change in advertising-sales-ratio	Linear	Insignificant

APPENDIX A---Continued

Study	Sample	Period	Dependent Variable	Independent Variable	Functional Form	Statistical Significance
arcus (1969) ^h	78 SIC four-digit consumer goods industries	1947-1963	Change in four-firm concentration	High, medium, or low advertising dummy variable	Linear	Significant for high and medium coefficients
elund and amm (1970) ⁱ	39 IRS three-digit consumer goods industries	1963	Four-firm concentration	Advertising-sales ratio	Linear	Insignificant; change in concentration also insignificant
th (1971) ^j	35 IRS three-digit consumer goods industries	1958, 1963	Four-firm concentration Lorenz coefficient	Advertising-sales ratio	Linear and log	Insignificant except for linear regression using Lorenz coefficient
rnson (1971) ^k	18 therapeutic product classes	1964, 1968	Four-firm concentration Herfindahl index	Promotion-sales ratio	Linear	Insignificant
eer (1971) ^l	41 IRS 3-digit consumer goods industries divided into three product differentiability groups	1947, 1954 and 1958	Advertising-sales ratio	Four-firm concentration	Quad-ratic	Insignificant and significant depending on sample tested
nn, Henning, d Meehan (1973) ^m	Greer's samples less one industry in each class	1947, 1954 and 1958	Advertising-sales ratio	Four-firm concentration	Quad-ratic	Generally insignificant

APPENDIX A--Continued

Study	Sample	Period	Dependent Variable	Independent Variable	Functional Form	Statistical Significance
Ward (1973) ⁿ	36 national banks	1964, 1965	Three-firm concentration	Advertising-sales ratio	Linear	Insignificant
Le (1972) ^o	26 narrowly defined consumer goods industries (Great Britain)	1963	Advertising-sales ratio and stock of advertising-sales ratio	Three-firm concentration ratio and Herfindahl index	Linear and quadratic	Mixed depending on functional form
Stein, Preston, Intriligator and Reaves (1973) ^p	113 IRS industries	1963	Four-firm concentration	Advertising-sales ratio	Log	Significant
Ston (1974) ^q	25 consumer goods industries (Great Britain)	1963	Advertising-sales ratio (inclusive of excise taxes)	Five-firm concentration	Linear	Insignificant
Miller and (1974) ^r	166 SIC four-digit industries	1947-1970	Change in four-firm concentration	High, moderate and low advertising intensive dummy variables	Linear	Significant for high and moderate
Kie (1975) ^s	63 nondurable consumer goods industries (Great Britain)	1971	Advertising-sales ratio	Three-firm and five-firm density ratios	Linear	Insignificant
					Quadratic	Insignificant

APPENDIX A--Continued

Study	Sample	Period	Dependent Variable	Independent Variable	Functional Form	Statistical Significance
es (1975) ^t	Sutton's sample (Great Britain)	1963, 1968	Advertising-sales ratio (including and excise taxes)	Five-firm concentration	Linear and quadratic	Significant when taxes are included
son (1975) ^u	41 IRS consumer goods divided into experience durable, non-durable and search goods	1958	Four-firm concentration	Advertising-sales ratio	Linear	Insignificant for experience durable and nondurable goods, significant for search goods
mbin (1976) ^v	Six subsamples drawn from 107 brands of consumer goods in Western European countries	1960-1970	Herfindahl index, three-firm and five-firm concentration ratios	Advertising-sales ratio and advertising per inhabitant	Linear	Insignificantly positive in five of six samples
sh (1976) ^w	28 SIC four-digit industries	1954-1963	Weighted average dominant firm advertising-sales ratio	Four-firm concentration	Linear	Significant
					Quadratic	Insignificant
roux (1976) ^x	78 and 61 SIC four-digit consumer goods industries	1947-1963	Change in four- and eight-firm concentration	Dummy variable for high and medium product differentiation based on advertising intensity	Linear	Significant in certain periods for 78 industry sample; insignificant for 61 industry sample

APPENDIX A--Continued

Study	Sample	Period	Dependent Variable	Independent Variable	Functional Form	Statistical Significance
Trickland and Miss (1976) ^y	408 SIC four- digit industries	1963	Advertising- sales ratio	Four-firm concentration	Quad- ratic	Significant
Ornstein (1978) ^z	261, 329 and 324 four-digit industry level U.S. input- output tables for 1947, 1963 and 1967 respectively	1947, 1963 and 1967	Four-firm concentration	Advertising- sales ratio	Linear	Significant
			Industry ad- vertising- sales ratio, log of total industry ad- vertising expenditures	Four-firm value of shipments concentration ratio, total industry sales	Linear, quad- ratic and log linear	Significant, positive linear relationship between advertising and concentration

Note: Certain studies had other independent variables such as market growth and various proxies for barriers to entry.

^a Adapted from Stanley I. Ornstein, Industrial Concentration and Advertising Intensity (Washington: American Enterprise Institute, 1977).

^b Lester G. Telser, "Advertising and Competition," Journal of Political Economy 72 (December 1964): 537-562.

^c Charles Y. Yang, "Industrial Concentration and Advertising," Hearings before Subcommittee on Antitrust and Monopoly of the Committee on the Judiciary, U.S. Senate, Part 5: Concentration and Divisional Reporting, Appendix S. Washington: U.S. Government Printing Office, 1966, pp. 2153-2163.

^d H. M. Mann, J. A. Henning, and J. W. Meehan, Jr., "Advertising and Concentration: An Empirical Investigation," Journal of Industrial Economics 16 (November 1967): 34-45.

^e Peter Doyle, "Advertising Expenditure and Consumer Demand," Oxford Economic Papers 20 (November 1968): 394-416.

^f Lester G. Telser, "Another Look at Advertising and Concentration," Journal of Industrial Economics 18 (November 1969):

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- ^gRobert B. Ekelund, Jr., and Charles Maurice, "An Empirical Investigation of Advertising and Concentration: Comment," Journal of Industrial Economics 18 (November 1969): 76-80.
- ^hMatityahu Marcus, "Advertising and Changes in Concentration," Southern Economic Journal 36 (October 1969): 117-121.
- ⁱRobert B. Ekelund, Jr., and William P. Gramm, "Advertising and Concentration: Some New Evidence," Antitrust Bulletin (Summer 1970): 243-249.
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- ^lDouglas F. Greer, "Advertising and Market Concentration," Southern Economic Journal 38 (July 1971): 19-32.
- ^mH. M. Mann, J. A. Henning, and J. W. Meehan, Jr., "Advertising and Market Concentration: Comment," Southern Economic Journal 39 (January 1973): 448-451.
- ⁿFranklin R. Edwards, "Advertising and Competition in Banking," Antitrust Bulletin 18 (Spring 1973): 23-32.
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- ^pStanley I. Ornstein, J. Fred Weston, Michael Intriligator, and Ronald Shrieves, "Determinants of Market Structure," Southern Economic Journal 39 (April 1973): 612-625.
- ^qC. J. Sutton, "Advertising, Concentration, and Competition," Economic Journal 84 (March 1974): 56-69.
- ^rWillard F. Mueller and Larry G. Hamm, "Trends in Industrial Market Concentration, 1947 to 1970," Review of Economics and Statistics 56 (November 1974): 511-520.
- ^sW. Duncan Reekie, "Advertising and Market Structure: Another Approach," Economic Journal 85 (March 1975): 156-164.
- ^tR. D. Rees, "Advertising, Concentration, and Competition: A Comment and Further Results," Economic Journal 85 (March 1975): 165-174.
- ^uPhillip Nelson, "The Economic Consequences of Advertising," Journal of Business 48 (April 1975): 213-241.

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^v Jean-Jacques Lambin, Advertising, Competition, and Market Conduct in Oligopoly over Time: An Econometric Investigation Western European Countries (Amsterdam: North-Holland, 1976).

^w Brian C. Brush, "The Influence of Market Structure on Industry Advertising Intensity," Journal of Industrial Economics 25 ptember 1976): 55-67.

^x David J. Theroux, "Marcus' 'Advertising and Changes in Concentration': A Comment," unpublished paper, University of cago, 1976.

^y Alllyn D. Strickland and Leonard W. Weiss, "Advertising, Concentration, and Price-Cost Margins," Journal of Political nomy 84 (October 1976): 1109-1121.

^z Stanley I. Ornstein, Industrial Concentration and Advertising Intensity (Washington: American Enterprise Institute, 7).

APPENDIX B
ADVERTISING EXPENDITURE DATA CODEBOOK^a

Column

1-4	Industry Code
	4112 = Lip and Eye Beauty Products
	✓ 4113 = Perfumes
	4114 = Make-up
	4115 = Manicure Preparations
	4121 = Toothpaste, Mouthwash
	4122 = Toilet Soap
	4123 = Feminine Hygiene Products
	4124 = Deodorants
	4125 = Shaving Cream
	4141 = Hair Treatment
	4142 = Shampoo, Rinses
	6122 = Cereals
	6310 = Beer (barrels)
	6320 = Wine (gallons)
	7112 = Cigars (units)
	7330 = Restaurants, Fast Food
	7531 = Pet Foods
	8412 = Detergents, Light
	8413 = Detergents, Heavy
6-7	Firm Number
	0 = Industry
	1 to 99 = Individual Firm
9-10	Brand Number
	1 to 16 = Brands
	17 = Industry or Firm
12-13	Year
	70 to 75 = 1970 to 1975
15-18	Market Share
	Nearest Tenth of a Percent (X.XXX)
20-26	Total Advertising - 6 Media Total
	Hundreds of Dollars (add 00)

^aFor use in conjunction with Appendix C below.

APPENDIX B---ContinuedColumn

27-33	Magazines Hundreds of Dollars (add 00)
34-40	Newspaper Supplements Hundreds of Dollars (add 00)
41-47	Network Television Hundreds of Dollars (add 00)
48-54	Spot Television Hundreds of Dollars (add 00)
55-61	Network Radio Hundreds of Dollars (add 00)
62-68	Outdoor Hundreds of Dollars (add 00)
69-75	Total Industry Sales Hundreds of Thousands of Dollars (add 00,000) Note: Industries #6310, #6320 and #7112 are in barrels, gallons and units respectively.
77-80	Record Identification Number 1 to 1722

APPENDIX C

SALES, MARKET SHARE AND ADVERTISING EXPENDITURES FOR FIRMS AND BRANDS IN 19 CONSUMER NON-DURABLE GOODS CATEGORIES^a

4112	0	17	75	1000	306098	00476	183	129745	100043	3049	0	0250	1
4112	0	17	74	1000	271053	03402	300	124905	73042	4099	0	7250	2
4112	0	17	73	1000	305207	08054	107	136471	94828	5457	0	0300	3
4112	0	17	72	1000	269305	01164	107	97102	90014	4000	0	0300	4
4112	0	17	71	1000	211350	03175	799	61801	62413	3100	0	0300	5
4112	0	17	70	1000	155300	04450	747	54316	50113	940	0	0300	6
4112	1	17	75	174	41090	10429	0	29552	1103	0	0	0250	7
4112	1	17	74	109	37435	0087	0	29290	48	0	0	7250	8
4112	1	17	73	152	39547	10003	0	17393	4351	0	0	0300	9
4112	1	17	71	104	32551	19079	0	4715	0457	0	0	0300	10
4112	1	17	70	101	34000	25009	0	0	11657	0	0	0300	11
4112	2	17	75	94	34	34	0	0	0	0	0	0300	12
4112	2	17	73	95	702	361	0	0	0	401	0	0300	13
4112	2	17	72	94	510	180	0	0	0	330	0	0300	14
4112	2	17	71	114	39109	0064	0	0	0	0	0	0300	15
4112	3	17	74	112	40431	0807	0	12190	13255	0	0	0300	16
4112	3	17	73	111	27707	0130	0	3700	7000	0	0	7250	17
4112	3	17	72	106	26242	0929	0	0449	13122	0	0	0300	18
4112	3	17	71	106	10237	0814	0	5500	13707	0	0	0300	19
4112	3	17	70	105	9148	4783	0	2000	3501	0	0	0300	20
4112	4	17	75	75	33010	4691	0	16292	14027	0	0	0300	21
4112	4	17	74	74	39240	9079	0	15457	14104	0	0	7250	22
4112	4	17	73	05	37674	0054	0	20827	10790	0	0	0300	23
4112	4	17	71	2	19825	1907	0	11553	3305	0	0	0300	24
4112	4	17	70	2	370	229	0	0	147	0	0	0300	25
4112	5	17	75	33	430	430	0	0	0	0	0	0300	26
4112	5	17	74	33	3630	3277	35	0	0	0	0	7250	27
4112	5	17	73	33	1757	1049	100	0	0	0	0	0300	28
4112	5	17	72	29	1132	1025	100	0	0	0	0	0300	29
4112	5	17	71	10	3938	3553	400	0	0	0	0	0300	30
4112	5	17	70	11	1233	1154	900	0	0	0	0	0300	31
4112	6	17	75	22	433	433	0	0	0	0	0	0300	32
4112	6	17	74	2	263	263	0	0	0	0	0	0300	33
4112	6	17	73	14	1503	1503	0	0	0	0	0	0300	34
4112	6	17	72	14	493	493	0	0	0	0	0	0300	35
4112	6	17	71	5	140	120	0	0	0	0	0	0300	36
4112	7	17	75	4	501	501	0	0	0	0	0	0300	37
4112	7	17	74	4	1100	1100	0	0	0	0	0	0300	38
4112	7	17	73	4	1340	1340	0	0	0	0	0	7250	39
4112	7	17	72	3	1899	1899	0	0	0	0	0	0300	40
4112	7	17	71	10	1233	1233	0	0	0	0	0	0300	41
4112	8	17	75	1	210	210	0	0	0	0	0	0300	42
4112	8	17	74	3	4004	4004	0	0	0	0	0	0300	43
4112	8	17	73	3	5155	1555	0	0	0	0	0	7250	44
4112	8	17	72	3	0770	413	0	0	0	0	0	0300	45
4112	8	17	71	3	9201	0000	0	135	209	0	0	0300	46
4112	9	17	75	1	9545	9545	0	0	0	0	0	0300	47
4112	9	17	74	0	9570	9570	0	0	0	0	0	0300	48
4112	9	17	73	11	3102	3102	0	0	0	0	0	0300	49
4112	9	17	72	10	1593	1593	0	0	0	0	0	7250	50
4112	9	17	71	10	9500	5039	0	0	386	0	0	0300	51
4112	10	17	75	10	5005	5005	0	0	0	0	0	0300	52
4112	10	17	74	3	0712	4547	0	0	410	0	0	0300	53
4112	10	17	73	2	906	906	0	0	0	0	0	0300	54
4112	10	17	72	3	853	859	0	0	0	0	0	7250	55
4112	10	17	71	3	701	701	0	0	0	0	0	0300	56
4112	11	17	75	3	530	462	0	0	0	0	0	0300	57
4112	11	17	74	3	671	671	0	0	0	0	0	0300	58
4112	11	17	73	2	403	465	0	0	0	0	0	0300	59
4112	11	17	72	2	310	310	0	0	0	0	0	0300	60
4112	11	17	71	0	1893	1862	0	0	0	0	0	0300	61
4112	12	17	75	0	3515	0	0	304	474	0	0	7250	62
4112	12	17	74	0	0833	459	0	0848	1340	0	0	0300	63
4112	12	17	73	0	1309	7287	0	5511	295	0	0	0300	64
4112	12	17	72	1	4230	3072	0	0	38	112	0	0300	65
4112	12	17	71	1	3847	3837	0	0	10	0	0	7250	66
4112	13	17	75	1	17204	2036	0	10019	4609	0	0	0300	67
4112	13	17	74	1	15215	4050	0	7447	2913	0	0	0300	68
4112	13	17	73	1	1014	1014	0	0	0	0	0	0300	69
4112	13	17	72	1	081	081	0	0	0	0	0	0300	70
4112	13	17	71	191	130805	12005	0	71711	44493	2521	0	0300	71
4112	14	17	75	107	124418	11073	0	73303	35301	4090	0	7250	72
4112	14	17	74	177	115723	11701	0	63773	35154	5550	0	0300	73
4112	14	17	73	174	92192	0883	0	43093	35940	3070	0	0300	74
4112	14	17	72	67	73705	5031	0	37444	34309	317	0	0300	75
4112	14	17	71	05	07038	0502	0	37744	22712	340	0	0300	76
4112	15	17	75	292	43902	15214	103	0	48133	0	0	0300	77
4112	15	17	74	395	27904	12920	107	0	14057	0	0	7250	78

^aSee Appendix B above for a description of the data organization.

44113	13	17	71	476	47950	31723	3934	5221	9759	851	0	54200	81
44113	0	17	75	10000	393117	106671	39331	151372	119400	9857	206	54200	82
44113	0	17	72	10000	301775	105449	3351	106372	73355	9550	0	54200	83
44113	0	17	73	10000	205153	110907	6524	84243	53002	333	137	7900	84
44113	0	17	72	10000	192123	90560	6524	42306	47033	0	0	7150	85
44113	0	17	71	10000	13387	99382	2340	440002	50010	330	0	6450	86
44113	0	17	70	10000	204537	91722	4289	43605	50205	1290	357	3350	87
44113	0	17	75	2980	23022	1040	0	19168	5133	2681	0	3350	88
44113	1	17	74	3310	10491	0	0	9143	2	1340	0	3750	89
44113	1	17	73	3310	9009	0	0	7965	1346	333	0	7900	90
44113	1	17	72	3320	7380	118	0	4241	3027	0	0	7150	91
44113	1	17	71	3320	15074	34655	0	4318	9771	0	0	9450	92
44113	2	17	75	3311	40413	96566	1324	10246	19160	0	0	9450	93
44113	2	17	74	333	20651	96566	271	74	3200	0	0	9750	94
44113	2	17	72	330	7501	4257	0	3364	0	0	0	7150	95
44113	2	17	71	330	4049	1937	0	0	2112	0	0	6450	96
44113	2	17	70	316	14937	1327	0	70	12930	0	0	9850	97
44113	3	17	75	333	7300	50694	56	0	1604	0	0	9550	98
44113	3	17	74	333	6549	5758	252	0	341	0	0	9750	99
44113	3	17	73	333	5320	43550	552	0	242	0	0	7900	100
44113	3	17	72	333	1220	10822	107	0	71	0	0	7150	101
44113	3	17	71	333	1354	1273	70	0	5	0	0	6450	102
44113	4	17	70	333	1701	1609	72	0	0	0	0	5850	103
44113	4	17	75	337	61393	40333	0	50601	6099	0	0	5850	104
44113	4	17	74	337	42004	9473	0	32320	211	0	0	7950	105
44113	4	17	73	334	37143	6544	0	25977	4033	0	0	7900	106
44113	4	17	72	331	33293	60500	0	16052	7997	0	0	7150	107
44113	4	17	71	331	21701	51017	0	11082	4010	0	0	6450	108
44113	4	17	70	330	21973	5141	0	8603	8155	0	0	5850	109
44113	5	17	75	332	17703	2713	275	0	14777	0	0	3300	110
44113	5	17	73	333	15543	4833	1039	9006	0	0	0	7900	111
44113	5	17	72	333	3693	8468	225	0	0	0	0	7150	112
44113	5	17	75	330	3869	753	0	3500	4014	0	0	9500	113
44113	5	17	74	330	3633	1433	0	3160	5235	0	0	6750	114
44113	5	17	73	330	11210	314	0	3140	7702	0	0	7900	115
44113	5	17	72	330	4700	433	0	446	3481	0	0	7150	116
44113	5	17	71	330	2083	697	0	0	719	0	0	6450	117
44113	5	17	70	330	1635	597	0	0	1083	0	0	5850	118
44113	7	17	75	430	2312	1911	213	0	133	0	0	3300	119
44113	7	17	74	430	6091	845	99	0	5147	0	0	3750	120
44113	7	17	73	530	10910	3913	527	0	6470	0	0	7900	121
44113	7	17	72	530	0333	6204	123	0	0	0	0	7150	122
44113	7	17	71	530	5333	3109	152	0	12	0	0	6450	123
44113	7	17	70	530	7903	4490	214	0	2342	0	357	5850	124
44113	8	17	75	539	44937	14708	047	7932	21945	0	0	5850	125
44113	8	17	74	630	46459	20846	403	10965	16305	0	0	6750	126
44113	8	17	73	632	33588	21805	576	0	11407	0	0	7900	127
44113	8	17	72	44	32039	19133	0	0	12906	0	0	7150	128
44113	8	17	75	337	43604	18008	0	25208	3388	0	0	9500	129
44113	8	17	74	337	27519	18273	0	7363	3733	150	0	6750	130
44113	9	17	73	400	22535	13865	0	8053	97	0	0	7900	131
44113	9	17	72	402	15107	18070	0	0	5037	0	0	7150	132
44113	9	17	71	334	14236	14142	0	0	94	0	0	6450	133
44113	9	17	70	331	17550	11542	0	5360	10	588	0	3350	134
44113	10	17	75	334	8200	1720	0	3244	3224	0	0	9500	135
44113	10	17	74	333	8000	2646	0	0	5354	0	0	6750	136
44113	10	17	73	239	2700	1475	0	0	1225	0	0	7900	137
44113	10	17	72	237	132	132	0	0	0	0	0	7150	138
44113	11	17	75	332	3211	3211	0	0	0	0	0	3300	139
44113	11	17	74	332	4023	3189	87	0	0	0	747	5750	140
44113	11	17	73	330	4372	4056	310	0	0	0	0	7900	141
44113	11	17	72	260	4273	3972	300	0	0	0	0	7150	142
44113	12	17	75	21	12810	2049	65	504	2602	0	0	9500	143
44113	12	17	74	22	5525	5338	176	0	11	0	0	6750	144
44113	12	17	73	21	4490	4408	54	0	28	0	0	7900	145
44113	12	17	72	22	7980	3378	15	0	4587	0	0	7150	146
44113	13	17	75	20	5849	5849	0	0	0	0	0	3300	147
44113	13	17	74	19	3850	3850	0	0	0	0	0	6750	148
44113	13	17	73	20	3338	2390	948	0	0	0	0	7900	149
44113	13	17	72	19	2299	1372	927	0	0	0	0	7150	150
44113	14	17	75	18	274	274	0	0	0	0	0	7900	151
44113	14	17	72	22	1403	1403	0	0	0	0	0	7150	152
44113	14	17	71	27	1090	1018	72	0	0	0	0	6450	153
44113	15	17	75	13	15997	6838	90	4535	4322	0	200	5360	154
44113	15	17	74	13	3873	1449	3393	4033	0	0	0	6750	155
44113	15	17	73	11	10600	1406	0	9202	36	1777	0	7900	156
44113	15	17	75	12	1863	0	0	0	0	1944	0	6750	157
44113	16	17	74	12	1944	0	0	0	0	0	0	7150	158
44113	16	17	73	12	10364	463	0	6128	1773	0	0	7900	159
44113	16	17	72	9	5440	1912	0	0	3330	0	0	7150	160
44113	16	17	71	7	6110	805	0	0	5305	0	0	6450	161
44113	16	17	70	7	1030	970	0	0	0	0	0	5850	162
44113	17	17	75	12	4120	3760	0	0	350	0	0	9850	163
44113	17	17	74	12	2480	1671	0	0	612	0	0	6750	164
44113	17	17	73	10	4330	3342	158	0	336	0	0	7900	165
44113	17	17	72	10	2212	1977	235	0	0	0	0	7150	166
44113	18	17	75	11	20820	4246	0	1200	4537	0	0	9500	167
44113	18	17	74	10	6520	5743	0	5743	781	0	0	6450	168

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4113	13	17	73	11	8403	145	0	7509	714	0	0	7900	163
4113	13	17	72	12	5893	71	0	5013	507	0	0	7150	171
4113	13	17	73	10	1023	1319	0	0	0	0	0	3500	171
4113	13	17	73	10	6322	343	0	0	0	0	0	8750	172
4113	13	17	73	10	404	385	0	0	0	0	0	7300	173
4113	21	17	75	9	1433	1370	0	0	0	0	0	3500	174
4113	21	17	73	10	1480	1367	0	0	0	0	0	7750	175
4113	21	17	73	10	1543	1441	0	0	0	0	0	7900	176
4113	21	17	72	9	1139	1139	0	0	0	0	0	7150	177
4113	22	17	75	7	1108	901	0	0	0	0	0	3530	178
4113	22	17	74	8	1094	843	0	0	0	0	0	8750	179
4113	22	17	73	8	1536	1022	0	0	148	0	0	7300	180
4113	22	17	72	9	1107	1020	0	0	0	0	0	7150	181
4113	23	17	75	5	3471	2509	0	0	0	0	734	3500	182
4113	23	17	74	5	4274	4010	0	0	0	0	0	8750	183
4113	23	17	73	6	2733	2560	0	0	0	0	0	7900	184
4113	23	17	72	7	1739	1663	0	0	0	0	0	7150	185
4113	24	17	75	9	5343	1370	0	0	7520	2527	1643	3500	186
4113	24	17	71	4	1123	325	0	0	4342	2337	0	8450	187
4113	24	17	70	5	1376	6591	0	0	3332	3321	710	3530	188
4114	0	17	75	1	1717	4865	0	0	3360	5551	1133	4100	189
4114	0	17	74	1	1534	3020	0	0	3443	4304	0	4300	190
4114	0	17	73	1	1372	4167	0	0	5874	3852	0	4700	191
4114	0	17	72	1	1313	3375	0	0	5502	4195	0	4500	192
4114	0	17	71	1	1162	4070	0	0	7080	2783	457	4300	193
4114	0	17	70	1	1404	9157	0	0	5827	2046	0	4100	194
4114	1	17	75	1	3243	1177	0	0	1534	5205	0	5100	195
4114	1	17	73	1	1671	1057	0	0	6138	0	0	4700	196
4114	1	17	72	1	1239	1021	0	0	2180	0	0	4500	197
4114	1	17	71	1	1480	1480	0	0	0	0	0	4300	198
4114	2	17	70	1	2103	2103	0	0	0	0	0	3100	199
4114	2	17	75	1	2674	62	0	0	0	2612	0	5100	200
4114	3	17	73	2	2349	302	0	0	8652	1121	0	5100	201
4114	3	17	72	2	2123	4693	0	0	5340	1058	0	4700	202
4114	3	17	71	2	1547	2930	0	0	4303	7636	0	4500	203
4114	3	17	70	2	9742	5739	0	0	1369	2174	0	4300	204
4114	4	17	75	0	6045	9700	0	0	2729	2231	1133	5100	205
4114	4	17	74	0	6132	1442	0	0	2536	2093	0	4900	206
4114	4	17	73	0	6303	3552	0	0	3528	2253	0	4700	207
4114	4	17	72	0	6363	2272	0	0	3433	2649	0	4500	208
4114	4	17	71	0	6255	190	0	0	3747	2508	0	4300	209
4114	4	17	70	0	4723	1312	0	0	3387	1149	0	4100	210
4114	5	17	75	3	1620	1501	0	0	0	0	0	5100	211
4114	5	17	74	3	3834	604	0	0	0	0	0	4300	212
4114	5	17	73	3	3450	3180	0	0	0	0	0	4700	213
4114	5	17	72	3	3500	350	0	0	0	0	0	4500	214
4114	5	17	71	3	3539	755	0	0	0	0	0	4100	215
4114	5	17	70	3	3276	7201	0	0	1472	1083	0	5100	216
4114	6	17	74	0	1780	1424	0	0	1113	5251	0	4900	217
4114	6	17	73	0	1575	1521	0	0	0	0	0	4700	218
4114	7	17	72	0	434	434	0	0	0	0	0	4500	219
4114	7	17	71	0	449	249	0	0	0	0	0	4300	220
4114	7	17	70	0	1231	1109	0	0	0	0	0	5100	221
4114	8	17	74	0	933	939	0	0	0	0	0	4900	222
4114	8	17	73	0	463	463	0	0	0	0	0	4700	223
4114	8	17	72	0	2500	2500	0	0	0	0	0	4500	224
4114	8	17	71	0	1612	1612	0	0	0	0	0	5100	225
4114	8	17	70	0	15	0	0	0	0	0	0	4900	226
4114	9	17	74	0	4094	4094	0	0	0	0	0	4500	227
4114	9	17	73	0	4996	4996	0	0	0	0	0	5100	228
4114	9	17	72	0	4990	4990	0	0	0	0	0	4900	229
4114	9	17	71	0	2730	2730	0	0	0	0	0	4700	230
4114	10	17	74	0	1225	1225	0	0	0	0	0	4500	231
4114	10	17	73	0	870	870	0	0	0	0	0	4300	232
4114	10	17	72	0	1112	1112	0	0	0	0	0	4100	233
4114	10	17	71	0	5362	5362	0	0	0	0	0	5100	234
4114	10	17	70	0	5117	5117	0	0	0	0	0	4900	235
4114	11	17	74	0	2282	2282	0	0	0	0	0	4700	236
4114	11	17	73	0	4087	4080	0	0	0	0	0	4500	237
4114	11	17	72	0	4629	4629	0	0	0	0	0	4300	238
4114	11	17	71	0	1207	1207	0	0	0	0	0	4100	239
4114	11	17	70	0	825	825	0	0	0	0	0	5100	240
4114	12	17	74	0	381	381	0	0	0	0	0	4900	241
4114	12	17	73	0	155	155	0	0	0	0	0	4700	242
4114	12	17	72	0	287	287	0	0	0	0	0	4500	243
4114	12	17	71	0	344	260	0	0	0	0	0	4900	244
4114	12	17	70	0	156	89	0	0	0	0	0	4100	245
4114	13	17	74	0	911	0	0	0	0	911	0	5100	246
4114	13	17	73	0	334	334	0	0	0	0	0	4700	247
4114	13	17	72	0	312	812	0	0	0	0	0	4500	248
4114	13	17	71	0	3114	591	0	0	0	0	0	5100	249
4114	13	17	70	0	2597	4562	0	0	1356	7820	0	4500	250
4115	0	17	75	0	2514	1422	0	0	1107	3634	0	1600	251
4115	0	17	74	0	3463	1955	0	0	1325	1331	0	1800	252
4115	0	17	73	0	4472	2208	0	0	0	2240	0	1520	253
4115	0	17	72	0	2653	1005	0	0	0	9013	0	1440	254
4115	0	17	71	0	1762	1097	0	0	0	8510	0	1370	255
4115	0	17	70	0	1313	5181	0	0	1274	3311	0	1300	256

41115	1	17	75	330	2059	2023	0	0	31	0	0	1600	257
41115	1	17	73	323	2081	2060	0	0	0	0	0	1600	258
41115	1	17	72	265	2234	2234	0	0	0	0	0	1520	259
41115	1	17	71	212	3199	3199	0	0	0	0	0	1440	260
41115	1	17	70	182	2210	2210	0	0	0	0	0	1370	261
41115	2	17	75	192	2936	2918	0	0	13	0	0	1300	262
41115	2	17	74	136	3659	3408	0	0	251	0	0	1600	263
41115	2	17	73	132	7049	3468	0	0	150	0	0	1600	264
41115	2	17	72	125	9382	3223	0	0	1157	0	0	1520	265
41115	2	17	71	157	1944	1942	0	0	0	2	0	1440	266
41115	2	17	70	153	3074	1942	0	0	450	0	0	1370	267
41115	4	17	75	105	8430	1813	0	0	1107	243	0	1300	268
41115	4	17	74	101	4824	1110	0	0	3516	2183	0	1600	269
41115	4	17	73	98	3739	3565	0	0	0	0	0	1600	270
41115	4	17	72	91	1499	1432	0	0	0	174	0	1520	271
41115	4	17	75	85	2360	2368	0	0	0	63	0	1440	272
41115	4	17	74	85	783	783	0	0	0	0	0	1600	273
41115	3	17	73	85	1720	1720	0	0	0	0	0	1800	274
41115	3	17	72	84	334	334	0	0	0	0	0	1520	275
41115	3	17	71	72	804	804	0	0	0	0	0	1440	276
41115	3	17	70	71	1233	1224	0	0	0	6	0	1370	277
41115	3	17	74	17	984	871	0	0	0	0	0	1300	278
41115	3	17	73	16	1075	1021	0	0	0	0	0	1600	279
41115	3	17	72	15	779	779	0	0	0	0	0	1520	280
41115	3	17	75	14	13	13	0	0	0	0	0	1440	281
41115	7	17	73	13	564	564	0	0	0	0	0	1520	282
41115	7	17	71	40	1233	1233	0	0	0	0	0	1440	283
41115	7	17	75	33	600	600	0	0	0	0	0	1600	284
41115	7	17	74	33	307	300	0	0	0	0	0	1600	285
41115	7	17	73	33	673	709	0	0	0	0	0	1600	286
41115	12	17	74	33	1505	3937	0	0	1078	93	0	1800	287
41115	12	17	73	33	2044	5539	0	0	206	65	0	1600	288
41115	12	17	72	33	1174	3299	0	0	779	84	0	1520	289
41115	12	17	71	33	1044	3794	0	0	65	14	0	1440	290
41115	12	17	70	33	5394	4547	0	0	3375	0	0	1370	291
41211	0	17	75	100	1302	79245	0	0	3139	61	1763	1300	292
41211	0	17	74	100	1137	82673	0	0	3680	84	1697	1240	293
41211	0	17	73	100	1137	112033	0	0	2357	54	1212	7200	294
41211	0	17	72	100	11199	37	0	0	7541	174	2453	95	295
41211	0	17	71	100	11072	49	0	0	7397	134	2474	719	296
41211	0	17	70	100	11072	49	0	0	7397	134	2474	719	297
41211	1	17	74	33	334	1639	0	0	2108	33	1015	36	298
41211	1	17	73	33	266	2019	0	0	1672	32	990	22	299
41211	1	17	72	33	2520	1	0	0	1600	33	7178	0	300
41211	1	17	74	181	2511	31714	0	0	7325	64	7432	5	301
41211	2	17	73	183	2157	34947	0	0	1133	32	2442	1150	302
41211	2	17	72	180	1940	36511	0	0	1075	37	3725	1278	303
41211	2	17	71	181	1762	4296	0	0	1131	73	5728	1499	304
41211	3	17	75	153	2070	18449	0	0	1361	23	5217	179	305
41211	3	17	74	131	1746	11148	0	0	8787	74	2426	1	306
41211	3	17	73	133	1023	2301	0	0	806	46	1928	9	307
41211	3	17	71	128	1417	52	0	0	1192	06	19992	907	308
41211	4	17	75	18	1808	2	0	0	1557	8	2504	0	309
41211	4	17	74	17	1810	3	0	0	1409	3	4010	0	310
41211	4	17	73	23	427	2703	0	0	3732	3	2460	0	311
41211	4	17	72	28	925	1878	0	0	8026	8	3363	1047	312
41211	4	17	75	183	811	1113	0	0	6183	33	1820	0	313
41211	4	17	74	181	1018	690	0	0	7955	52	2159	0	314
41211	5	17	73	192	768	33	0	0	603	77	1642	0	315
41211	5	17	72	202	808	14	0	0	5631	17	2354	0	316
41211	5	17	71	203	1134	26	0	0	7594	4	3009	2	317
41211	5	17	73	19	306	739	0	0	0	0	309	0	318
41211	6	17	72	21	862	0	0	0	0	0	862	0	319
41211	6	17	71	23	1231	0	0	0	1152	26	1290	0	320
41211	7	17	75	33	1804	207	0	0	1201	16	5797	0	321
41211	7	17	74	38	2061	1978	0	0	1774	3	878	0	322
41211	7	17	73	59	2071	2797	0	0	1991	12	3596	0	323
41211	7	17	72	59	1794	415	0	0	1617	70	1364	0	324
41211	7	17	71	61	2931	1304	0	0	19131	3	3824	0	325
41211	7	17	74	87	3687	31	0	0	2402	50	9147	5408	326
41211	9	17	73	75	3854	39103	0	0	2286	9	1124	1651	327
41211	1	1	75	234	1727	16512	0	0	1121	158	4398	0	328
41211	1	1	74	231	1624	16020	0	0	1144	30	5192	0	329
41211	1	1	73	231	1539	13181	0	0	844	90	4126	0	330
41211	1	1	72	221	1333	19305	0	0	831	30	3682	0	331
41211	1	1	71	218	1488	21155	0	0	950	79	3248	0	332
41211	1	2	75	44	641	99	0	0	422	59	1938	0	333
41211	1	2	74	42	783	25	0	0	523	13	2500	0	334
41211	1	2	73	45	780	38	0	0	427	10	3532	0	335
41211	1	2	72	48	904	39	0	0	450	41	1479	0	336
41211	1	3	74	72	740	23	0	0	490	43	2460	0	337
41211	1	3	73	70	544	91	0	0	360	52	2243	0	338
41211	1	3	72	67	522	34	0	0	315	14	2316	0	339
41211	2	1	75	130	1622	13240	0	0	1086	6	4035	0	340
41211	2	1	74	128	1433	25330	0	0	210	6	3705	0	341
41211	2	1	73	133	1458	2	0	0	786	31	2695	0	342
41211	2	1	72	130	1238	22	0	0	709	9	2342	0	343
41211	2	1	71	124	1230	99	0	0	749	79	4349	325	344

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4121	2	2	74	38	71137	53	0	50194	3383	11502	0	7200	345
4121	2	2	75	41	69704	4572	0	49432	5172	10475	0	3350	346
4121	2	2	72	43	68530	10339	0	36522	3723	12788	0	8700	347
4121	2	2	71	40	49134	0	0	37503	10401	1105	0	9400	348
4121	2	3	75	20	24030	4637	0	0	17393	0	0	7240	349
4121	2	3	74	10	35931	0325	905	702	27873	0	0	7200	350
4121	2	4	75	4	103	0	0	0	103	0	0	7240	351
4121	2	4	74	5	3	0	0	0	3	0	0	7200	352
4121	2	4	73	9	214	0	0	0	214	0	0	0350	353
4121	2	4	72	10	1087	1507	0	0	100	0	0	0700	354
4121	2	4	71	13	4330	0	0	320	3380	0	0	0800	355
4121	3	1	75	63	74517	2870	0	44387	26600	0	0	0240	356
4121	3	1	74	02	03904	4455	0	52910	20033	0	0	7200	357
4121	3	1	73	74	73333	2259	308	33035	10871	0	0	6950	358
4121	3	1	72	82	93431	811	0	77030	14653	117	0	0700	359
4121	3	1	71	94	124845	0	1647	106245	16046	307	0	0800	360
4121	3	2	75	20	19732	0	0	17499	2233	0	0	7240	361
4121	3	2	74	27	20634	720	0	25303	2591	0	0	7200	362
4121	3	2	73	29	29471	0	0	27011	2413	0	0	0350	363
4121	3	2	72	34	24117	0	0	19694	4423	0	0	0700	364
4121	3	2	71	30	10907	0	0	14901	3946	0	0	0400	365
4121	3	3	75	04	112812	15573	310	73037	43266	0	0	7240	366
4121	3	3	74	42	82032	5973	1400	3816	44777	0	0	7200	367
4121	4	1	75	12	18082	0	0	15378	2304	0	0	7240	368
4121	4	1	74	17	13133	0	0	14093	4010	0	0	7200	369
4121	4	1	73	23	42702	2700	279	37323	2400	0	0	0350	370
4121	4	1	72	20	92530	1578	0	80200	9303	1047	0	0700	371
4121	4	1	71	103	81154	1113	0	61833	16208	0	0	7240	372
4121	5	1	74	131	101843	090	0	79552	21595	0	0	7200	373
4121	5	1	73	132	70003	0	0	60377	16426	0	0	6350	374
4121	5	1	72	202	63814	949	0	38117	23548	0	0	0800	375
4121	5	1	71	203	113400	7390	0	75944	30092	0	0	0400	376
4121	0	0	75	19	346	0	0	0	300	0	0	0350	377
4121	0	0	74	21	602	0	0	0	602	0	0	0700	378
4121	6	1	71	23	12810	0	0	11526	1250	0	0	0400	379
4121	7	1	75	32	17813	0	0	12016	5797	0	0	7240	380
4121	7	1	74	35	18621	0	0	17743	878	0	0	7200	381
4121	7	1	73	37	24407	510	389	19912	3595	0	0	0350	382
4121	7	1	72	39	17534	0	0	18170	1364	0	0	0700	383
4121	7	1	71	40	27955	0	0	19131	8824	0	0	0400	384
4121	7	2	75	21	207	0	0	0	0	0	0	7240	385
4121	7	2	74	23	1937	1973	13	0	0	0	0	7200	386
4121	7	2	73	22	2304	2287	17	0	0	0	0	0350	387
4121	7	2	72	20	415	415	0	0	0	0	0	0700	388
4121	7	2	71	21	1304	1364	0	0	0	0	0	0400	389
4122	0	17	75	1000	533530	17073	0	355530	148064	11410	0	0750	390
4122	0	17	74	1000	429728	8433	1276	268776	143649	11194	0	0800	391
4122	0	17	73	1000	392009	7309	1004	247645	132651	3340	0	0750	392
4122	0	17	72	1000	409730	29127	325	239509	117740	2509	0	0420	393
4122	1	17	75	1000	200931	200	359	142449	57923	0	0	0750	394
4122	1	17	74	1000	176271	0	1239	122818	52214	0	0	0800	395
4122	1	17	73	1000	170925	0	204	125831	44830	0	0	0750	396
4122	1	17	72	1000	177593	899	0	137800	33034	0	0	0420	397
4122	2	17	75	1000	102101	30	0	85484	7753	3834	0	0750	398
4122	2	17	74	1000	54023	0	0	32326	12516	3603	0	0800	399
4122	2	17	73	1000	53477	0	0	46588	4889	0	0	0750	400
4122	2	17	72	1000	60675	9028	0	47411	4236	0	0	0420	401
4122	3	17	75	1000	122543	0	0	74690	47353	0	0	0750	402
4122	3	17	74	1000	110276	0	0	64337	45359	0	0	0800	403
4122	3	17	73	1000	62052	413	0	38433	33806	0	0	0750	404
4122	3	17	72	1000	40931	1500	0	28454	16511	0	0	0420	405
4122	4	17	75	1000	54677	4243	0	35434	12363	2576	0	0750	406
4122	4	17	74	1000	45971	545	0	28308	12007	2511	0	0800	407
4122	4	17	73	1000	48060	818	0	22795	21107	3340	0	0750	408
4122	4	17	72	1000	69737	0471	0	26477	34280	0	0	0420	409
4122	0	17	75	1000	33338	13394	328	17429	22187	0	0	0750	410
4122	0	17	74	1000	45105	7868	37	18557	16253	0	0	0800	411
4122	0	17	73	1000	56835	6158	740	21978	28013	0	0	0750	412
4122	0	17	72	1000	55248	11163	825	19381	23879	0	0	0420	413
4122	1	17	75	1000	53304	0	0	44049	14255	0	0	0750	414
4122	1	17	74	1000	48363	0	0	30466	17897	0	0	0800	415
4122	1	17	73	1000	40700	0	0	26095	14611	0	0	0750	416
4122	1	17	72	1000	56695	0	0	41107	17523	0	0	0420	417
4122	1	2	75	49	23990	0	0	20393	9597	0	0	0750	418
4122	1	2	74	53	33135	0	0	25430	7179	0	0	0800	419
4122	1	2	73	48	36408	0	0	26072	9532	0	0	0750	420
4122	1	2	72	49	28642	94	0	22304	0244	0	0	0420	421
4122	1	2	71	73	00930	0	0	43503	17217	0	0	0750	422
4122	1	4	74	78	50513	0	595	34313	15100	0	0	0800	423
4122	1	4	73	120	49823	0	0	35301	14422	0	0	0750	424
4122	1	4	72	119	51181	805	0	37003	13306	0	0	0420	425
4122	1	5	75	05	48032	0	0	34498	14037	0	0	0750	426
4122	1	5	74	03	43502	0	0	32101	11000	0	0	0800	427
4122	1	5	73	07	43943	0	0	33001	64655	0	0	0750	428
4122	1	5	72	04	39081	0	0	37327	1734	0	0	0420	429
4122	1	0	75	15	2907	200	0	0	2767	0	0	0750	430
4122	2	1	74	20	47550	0	0	42253	5403	0	0	0800	431
4122	2	1	73	20	9885	0	0	0	9835	0	0	0750	432

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4122	2	2	75	200	544	45	30	0	432	31	2350	333	0	5750	433
4122	2	2	74	195	441	40	0	0	325	20	2531	363	0	3000	434
4122	2	2	73	210	534	77	0	0	485	38	3389	0	0	3750	435
4122	2	2	72	221	006	75	302	0	474	11	4230	0	0	3426	436
4122	2	2	71	72	459	34	0	0	349	38	1100	0	0	3750	437
4122	2	2	70	71	453	46	0	0	332	31	1335	0	0	3000	438
4122	2	2	69	07	410	59	14	0	284	33	1322	0	0	3750	439
4122	2	2	68	06	406	74	4	0	205	23	1270	0	0	3750	440
4122	2	2	67	79	30	0	0	0	0	0	36	0	0	3750	441
4122	2	2	66	73	10	0	0	0	0	0	10	0	0	3750	442
4122	2	2	65	74	224	37	0	0	192	3	3535	0	0	3750	443
4122	2	2	64	73	292	21	0	0	292	21	2922	0	0	3750	444
4122	2	2	63	73	119	32	0	0	0	0	1193	0	0	3750	445
4122	2	2	62	72	223	0	0	0	0	0	223	0	0	3750	446
4122	2	2	61	73	33	0	0	0	204	69	1492	0	0	3750	447
4122	2	2	60	74	355	08	0	0	262	32	2665	0	0	3750	448
4122	2	2	59	75	2	0	0	0	0	0	2	0	0	3750	449
4122	2	2	58	74	463	1	0	0	439	4	237	0	0	3750	450
4122	2	2	57	73	86	12	0	0	0	0	361	0	0	3750	451
4122	2	2	56	72	349	36	41	0	193	1	3505	0	0	3750	452
4122	2	2	55	71	413	0	0	0	0	0	0	0	0	3750	453
4122	2	2	54	70	119	0	0	0	0	0	0	0	0	3750	454
4122	2	2	53	69	178	36	0	0	101	95	764	0	0	3750	455
4122	2	2	52	68	70	77	0	0	447	0	2507	0	0	3750	456
4122	2	2	51	67	105	73	0	0	96	2	1344	216	0	3750	457
4122	2	2	50	66	104	80	0	0	0	0	933	0	0	3750	458
4122	2	2	49	65	363	39	42	0	252	89	4725	257	0	3750	459
4122	2	2	48	64	368	36	43	0	244	38	3342	251	0	3750	460
4122	2	2	47	63	313	82	0	0	213	33	7557	117	0	3750	461
4122	2	2	46	62	437	09	14	0	204	77	1330	250	0	3750	462
4122	2	2	45	61	105	58	0	0	0	0	58	0	0	3750	463
4122	2	2	44	60	103	1	0	0	0	0	105	0	0	3750	464
4122	2	2	43	59	154	31	40	0	0	0	114	0	0	3750	465
4122	2	2	42	58	223	31	14	0	426	5	1601	0	0	3750	466
4122	2	2	41	57	223	07	14	0	651	10	1940	251	0	3750	467
4122	2	2	40	56	268	42	18	0	713	3	2773	431	0	3750	468
4122	2	2	39	55	339	81	32	0	633	10	0	123	0	3750	469
4122	2	2	38	54	403	04	34	0	610	07	0	0	0	3750	470
4122	2	2	37	53	424	97	36	0	633	03	0	0	0	3750	471
4122	2	2	36	52	505	03	96	0	103	8	3455	341	0	3750	472
4122	2	2	35	51	120	35	10	0	179	0	1255	0	0	3750	473
4122	2	2	34	50	184	40	10	0	0	0	349	0	0	3750	474
4122	2	2	33	49	741	90	28	0	426	13	3536	0	0	3750	475
4122	2	2	32	48	371	07	30	0	580	0	371	0	0	3750	476
4122	2	2	31	47	370	18	36	0	487	0	0	0	0	3750	477
4122	2	2	30	46	704	89	27	0	422	07	1110	0	0	3750	478
4122	2	2	29	45	634	40	25	0	354	59	2757	0	0	3750	479
4122	2	2	28	44	530	06	23	0	330	07	0471	123	0	3750	480
4122	2	2	27	43	290	4	28	0	0	0	0	0	0	3750	481
4122	2	2	26	42	434	7	43	0	0	0	84	0	0	3750	482
4122	2	2	25	41	842	1	38	0	0	0	573	0	0	3750	483
4122	2	2	24	40	502	1	34	0	0	0	947	0	0	3750	484
4122	2	2	23	39	104	90	46	0	387	9	1570	0	0	3750	485
4122	2	2	22	38	103	13	46	0	365	50	2330	0	0	3750	486
4122	2	2	21	37	104	56	50	0	307	0	2380	0	0	3750	487
4122	2	2	20	36	827	80	33	0	365	31	1336	533	0	3750	488
4122	2	2	19	35	737	47	73	0	257	9	564	889	0	3750	489
4122	2	2	18	34	828	08	55	0	391	0	6436	114	0	3750	490
4122	2	2	17	33	090	18	69	0	900	0	4750	135	0	3750	491
4122	2	2	16	32	334	57	42	0	781	0	3724	112	0	3750	492
4122	2	2	15	31	154	37	36	0	22	0	1429	755	0	3750	493
4122	2	2	14	30	126	73	43	0	41	0	1034	993	0	3750	494
4122	2	2	13	29	112	13	33	0	0	0	904	137	0	3750	495
4122	2	2	12	28	121	86	1	0	389	0	951	147	0	3750	496
4122	2	2	11	27	121	86	1	0	389	0	951	147	0	3750	497
4122	2	2	10	26	121	86	1	0	389	0	951	147	0	3750	498
4122	2	2	9	25	121	86	1	0	389	0	951	147	0	3750	499
4122	2	2	8	24	121	86	1	0	389	0	951	147	0	3750	500
4122	2	2	7	23	121	86	1	0	389	0	951	147	0	3750	501
4122	2	2	6	22	121	86	1	0	389	0	951	147	0	3750	502
4122	2	2	5	21	121	86	1	0	389	0	951	147	0	3750	503
4122	2	2	4	20	121	86	1	0	389	0	951	147	0	3750	504
4122	2	2	3	19	121	86	1	0	389	0	951	147	0	3750	505
4122	2	2	2	18	121	86	1	0	389	0	951	147	0	3750	506
4122	2	2	1	17	121	86	1	0	389	0	951	147	0	3750	507
4122	2	2	0	16	121	86	1	0	389	0	951	147	0	3750	508
4122	2	2	0	15	121	86	1	0	389	0	951	147	0	3750	509
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4122	2	2	0	11	121	86	1	0	389	0	951	147	0	3750	513
4122	2	2	0	10	121	86	1	0	389	0	951	147	0	3750	514
4122	2	2	0	9	121	86	1	0	389	0	951	147	0	3750	515
4122	2	2	0	8	121	86	1	0	389	0	951	147	0	3750	516
4122	2	2	0	7	121	86	1	0	389	0	951	147	0	3750	517
4122	2	2	0	6	121	86	1	0	389	0	951	147	0	3750	518
4122	2	2	0	5	121	86	1	0	389	0	951	147	0	3750	519
4122	2	2	0	4	121	86	1	0	389	0	951	147	0	3750	520

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4124	7	17	73	50	10141	0	0	2248	7913	0	0	4750	521
4124	7	17	72	53	3333	0	0	0	3833	0	0	4750	522
4124	8	17	74	53	25813	44	50	13183	12110	0	0	4750	523
4124	8	17	73	50	24102	43731	0	1074	20	0	0	4750	524
4124	8	17	72	50	35449	4385	0	19442	5099	0	0	4750	525
4124	8	17	71	51	13146	4371	573	25187	5877	0	0	4750	526
4124	9	17	75	42	8336	1048	0	7985	217	0	0	4750	527
4124	9	17	74	41	42487	3624	0	4304	47	2481	0	4750	528
4124	9	17	73	18	44013	0	0	31932	177	6694	0	4750	529
4124	9	17	71	14	379	348	0	32500	5	11454	0	4750	530
4124	10	17	73	146	103116	3367	369	0	31	0	0	4750	531
4124	10	17	72	146	153216	34213	37	66143	25858	1579	0	4750	532
4124	10	17	71	243	108993	23003	184	84435	34531	0	0	4750	533
4124	1	1	74	135	95517	7197	104	38283	47523	0	0	4750	534
4124	1	1	73	197	102163	948	0	74482	13467	287	0	4750	535
4124	1	1	72	160	83425	2718	0	93600	7329	308	0	4750	536
4124	1	1	71	195	70016	3396	0	63980	7069	4561	0	4750	537
4124	1	1	75	42	41812	220	0	62083	5975	4561	0	4750	538
4124	1	1	73	47	52138	2702	22	30007	11185	0	0	4750	539
4124	1	1	72	35	42882	1343	41	49237	227	0	0	4750	540
4124	1	1	71	30	38123	0	0	33345	2922	4711	0	4750	541
4124	2	1	75	146	121863	12858	393	28384	7759	0	0	4750	542
4124	2	1	74	124	80889	1362	389	95147	13475	0	0	4750	543
4124	2	1	73	123	88432	3500	0	71430	7444	0	0	4750	544
4124	2	1	71	123	38373	2859	44	71141	5811	0	0	4750	545
4124	2	1	75	8	116978	0	50	28773	4209	0	0	4750	546
4124	3	1	75	130	105549	0	0	0	238	0	0	4750	547
4124	3	1	74	145	129929	7733	0	113409	3511	0	0	4750	548
4124	3	1	73	150	118044	8204	0	103659	682	1008	0	4750	549
4124	3	1	72	143	124233	80	0	118889	3207	0	0	4750	550
4124	3	1	71	150	891125	454	0	84880	24213	2747	0	4750	551
4124	4	1	75	95	75115	0	0	99249	22201	2493	0	4750	552
4124	4	1	74	95	08360	984	0	67332	21343	0	0	4750	553
4124	4	1	73	75	88360	984	0	53193	11922	0	0	4750	554
4124	4	1	72	78	84828	124	0	53314	11582	0	0	4750	555
4124	4	1	71	80	54900	2598	0	44816	19888	0	0	4750	556
4124	4	2	75	100	138984	3320	1228	47513	4780	0	0	4750	557
4124	4	2	74	120	140149	8193	155	102418	25398	0	0	4750	558
4124	4	2	73	40	4240	13913	0	96513	37288	0	0	4750	559
4124	4	2	72	3	4240	1397	0	89203	40549	0	0	4750	560
4124	4	2	71	70	54212	9631	0	2843	294	0	0	4750	561
4124	5	1	75	20	70784	12981	1918	44457	124	0	0	4750	562
4124	5	1	74	90	48085	3589	0	34389	916	0	0	4750	563
4124	5	1	73	95	49272	6199	0	31481	3081	0	0	4750	564
4124	5	1	71	100	45247	5388	0	33295	6779	0	0	4750	565
4124	6	1	75	9	1036	145	0	59773	86	0	0	4750	566
4124	6	1	74	9	17852	0228	0	0	9	0	0	4750	567
4124	6	1	73	9	24431	0	0	387	4	0	0	4750	568
4124	6	1	72	15	39050	293	0	7522	4104	0	0	4750	569
4124	6	1	71	15	78446	0	0	12264	12227	0	0	4750	570
4124	7	2	73	30	22333	0	0	20010	18397	150	0	4750	571
4124	7	2	72	23	86366	0	0	2228	5618	0	0	4750	572
4124	7	2	71	34	25813	444	96	0	22655	0	0	4750	573
4124	8	1	75	53	24825	43731	0	13183	12110	0	0	4750	574
4124	8	1	74	50	24102	984	0	1074	20	0	0	4750	575
4124	8	1	73	30	35449	4385	0	18442	5099	0	0	4750	576
4124	8	1	72	31	13146	4371	573	25187	5877	0	0	4750	577
4124	8	1	71	18	8333	1048	0	7985	217	0	0	4750	578
4124	9	1	75	41	42487	3624	0	4804	47	2481	0	4750	579
4124	9	1	74	13	44013	0	0	31932	177	6694	0	4750	580
4124	9	1	73	14	379	348	0	32500	5	11454	0	4750	581
4124	9	2	75	24	47	0	11	34744	4467	3171	0	4750	582
4124	9	2	74	13	579	579	0	0	47	0	0	4750	583
4124	9	2	73	14	379	348	0	0	31	0	0	4750	584
4125	0	17	75	1000	340761	39361	3489	209508	88274	149	0	1160	587
4125	0	17	74	1000	314737	32881	1374	207583	71917	532	0	1103	588
4125	0	17	73	1000	320470	32831	2283	218488	65456	1413	0	1088	589
4125	0	17	72	1000	312309	29162	1897	215481	66063	186	0	1020	590
4125	0	17	71	1000	331931	33309	1878	211789	85272	1753	0	950	591
4125	1	17	75	316	20117	94	0	14846	5117	60	0	1160	592
4125	1	17	74	317	27517	120	0	21492	5745	160	0	1100	593
4125	1	17	73	274	21544	33	0	21289	50	142	0	1080	594
4125	1	17	72	245	21433	135	0	20339	383	186	0	1020	595
4125	1	17	71	116	13129	507	0	16739	3957	110	0	950	596
4125	2	17	75	115	12570	0	0	6800	6329	0	0	1160	597
4125	2	17	74	103	13875	0	0	5539	6311	0	0	1100	598
4125	2	17	73	103	14729	0	0	8965	8308	0	0	1036	599
4125	2	17	72	103	13853	0	0	8325	5804	0	0	1020	600
4125	2	17	71	110	7555	0	0	10738	8140	0	0	950	601
4125	3	17	75	112	13684	0	0	8943	612	0	0	1160	602
4125	3	17	74	118	12581	0	0	12302	1162	0	0	1100	603
4125	3	17	73	124	10889	0	0	9779	2302	0	0	1020	604
4125	3	17	72	124	8032	417	0	12434	4435	0	0	950	605
4125	3	17	71	70	13135	329	0	7133	576	0	0	1160	606
4125	4	17	75	70	21631	120	0	10303	2003	0	0	1100	607
4125	4	17	73	70	0	0	0	19523	1952	0	0	1080	608

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41255	4	17	72	30	40501	053	0	10045	3257	0	0	10045	003
41255	4	17	71	32	13532	303	0	10032	2012	0	0	10032	010
41255	4	17	70	11	13424	453	0	10039	4557	0	0	10039	011
41255	4	17	70	10	13340	348	0	10181	4217	0	0	10181	012
41255	4	17	72	35	17034	5592	0	11005	2537	0	0	10020	013
41255	4	17	73	32	32438	150	0	51338	0	0	0	10000	014
41255	4	17	72	31	27477	0	0	27477	0	0	0	10200	015
41255	4	17	73	272	278504	38592	340	105071	7003	80	0	11000	016
41255	4	17	73	231	11722	94	0	10023	1543	0	0	11000	017
41255	4	17	74	200	12908	120	0	12531	130	127	0	11000	018
41255	4	17	73	274	21544	03	0	21203	50	142	0	10000	019
41255	4	17	72	275	21063	135	0	20359	383	180	0	10200	020
41255	4	17	71	257	20383	117	0	10739	3357	110	0	10000	021
41255	4	17	75	35	33333	0	0	48233	3572	0	0	11000	022
41255	4	17	74	37	10003	0	0	0001	5015	33	0	11000	023
41255	4	17	71	52	450	450	0	0000	0	0	0	10000	024
41255	4	17	75	110	13129	0	0	6323	0323	0	0	11000	025
41255	4	17	74	113	12570	0	0	5759	0811	0	0	11000	026
41255	4	17	73	103	13073	0	0	0000	0000	0	0	10000	027
41255	4	17	72	103	14723	0	0	8925	5004	0	0	10200	028
41255	4	17	71	93	18838	0	0	10738	3120	0	0	10000	029
41255	4	17	75	110	70333	0	0	0943	612	0	0	11000	030
41255	4	17	74	112	13034	0	0	12502	1182	0	0	11000	031
41255	4	17	73	134	12502	0	0	3770	2802	0	0	10200	032
41255	4	17	71	154	16309	0	0	12434	4435	0	0	10000	033
41255	4	17	75	75	30032	217	0	7133	676	0	0	11000	034
41255	4	17	74	70	13133	323	0	10003	2003	0	0	11000	035
41255	4	17	73	70	21601	120	0	19523	1752	0	0	10000	036
41255	4	17	72	03	20501	059	0	10045	3257	0	0	10000	037
41255	4	17	71	02	19502	368	0	10002	2012	0	0	10000	038
41255	4	17	73	107	13424	453	0	5103	4057	0	0	11000	039
41255	4	17	72	93	15340	348	0	10181	4217	0	0	10000	040
41255	4	17	71	32	17034	5592	0	11005	2537	0	0	10000	041
41255	4	17	73	31	52438	150	0	51338	0	0	0	10000	042
41255	4	17	72	31	27477	0	0	27477	0	0	0	10000	043
41255	4	17	73	100	00100	152140	378	346328	128238	51222	500	10000	044
41255	4	17	74	100	00313	155338	35260	357319	124183	45228	000	10000	045
41255	4	17	75	100	00613	151741	3270	370388	179306	15225	000	10000	046
41255	4	17	72	100	023204	151243	3436	231113	137033	0	2500	10000	047
41255	4	17	71	100	04770	181340	2502	242703	175543	0	0	10000	048
41255	4	17	73	303	334784	122053	4268	170608	37975	612	0	10000	049
41255	4	17	74	301	316574	110949	4174	153717	47102	0	0	10000	050
41255	4	17	72	230	230001	93302	1459	110005	22335	0	0	10000	051
41255	4	17	71	270	214001	91710	0	103300	19319	0	0	10000	052
41255	4	17	75	49	43075	554	0	27937	15134	0	0	10000	053
41255	4	17	74	44	33370	143	0	30307	9060	0	0	10000	054
41255	4	17	73	40	43794	213	0	32433	0150	0	0	10000	055
41255	4	17	72	35	703	228	0	0	475	0	0	10000	056
41255	4	17	71	22	7920	2210	0	2209	5704	0	0	10000	057
41255	4	17	75	22	0500	0	0	0	4297	0	0	10000	058
41255	4	17	74	21	4412	0	0	2132	2280	0	0	10000	059
41255	4	17	73	23	3509	0	0	5494	75	0	0	10000	060
41255	4	17	72	24	2100	0	0	1705	463	0	0	10000	061
41255	4	17	71	23	10773	1815	0	4914	4040	0	0	10000	062
41255	4	17	75	73	50320	2472	0	32602	23192	0	0	10000	063
41255	4	17	74	09	59053	2308	0	30608	17805	0	0	10000	064
41255	4	17	73	90	54301	2680	0	14474	40633	0	0	10000	065
41255	4	17	72	102	133402	1230	0	54357	77873	0	0	10000	066
41255	4	17	75	10	0	0	0	0	0	0	0	10000	067
41255	4	17	73	12	794	374	0	420	0	0	0	10000	068
41255	4	17	71	12	2851	1404	638	0	749	0	0	10000	069
41255	4	17	75	79	15423	3927	0	9388	2406	0	0	10000	070
41255	4	17	74	17	0034	3578	0	0	2450	0	0	10000	071
41255	4	17	72	17	21945	2386	0	8250	11303	0	0	10000	072
41255	4	17	71	29	10302	1712	0	2591	12053	0	0	10000	073
41255	4	17	75	00	24951	0	0	24806	85	0	0	10000	074
41255	4	17	74	08	30602	0	0	45138	5464	0	0	10000	075
41255	4	17	73	08	30381	2628	0	20397	24850	0	0	10000	076
41255	4	17	72	08	30130	3254	0	21096	23180	0	0	10000	077
41255	4	17	75	02	0	0	0	0	0	0	0	10000	078
41255	4	17	74	02	12	0	0	0	0	0	0	10000	079
41255	4	17	73	04	0213	1047	0	0	4572	0	0	10000	080
41255	4	17	72	04	25	0	0	0	25	0	0	10000	081
41255	4	17	71	04	12	0	0	0	12	0	0	10000	082
41255	4	17	74	02	14230	0	0	14133	11	0	0	10000	083
41255	4	17	73	01	23270	6117	0	17643	4505	0	0	10000	084
41255	4	17	72	01	54488	1001	0	36875	10612	0	0	10000	085
41255	4	17	71	05	37090	430	0	23390	13262	0	0	10000	086
41255	4	17	74	03	145789	10330	1352	75548	47393	389	0	10000	087
41255	4	17	73	03	125737	40093	1377	42444	32345	0	375	10000	088
41255	4	17	72	03	52609	12039	460	39441	183	0	0	10000	089
41255	4	17	71	03	43638	10759	413	37824	815	0	0	10000	090
41255	4	17	75	03	42920	10082	413	30645	1780	0	0	10000	091
41255	4	17	74	03	39801	13158	0	35724	919	0	0	10000	092
41255	4	17	73	03	34034	11040	0	19790	3250	0	0	10000	093
41255	4	17	72	03	53391	15071	0	26107	11413	0	0	10000	094
41255	4	17	71	03	43224	11331	0	23722	13671	0	0	10000	095
41255	4	17	75	03	47923	11727	0	20775	15427	0	0	10000	096

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4141	1	2	74	70	32230	14767	0	16147	1316	0	0	5450	657
4141	1	2	71	69	40359	16135	0	22413	1309	0	0	5500	698
4141	1	3	75	50	42934	15874	0	27037	3	0	0	5500	699
4141	1	3	74	48	47332	21500	1600	23312	372	0	0	5500	700
4141	1	3	73	47	45053	10670	1100	25770	2101	0	0	5500	701
4141	1	3	72	47	44434	14914	300	28632	439	0	0	5500	702
4141	1	3	71	44	53294	16483	0	32534	4122	0	0	5500	703
4141	1	4	75	24	19118	7837	0	41394	7067	0	0	5500	704
4141	1	4	74	22	18293	9752	0	48053	3738	0	0	5500	705
4141	1	4	73	19	13060	7382	0	1537	4141	0	0	5500	706
4141	1	4	72	21	8493	5751	0	0	744	0	0	5500	707
4141	1	4	71	22	4725	4725	0	0	0	0	0	5500	708
4141	1	5	75	44	40919	4318	2100	30267	148	0	0	5500	709
4141	1	5	74	37	41759	11465	0	29068	700	0	0	5500	710
4141	1	5	73	34	125813	62914	541	43222	19136	0	0	5500	711
4141	1	6	74	77	103546	48902	1506	36446	41940	63	0	5500	712
4141	1	6	73	71	99711	40237	1099	33533	18822	0	0	5500	713
4141	1	6	72	30	107131	40712	1399	40102	13218	0	0	5500	714
4141	2	5	71	56	81523	42722	0	28677	10130	0	0	5500	715
4141	2	1	75	49	43675	554	0	27987	15134	0	0	5500	716
4141	2	1	74	44	39576	149	0	30367	9060	0	0	5500	717
4141	2	1	73	40	40794	2145	0	32493	0150	0	0	5500	718
4141	2	1	72	35	703	220	0	0	473	0	0	5500	719
4141	2	1	71	22	793	2216	0	0	5704	0	0	5500	720
4141	2	1	70	22	6506	0	0	2239	4297	0	0	5500	721
4141	3	1	74	21	4412	0	0	2132	2280	0	0	5500	722
4141	3	1	73	23	5509	0	0	5494	75	0	0	5500	723
4141	3	1	72	24	2108	0	0	1705	403	0	0	5500	724
4141	3	1	71	23	10775	1815	0	4914	4046	0	0	5500	725
4141	4	1	75	45	3214	2375	0	0	333	0	0	5500	726
4141	4	1	74	7	1009	1069	0	0	0	0	0	5500	727
4141	4	1	72	13	17043	1230	0	5851	10612	0	0	5500	728
4141	4	2	75	5	3480	0	0	8988	492	0	0	5500	729
4141	4	2	74	5	10073	0	0	10073	0	0	0	5500	730
4141	4	2	73	7	19411	530	0	3691	14690	0	0	5500	731
4141	4	2	72	16	30693	0	0	12713	17980	0	0	5500	732
4141	4	2	71	13	19130	0	0	5272	13909	0	0	5500	733
4141	4	3	75	32	44790	97	0	23035	21058	0	0	5500	734
4141	4	3	74	37	41756	0	0	26075	15081	0	0	5500	735
4141	4	3	73	57	40850	0	0	26275	14575	0	0	5500	736
4141	4	3	72	56	09829	0	0	26525	43304	0	0	5500	737
4141	4	3	71	10	109	0	0	0	109	0	0	5500	738
4141	4	4	74	12	3710	0	0	25200	1190	0	0	5500	739
4141	4	4	73	13	23045	0	0	14204	3841	0	0	5500	740
4141	4	4	72	8	12551	0	0	0930	5021	0	0	5500	741
4141	4	5	74	6	137	125	0	0	12	0	0	5500	742
4141	4	5	73	3	0931	0	0	4786	2145	0	0	5500	743
4141	4	5	72	4	9	0	0	0	9	0	0	5500	744
4141	4	5	71	7	2342	0	0	2338	4	0	0	5500	745
4141	4	6	71	10	8082	3185	0	37005	3722	0	0	5500	746
4141	4	7	75	1	733	0	0	39	094	0	0	5500	747
4141	4	7	74	1	2314	1392	0	0	922	0	0	5500	748
4141	4	7	73	1	4555	1058	0	2318	379	0	0	5500	749
4141	4	7	72	2	354	0	0	0	354	0	0	5500	750
4141	5	1	71	2	12586	0	0	2173	10393	0	0	5500	751
4141	5	1	75	10	794	374	0	0	1	0	0	5500	752
4141	5	1	72	12	794	374	0	420	0	0	0	5500	753
4141	5	1	71	12	2851	1464	638	0	749	0	0	5500	754
4141	6	1	75	13	3224	3224	0	0	0	0	0	5500	755
4141	6	1	74	13	5994	3578	0	0	2416	0	0	5500	756
4141	6	1	73	12	5461	0	0	1579	3882	0	0	5500	757
4141	6	1	72	12	10851	277	0	3229	7345	0	0	5500	758
4141	6	1	71	11	9983	0	0	0	9983	0	0	5500	759
4141	6	2	75	6	12188	403	0	9386	2397	0	0	5500	760
4141	6	4	75	4	11	0	0	0	11	0	0	5500	761
4141	6	4	74	3	40	0	0	0	40	0	0	5500	762
4141	6	4	73	3	10611	5445	0	5166	0	0	0	5500	763
4141	6	4	72	5	11094	2109	0	5021	3964	0	0	5500	764
4141	6	4	71	3	4839	172	0	2591	2076	0	0	5500	765
4141	6	5	71	3	1540	1540	0	0	0	0	0	5500	766
4141	7	1	75	50	8793	0	0	3723	67	0	0	5500	767
4141	7	1	74	54	28778	0	0	23314	5464	0	0	5500	768
4141	7	1	73	57	44871	0	0	26300	18571	0	0	5500	769
4141	7	1	72	61	31584	1840	0	11310	17334	0	0	5500	770
4141	7	1	71	68	29427	2474	0	13060	13893	0	0	5500	771
4141	7	2	75	10	16150	0	0	16138	13	0	0	5500	772
4141	7	2	74	12	13902	0	0	13902	0	0	0	5500	773
4141	7	2	73	15	3055	0	0	7226	829	0	0	5500	774
4141	7	2	72	16	8577	0	0	8573	4	0	0	5500	775
4141	7	2	71	19	10468	1982	0	4252	4234	0	0	5500	776
4141	7	3	74	10	7382	0	0	7382	0	0	0	5500	777
4141	7	3	72	11	13720	788	0	5914	7016	0	0	5500	778
4141	7	3	71	11	10235	798	0	4384	5053	0	0	5500	779
4141	9	3	75	6	5	0	0	0	5	0	0	5500	780
4141	9	3	74	2	12	0	0	0	12	0	0	5500	781
4141	9	3	73	3	6219	1647	0	0	4572	0	0	5500	782
4141	8	3	72	4	25	0	0	0	25	0	0	5500	783
4141	8	3	71	4	12	0	0	0	12	0	0	5500	784

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4141	9	1	74	22	14200	0117	0	14109	11	0	0	3350	785
4141	9	1	73	31	23270	0117	0	17043	4505	0	0	5330	780
4141	9	1	72	41	54488	1001	0	36375	15012	0	0	5430	787
4141	9	1	71	5	37036	0433	0	23336	13262	0	0	5500	788
4142	0	17	75	1000	772314	05055	2510	340020	143693	8228	0	7400	783
4142	0	17	74	1000	019443	70751	2014	352634	169501	24219	0	0750	790
4142	0	17	73	1000	780324	73389	2434	408370	239373	23361	0	0300	791
4142	0	17	72	1000	732048	87180	2275	430618	199302	12067	0	5800	792
4142	1	17	75	157	175059	4447	1083	124731	44796	0	0	7200	793
4142	1	17	74	167	145079	3449	1448	100104	35073	0	0	0750	794
4142	1	17	73	186	147705	2554	323	102400	41002	0	0	0300	795
4142	1	17	72	102	124820	3810	774	89318	30410	0	0	5300	796
4142	2	17	75	1000	03542	789	0	80359	8501	193	0	7200	797
4142	2	17	74	111	102411	1075	0	38705	5835	6056	0	6750	798
4142	2	17	73	119	34301	3704	0	03322	3356	4359	0	0300	799
4142	2	17	72	123	50370	2147	0	47290	4155	2784	0	5800	800
4142	3	17	75	00	70259	1571	1244	57023	4821	0	0	7200	801
4142	3	17	74	91	64763	10350	0	41503	4876	7949	0	0750	802
4142	3	17	73	72	09580	11429	1257	46540	7593	2761	0	0300	803
4142	3	17	72	50	58005	19048	0	25301	12404	1032	0	5800	804
4142	4	17	75	06	129034	10450	0	101737	17611	0	0	7200	805
4142	4	17	73	32	30100	2073	0	15706	10381	0	0	0300	806
4142	4	17	72	33	39491	13714	0	17107	5430	0	0	5800	807
4142	5	17	74	70	71254	10433	0	37477	11503	5721	0	0750	808
4142	5	17	73	72	36700	14005	0	14012	8463	0	0	0300	809
4142	5	17	72	73	42343	14098	433	12981	14331	0	0	5800	810
4142	6	17	75	41	30577	740	0	10390	13336	4339	0	7200	811
4142	6	17	74	43	35350	3	0	31332	183	3327	0	6750	812
4142	6	17	73	41	22724	0	0	15908	2181	4633	0	0300	813
4142	6	17	72	14	1	0	0	0	1	0	0	5300	814
4142	7	17	75	53	35210	385	0	14345	19083	0	0	7200	815
4142	7	17	74	57	00309	3876	0	42406	40407	0	0	0750	816
4142	7	17	73	77	100439	4333	0	31093	53813	0	0	0300	817
4142	7	17	72	71	107373	3150	0	55198	49030	0	0	5800	818
4142	8	17	75	14	14239	0	0	3477	10322	0	0	7200	819
4142	8	17	74	16	23721	3002	0	5095	15024	0	0	0750	820
4142	8	17	73	41	10543	1424	0	14285	834	0	0	0300	821
4142	8	17	72	52	50595	0	0	44043	6540	0	0	5800	822
4142	9	17	75	13	418	0	0	0	0	0	0	7200	823
4142	9	17	74	25	3003	1503	0	11519	1354	200	0	0750	824
4142	9	17	73	23	20888	033	0	11519	2312	0019	0	0300	825
4142	9	17	72	23	34431	1791	410	2507	2572	3831	0	5800	826
4142	10	17	75	43	13401	190	0	8104	7107	0	0	7200	827
4142	10	17	74	47	11532	879	0	7200	3447	0	0	0750	828
4142	10	17	73	7	4393	677	0	2530	1192	0	0	0300	829
4142	10	17	72	22	757	757	0	0	0	0	0	5800	830
4142	11	17	75	7	0	0	0	0	0	0	0	7200	831
4142	11	17	74	11	4933	0	0	2343	2590	0	0	0750	832
4142	11	17	73	17	34341	2433	0	10148	13700	0	0	0300	833
4142	12	17	75	4	2499	2217	0	0	482	0	0	7200	834
4142	12	17	74	15	7887	2336	0	113	4883	0	0	0750	835
4142	12	17	73	20	16138	7529	0	0	3609	0	0	0300	836
4142	12	17	72	20	12108	3850	0	0	8250	0	0	5800	837
4142	13	17	75	307	163100	27270	254	106721	46334	2587	0	0300	838
4142	13	17	74	234	203683	44603	856	112727	83273	442	0	5800	839
4142	13	17	73	101	102688	4447	740	77586	19915	0	0	7200	840
4142	13	17	72	105	87335	3449	1448	63030	13408	0	0	0750	841
4142	14	17	75	119	75531	2554	323	52500	19746	0	0	0300	842
4142	14	17	74	127	65399	3544	773	42413	18688	0	0	5800	843
4142	14	17	73	50	72371	0	343	47145	24883	0	0	7200	844
4142	14	17	72	04	59344	0	0	42474	10870	0	0	0750	845
4142	15	17	75	07	71934	0	0	49878	22350	0	0	0300	846
4142	15	17	74	75	59421	274	0	47405	11742	0	0	5800	847
4142	15	17	73	106	89542	789	0	90059	8501	193	0	7200	848
4142	15	17	72	111	102411	1075	0	66705	3895	6656	0	0750	849
4142	16	17	75	119	84001	3764	0	99922	3355	4359	0	0300	850
4142	16	17	74	129	56370	2147	0	47290	4133	2784	0	5800	851
4142	16	17	73	75	40023	4375	0	34091	1557	0	0	7200	852
4142	16	17	72	70	50892	0343	0	37220	2325	4398	0	0750	853
4142	17	17	75	51	52374	8162	1257	34587	5007	2761	0	0300	854
4142	17	17	74	31	13600	7797	0	9480	1497	1032	0	5800	855
4142	17	17	73	18	17	0	0	0	17	0	0	0750	856
4142	17	17	72	41	4503	4137	0	2327	41	0	0	0300	857
4142	18	17	75	5	38230	10790	1244	22932	3204	3551	0	7200	858
4142	18	17	74	4	13654	3401	0	4368	2534	0	0	0750	859
4142	18	17	73	3	17100	3267	0	11953	1180	0	0	0300	860
4142	18	17	72	3	33754	3114	0	13774	10309	0	0	5800	861
4142	19	17	75	16	5357	0	0	5357	0	0	0	7200	862
4142	19	17	74	18	17793	0	0	17707	6	0	0	0750	863
4142	19	17	73	31	3031	8029	0	0	0	0	0	0300	864
4142	19	17	72	40	61444	2195	0	41259	17600	0	0	5800	865
4142	20	17	75	25	3127	0	0	0	0	0	0	0750	866
4142	20	17	74	10	22002	1771	0	8110	12121	0	0	0300	867
4142	20	17	73	20	29371	1189	0	28150	33	0	0	7200	868
4142	20	17	72	23	24193	309	0	23741	148	0	0	0750	869
4142	21	17	75	21	13920	125	0	7590	6205	0	0	0300	870
4142	21	17	74	21	31453	5865	0	17147	3421	0	0	5800	871
4142	21	17	73	21	31453	5865	0	17147	3421	0	0	0750	872

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4142	4	4	73	1	3504	0	0	0	3504	0	0	7200	873	
4142	4	4	74	1	523	53	0	0	470	0	0	0750	874	
4142	4	4	73	1	252	177	0	0	55	0	0	0500	875	
4142	4	4	75	50	41327	5821	0	0	34234	149	1573	0700	876	
4142	4	4	74	50	50831	12162	0	0	32262	0736	5721	0750	877	
4142	4	4	73	50	22495	13333	255	0	0	0190	0	0	0300	878
4142	4	4	72	16	22237	13333	0	0	5213	8693	0	0	0300	879
4142	4	4	74	16	14373	4331	0	0	14012	4027	0	0	0750	880
4142	4	4	73	16	14285	0	0	0	273	0	0	0300	881	
4142	4	4	72	17	23030	753	178	0	12331	5133	0	0	0800	882
4142	4	4	75	16	17278	0	0	0	16359	419	0	0	0700	883
4142	4	4	74	16	12535	0	0	0	12754	181	0	0	0750	884
4142	4	4	73	16	4903	0	0	0	3959	350	0	0	0300	885
4142	4	4	72	17	144	0	0	0	0	0	0	0	0800	886
4142	4	4	75	25	19234	746	0	0	1537	12017	4393	0	0700	887
4142	4	4	74	27	22413	0	0	0	19078	2	3327	0	0750	888
4142	4	4	73	0	17815	0	0	0	11949	1231	4635	0	0300	889
4142	4	4	75	23	32947	0	0	0	14348	17999	0	0	0700	890
4142	4	4	74	25	38247	1311	0	0	21120	15816	0	0	0750	891
4142	4	4	73	38	44112	1983	0	0	34151	17973	0	0	0300	892
4142	4	4	72	36	06970	3150	0	0	34396	31424	0	0	0800	893
4142	4	4	75	35	3077	0	0	0	2500	5577	0	0	0750	894
4142	4	4	74	32	23303	0	0	0	11439	8804	0	0	0300	895
4142	4	4	73	32	30221	0	0	0	18410	12511	0	0	0800	896
4142	4	4	75	33	435	337	0	0	0	3	0	0	0700	897
4142	4	4	74	37	37658	968	0	0	18846	17844	0	0	0750	898
4142	4	4	73	4	23803	120	0	0	12017	11751	0	0	0300	899
4142	4	4	75	2	883	48	0	0	0	835	0	0	0700	900
4142	4	4	74	2	2627	1597	0	0	0	1230	0	0	0750	901
4142	4	4	73	3	20130	1430	0	0	3426	15230	0	0	0300	902
4142	4	4	72	3	7407	0	0	0	2392	5095	0	0	0800	903
4142	4	4	75	14	14299	0	0	0	3477	10622	0	0	0700	904
4142	4	4	74	16	23721	3002	0	0	5899	15324	0	0	0750	905
4142	4	4	73	52	16543	1424	0	0	14285	334	0	0	0300	906
4142	4	4	72	50	50595	0	0	0	44049	6546	0	0	0800	907
4142	4	4	75	3	2596	1503	0	0	0	1093	0	0	0700	908
4142	4	4	74	4	436	221	0	0	0	215	0	0	0750	909
4142	4	4	73	12	393	0	0	0	0	9	0	0	0300	910
4142	4	4	72	15	393	0	0	0	0	187	208	0	0700	911
4142	4	4	75	20	20230	017	410	11519	2125	6013	0	0	0750	912
4142	4	4	74	22	33300	892	0	25327	2400	3831	0	0	0300	913
4142	4	4	73	0	209	0	0	0	209	0	0	0	0800	914
4142	4	4	72	7	74	0	0	0	74	0	0	0	0700	915
4142	4	4	75	7	172	0	0	0	172	0	0	0	0750	916
4142	4	4	74	3	1077	899	0	0	1450	1323	0	0	0300	917
4142	4	4	73	4	2773	0	0	0	1417	0	0	0	0800	918
4142	4	4	72	22	1417	757	0	0	0	0	0	0	0700	919
4142	4	4	75	17	10633	130	0	0	4714	3784	0	0	0750	920
4142	4	4	74	16	10115	879	0	0	5789	3447	0	0	0300	921
4142	4	4	73	7	4033	877	0	0	2530	1192	0	0	0800	922
4142	4	4	72	7	4	0	0	0	0	4	0	0	0700	923
4142	4	4	75	11	4933	2493	0	0	2343	2590	0	0	0750	924
4142	4	4	74	17	34341	2217	0	0	18148	13700	0	0	0300	925
4142	4	4	73	2	2499	0	0	0	282	0	0	0	0800	926
4142	4	4	72	18	7887	2880	0	0	113	4888	0	0	0700	927
4142	4	4	75	12	10138	7529	0	0	0	8603	0	0	0750	928
4142	4	4	74	20	12106	3858	0	0	0	8250	0	0	0300	929
4142	4	4	73	10000	1220740	43035	18423	763742	394490	250	15000	0	0800	930
4142	4	4	72	10000	1127271	49003	12278	657190	407016	1800	78	13000	0700	931
4142	4	4	75	10000	981875	32929	8854	583113	351269	7732	222	10500	0750	932
4142	4	4	74	20	909458	55521	10406	548570	290024	4715	222	9000	0300	933
4142	4	4	73	17	34907	13310	777	4004	15990	0	220	15000	0800	934
4142	4	4	72	17	44540	3672	390	15025	23259	0	0	13000	0700	935
4142	4	4	75	31	67397	3009	488	22170	33750	0	0	10500	0750	936
4142	4	4	74	19	26557	7080	2273	1132	13324	0	140	9000	0300	937
4142	4	4	73	4	14731	15908	13481	285536	93776	0	30	15000	0800	938
4142	4	4	72	410	351473	0360	4953	213255	105021	1800	73	13000	0700	939
4142	4	4	75	417	220535	11687	2954	211204	37977	4639	72	15500	0750	940
4142	4	4	74	433	312457	22148	3763	229868	56602	0	76	9000	0300	941
4142	4	4	73	212	273008	6552	387	121730	145139	0	0	15000	0800	942
4142	4	4	72	210	244040	12584	0	109172	122284	0	0	13000	0700	943
4142	4	4	75	210	239747	8042	0	110942	117670	3093	0	10500	0750	944
4142	4	4	74	222	237278	3818	2387	128884	92274	3415	0	9000	0300	945
4142	4	4	73	171	264013	1814	390	184323	75392	0	0	15000	0800	946
4142	4	4	72	160	217904	1823	373	135718	58440	0	0	13000	0700	947
4142	4	4	75	152	192630	1917	2023	132133	38532	0	0	10500	0750	948
4142	4	4	74	157	137405	018	1088	32159	43060	0	0	9000	0300	949
4142	4	4	73	90	113424	2220	2788	77474	30333	0	0	15000	0800	950
4142	4	4	72	100	154200	10107	3633	70734	83705	0	0	13000	0700	951
4142	4	4	75	97	103291	312	0	30707	52919	0	0	10500	0750	952
4142	4	4	74	43	132703	14779	337	55353	01434	800	0	9000	0300	953
4142	4	4	73	43	59762	934	0	40978	17850	0	0	15000	0800	954
4142	4	4	72	43	45409	123	17	32424	12905	0	0	13000	0700	955
4142	4	4	75	46	48943	283	0	31476	15199	0	0	10500	0750	956
4142	4	4	74	49	48042	190	50	27378	19918	500	0	9000	0300	957

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01222	0	17	75	32	50644	4513	0	47748	1033	0	0	15000	961
01222	0	17	74	24	41303	1435	333	36437	3300	0	0	15000	962
01222	0	17	73	25	22390	1533	723	17373	2433	0	0	15000	963
0001222	0	17	72	25	14333	633	0	13736	774	0	0	9000	964
0001222	7	17	75	10	94440	3300	0	2042	6327	0	0	15000	965
01222	7	17	74	10	43003	4394	1263	21345	20102	0	0	13000	966
0001222	7	17	73	10	23942	2333	401	7736	9790	0	0	15000	967
0001222	1	1	75	00	27040	429	0	20701	5910	0	0	15000	968
0001222	1	1	74	08	30452	460	0	19737	10195	0	0	13000	969
01222	1	1	73	42	13840	200	0	13227	3191	1108	0	15000	970
01222	1	2	72	31	27221	1919	390	17211	7701	0	0	9000	971
01222	1	2	75	35	46660	143	0	3441	3070	0	0	15000	972
01222	1	2	74	30	43734	260	0	37676	11223	0	0	13000	973
01222	1	2	73	30	45653	873	0	33303	10316	601	0	15000	974
0001222	1	2	72	30	45420	3071	360	24440	2949	0	0	9000	975
0001222	1	3	75	01	60103	3244	0	30000	7853	0	0	15000	976
0001222	1	3	74	01	52701	1943	0	33111	14423	0	0	15000	977
01222	1	3	73	02	43134	4260	1537	32048	9911	772	0	15000	978
0001222	1	3	72	03	52375	5173	33	35420	11337	0	0	9000	979
01222	1	4	75	35	36453	253	0	30334	5512	0	0	15000	980
01222	1	4	74	35	40996	130	0	21362	3504	0	0	15000	981
01222	1	4	73	41	28470	1403	0	19939	9525	055	0	15000	982
01222	1	5	75	33	23803	2490	0	21126	6207	0	0	9000	983
01222	1	5	74	33	59035	4742	0	37538	15505	0	0	15000	984
01222	1	5	73	40	43703	2350	0	29900	13459	1800	0	13000	985
01222	1	5	72	40	47023	2315	0	31453	12074	033	0	15000	986
0001222	1	5	75	34	45023	4031	360	33170	7203	0	0	9000	987
01222	1	5	74	20	13520	0	0	7102	6350	0	0	15000	988
01222	1	5	73	20	8702	0	0	8052	650	0	0	13000	989
01222	1	7	75	25	10662	0	0	10449	213	0	0	15000	990
01222	1	7	74	25	3771	0	0	9147	624	0	0	9000	991
01222	1	7	73	20	7701	359	4095	0	67	0	0	15000	992
01222	1	8	75	17	14943	0	0	7103	7340	0	0	15000	993
01222	1	8	74	17	9101	0	0	7450	1051	0	0	13000	994
01222	1	8	73	13	11250	0	0	11243	13	0	0	15000	995
01222	1	8	72	10	11076	0	0	9302	1274	0	0	9000	996
01222	1	9	75	17	14377	0	0	7145	7232	0	0	15000	997
01222	1	9	74	16	3251	0	0	9090	1255	0	0	13000	998
0001222	1	9	73	20	3574	0	0	9491	83	0	0	15000	999
01222	1	10	75	20	3283	0	0	8236	993	0	0	9000	1000
01222	1	10	74	14	12095	0	0	3437	6253	0	0	15000	1001
01222	1	10	73	12	5711	0	0	5533	172	0	0	13000	1002
01222	1	10	72	13	7341	0	0	7334	147	0	0	15000	1003
01222	1	11	75	13	6293	0	757	5536	0	0	0	9000	1004
01222	1	11	74	12	3570	2420	0	22701	10601	0	0	15000	1005
01222	1	11	73	12	22123	0	0	13350	0179	0	0	13000	1006
0001222	1	11	72	10	28073	1103	0	20337	3072	067	0	15000	1007
01222	1	12	75	12	23732	3014	0	21372	3800	0	0	9000	1008
01222	1	12	74	11	24904	0	0	23540	1350	0	0	15000	1009
01222	1	12	73	11	13881	0	0	14843	1030	0	0	13000	1010
0001222	1	12	72	13	15703	0	0	14977	792	0	0	15000	1011
01222	1	13	75	17	18850	190	0	18047	613	0	0	9000	1012
01222	1	13	74	08	12470	0	0	12404	6	0	0	15000	1013
01222	1	13	73	10	3411	0	0	7432	379	0	0	13000	1014
01222	1	13	72	12	3400	0	0	5383	17	0	0	15000	1015
01222	1	13	75	13	6320	0	0	6307	13	0	0	9000	1016
01222	1	14	74	7	30744	119	1924	14403	14290	0	0	15000	1017
01222	1	14	73	07	38230	111	1428	0	39791	0	0	13000	1018
0001222	1	14	72	01	20550	353	7402	2051	4223	0	0	15000	1019
01222	1	16	75	50	8210	0	3180	2177	775	73	0	15000	1020
01222	1	16	74	43	7814	0	1257	0	6450	72	0	15000	1021
01222	1	16	73	41	18120	0	1057	10001	3323	76	0	9000	1022
01222	2	1	75	00	00303	170	0	23316	30217	0	0	15000	1023
01222	2	1	74	05	91833	1851	0	20509	39449	0	0	13000	1024
01222	2	1	73	04	61731	330	0	21472	39929	0	0	15000	1025
01222	2	1	72	03	38141	1403	707	27911	29118	0	0	9000	1026
0001222	2	2	75	00	30933	340	0	20403	3990	0	0	15000	1027
01222	2	2	74	00	23416	535	0	10060	6195	0	0	13000	1028
01222	2	2	73	00	43800	0	501	17221	6647	0	0	15000	1029
01222	2	2	72	00	20670	250	0	15995	3854	0	0	9000	1030
0001222	2	2	75	00	42303	0	0	33004	9551	0	0	15000	1031
01222	2	2	74	00	26733	2355	0	22246	4138	0	0	13000	1032
01222	2	2	73	00	31831	3749	0	24131	4508	3093	0	15000	1033
01222	2	2	72	00	29240	4738	419	16312	5909	1802	0	9000	1034
01222	2	4	75	00	23400	0	0	0133	2050	0	0	15000	1035
01222	2	4	74	00	23343	0	0	0746	15597	0	0	13000	1036
01222	2	4	73	00	19242	0	0	0537	12705	0	0	15000	1037
01222	2	4	72	00	14530	0	0	0027	0903	0	0	9000	1038
0001222	2	4	75	00	41040	0	0	6250	15392	0	0	15000	1039
01222	2	4	74	00	19920	0	0	6390	13390	0	0	13000	1040
01222	2	4	73	00	17204	0	0	6449	10775	0	0	15000	1041
01222	2	4	72	00	12600	0	0	5472	3923	0	0	9000	1042
0001222	2	6	75	00	12408	0	0	873	1535	0	0	15000	1043
01222	2	6	74	00	3241	0	0	0	5241	0	0	13000	1044
01222	2	7	73	00	0	0	0	0	0	0	0	15000	1045
01222	2	7	72	00	12123	1406	0	6104	4013	0	0	15000	1046
01222	2	8	75	00	30031	3723	0	40000	8154	0	0	13000	1047
01222	2	8	74	00	17700	995	0	3545	13248	0	0	15000	1048

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6122	22	74	14	222	7	1002		804	1318			1300	1049
6122	22	72	17	330	7	1403		172	1432			1050	1050
6122	22	72	19	430	7	2390	1094	262	1240	1507		1051	1051
6122	22	75	10	138	3			229	1153			1052	1052
6122	22	74	10	133	3			203	1129			1053	1053
6122	22	73	10	122	0			408	819			1054	1054
6122	22	73	11	363	3			331	630			1055	1055
6122	22	73	7	139	2	1331		967	731			1056	1056
6122	22	74	5	109	9	2110	387	414	437			1057	1057
6122	22	74	5	158	7	2749		523	786			1058	1058
6122	22	73	9	362	2	1739		137	207			1059	1059
6122	22	72	8	487	6	1025	100	295	130	4		1060	1060
6122	22	75	3	464	7			381	314			1061	1061
6122	22	74	3	593	4			494	988			1062	1062
6122	22	73	3	507	3			433	731			1063	1063
6122	22	72	1	342	8			248	911			1064	1064
6122	22	75	2	344	8			233	109			1065	1065
6122	22	74	2	277	1			411	057			1066	1066
6122	22	73	2	290	2			213	744			1067	1067
6122	22	72	2	243	0			173	094			1068	1068
6122	22	75	2	805	6			001	204			1069	1069
6122	22	74	2	742	3			460	272			1070	1070
6122	22	73	2	536	0	130		228	309			1071	1071
6122	22	72	2	203	7	610		130	160			1072	1072
6122	22	75	1	263	1			104	101			1073	1073
6122	22	74	1	203	7			172	063			1074	1074
6122	22	73	1	138	1			111	253			1075	1075
6122	22	72	1	100	0			342	460			1076	1076
6122	22	75	1	152	0			912	608			1077	1077
6122	22	74	1	177	5			149	234			1078	1078
6122	22	73	1	214	8			174	404			1079	1079
6122	22	72	1	112	1			927	194			1080	1080
6122	22	75	1	76	1			76	17			1081	1081
6122	22	74	1	225	3			160	25			1082	1082
6122	22	73	1	125	8			997	261			1083	1083
6122	22	72	1	199	1			159	400			1084	1084
6122	22	75	1	170	2			126	437			1085	1085
6122	22	74	1	143	2	1432		0	0			1086	1086
6122	22	73	1	272	0			209	34			1087	1087
6122	22	72	1	320	4			0	320			1088	1088
6122	22	75	1	77				0	77			1089	1089
6122	22	74	1	127	8			94	25			1090	1090
6122	22	73	1	184	4	382		0	335			1091	1091
6122	22	72	1	184	4			0	146			1092	1092
6122	22	75	1	184	4	382		0	146			1093	1093
6122	22	74	1	382	3	1779		202	63			1094	1094
6122	22	73	1	410	3			216	122			1095	1095
6122	22	72	1	407	4			310	943			1096	1096
6122	22	75	1	214	4	2304		144	465			1097	1097
6122	22	74	1	170	2			126	435			1098	1098
6122	22	73	1	319	2			217	102			1099	1099
6122	22	72	1	110	9	1063		483	396			1100	1100
6122	22	75	1	592	0	3270	122	150	45			1101	1101
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6122	22	73	1	102	3	3930		0	635			1103	1103
6122	22	72	1	320	4			199	25			1104	1104
6122	22	75	1	293	7			194	03			1105	1105
6122	22	74	1	198	2			125	68			1106	1106
6122	22	73	1	172	5			904	163			1107	1107
6122	22	72	1	295	4	1165	1300	216	59			1108	1108
6122	22	75	1	441	3	5533	1139	217	03			1109	1109
6122	22	74	1	430	3			248	19			1110	1110
6122	22	73	1	732	4	10849	337	327	33	80		1111	1111
6122	22	72	1	272	5			193	10			1112	1112
6122	22	75	1	325	0	934		210	08			1113	1113
6122	22	74	1	239	3	2513		204	03			1114	1114
6122	22	73	1	199	9	1435	333	165	88			1115	1115
6122	22	72	1	266	5			200	45			1116	1116
6122	22	75	1	215	7			199	09			1117	1117
6122	22	74	1	50				166	2			1118	1118
6122	22	73	1	94	4			56				1119	1119
6122	22	72	1	10				204	9			1120	1120
6122	22	75	1	430	9	4594	190	21	43			1121	1121
6122	22	74	1	209	4	2933		77	36			1122	1122
6122	22	73	1	894	1	38063	360	265	52	10101	34374	1123	1123
6122	22	72	1	885	2	27002	339	231	06	3523	39877	1124	1124
6122	22	75	1	227	3	40259	543	272	05	4235	60934	1125	1125
6122	22	74	1	370	4	32000	072	220	33	5759	73753	1126	1126
6122	22	73	1	123	5	9293		703	40			1127	1127
6122	22	72	1	129	3	2469		055	26			1128	1128
6122	22	75	1	142	0	14484		577	42			1129	1129
6122	22	74	1	157	7	19813		066	17	3532	3702	1130	1130
6122	22	73	1	154	1	15773		538	48			1131	1131
6122	22	72	1	178	2	980		060	18			1132	1132
6122	22	75	1	178	2	130		823	39			1133	1133
6122	22	74	1	150	1	5063		600	09			1134	1134
6122	22	73	1	042	1	1200		175	57			1135	1135
6122	22	72	1	014	1			215	16			1136	1136

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0310	4	17	71	07	13423	2107	0	0	4310	0	0443	1273	1141	
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0310	5	17	73	30	100017	121	0	0	59523	33103	1100	1300	1143	
0310	5	17	72	40	83393	2335	0	0	20048	1090	2109	1310	1144	
0310	5	17	71	40	105047	12433	0	0	61091	29130	10	2503	1273	1145
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0310	6	17	71	40	3975	0	0	0	3405	0	510	1273	1149	
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0310	7	17	73	40	24333	191	0	0	23050	0	342	1300	1151	
0310	7	17	72	42	29944	044	0	0	1494	20025	1781	1318	1152	
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0310	8	17	74	30	34700	0	0	0	30905	0	3001	1450	1154	
0310	8	17	73	33	31446	0	0	0	26722	0	4003	1300	1155	
0310	8	17	72	32	35072	0	0	0	1314	27474	0804	1318	1150	
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0310	9	17	74	29	23232	0	0	0	0	22750	542	1450	1150	
0310	9	17	72	23	22004	0	0	0	0	21379	922	1318	1159	
0310	9	17	71	22	20049	1113	0	0	0	10330	1200	1273	1100	
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0310	10	17	73	20	23225	0	0	0	0	21130	523	1300	1102	
0310	10	17	72	23	24311	3943	0	0	0	17910	1240	1318	1103	
0310	10	17	71	24	32505	0304	0	0	0	10050	4714	1273	1104	
0310	11	17	74	24	30349	0	0	0	0	30250	99	1450	1105	
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0310	11	17	71	25	23935	0	0	0	0	21001	2174	1273	1107	
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0310	13	17	71	29	43059	1021	0	0	0	0370	20312	0748	1273	1175
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0310	14	17	71	27	35233	0	0	0	0	0	3397	30	1273	1179
0310	15	17	74	14	22704	1501	0	0	0	14972	3042	1249	1450	1180
0310	15	17	73	10	23423	2000	0	0	0	11700	7172	1350	1181	
0310	15	17	72	10	25902	2343	0	0	0	11510	10373	1730	1318	1182
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0310	16	17	73	13	18102	0	0	0	0	0	15222	600	1300	1185
0310	16	17	72	13	17382	57	0	0	0	0	16270	1055	1318	1180
0310	16	17	71	12	15035	520	0	0	0	0	13545	1104	1273	1187
0310	17	17	74	11	12102	0	0	0	0	0	11452	710	1450	1188
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0310	18	17	74	7	0105	0	0	0	0	0	2402	3021	1450	1192
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0310	18	17	71	9	4457	0	0	0	0	0	1309	3140	1273	1195
0310	19	17	73	7	4330	512	0	0	0	0	2359	1241	1300	1196
0310	19	17	72	8	6100	210	0	0	0	0	3816	597	1318	1197
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0320	2	17	70	295	03172	0	0	0	0	0	0	0	1207	
0320	2	17	74	44	9544	9544	0	0	0	0	0	0	1208	
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0320	3	17	70	24	4413	4413	0	0	0	0	0	0	1211	
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0320	5	17	74	34	2939	1020	707	0	0	0	592	3491	1217	
0320	5	17	73	35	2233	1060	0	0	0	0	427	3409	1218	
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0320	6	17	74	31	15054	040	381	5037	0423	0	78	3491	1221	
0320	6	17	73	31	20093	7784	79	0	12172	0	0	3409	1222	
0320	6	17	71	30	14522	9272	154	170	4019	0	55	3050	1223	
0320	6	17	70	30	14476	9205	0	34	4303	0	104	2051	1224	

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6320	7	17	74	33	13553			9978	3600			3491	1225
6320	7	17	73	41	11274			4046	7223			3409	1226
6320	7	17	72	35	13575			12132	3383			3366	1227
6320	7	17	71	28	17539			6297	11242			3050	1228
6320	7	17	70	23	10617			0500	9457			2651	1229
6320	8	17	74	29	375			0	293			3491	1230
6320	8	17	73	30	2296				2124			3469	1231
6320	8	17	72	28	4428				4149			3300	1232
6320	8	17	71	23	23				1			3050	1233
6320	9	17	74	24	10933	1049			434			3491	1234
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6320	9	17	72	16	14236	2343			11413			3366	1236
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6320	10	17	72	15	2534	2363			0			3366	1240
6320	10	17	71	14	2279	2247			0			3050	1241
6320	11	17	74	10	120				0			3491	1242
6320	11	17	73	2	132	180			0			3491	1243
6320	11	17	72	3	112	12			0			3491	1244
6320	11	17	71	3	32				0			3469	1245
6320	12	17	74	2	32				0			3366	1246
6320	12	17	73	2	32				0			3050	1247
6320	12	17	72	2	27				127			3469	1248
6320	12	17	71	2	163				163			3366	1249
6320	13	17	74	2	27				0			2651	1250
6320	13	17	73	2	172	139			0			3491	1251
6320	13	17	72	2	79				0			3469	1252
6320	13	17	71	2	223				71			3491	1253
6320	14	17	74	2	223				223			3469	1254
6320	14	17	73	2	177				177			3366	1255
6320	14	17	72	2	217				216			3050	1256
6320	14	17	71	2	239	3944			5931			3469	1257
6320	15	17	74	4	179410	41391			993			3050	1258
7112	0	17	74	10000	181475	33692	16514	101659	24070	724	6216	93400	1259
7112	0	17	73	10000	256553	33991	9403	150789	50193	57	7135	112300	1260
7112	0	17	72	10000	247871	34463	1736	145755	62386	430	2501	109740	1261
7112	0	17	71	10000	228030	44143	2195	123432	48104	3920	182	88260	1262
7112	1	17	74	10000	426212	63154	3399	312922	63716	6532	521	79840	1263
7112	1	17	73	103	51317	403	345	34355	16214			93400	1264
7112	1	17	72	103	55181	1067		37127	16987			109740	1265
7112	1	17	71	220	73413	3164	335	48806	21113			88260	1266
7112	2	17	74	223	85142	3536	680	35910	25016			79840	1267
7112	2	17	73	126	32534	1420		29276	1114	724		93400	1268
7112	2	17	72	122	46424	3937	218	18955	17039	230		109740	1269
7112	2	17	71	107	68394	9098	609	48772	11637	1278		88260	1270
7112	3	17	74	196	69624	11405	361	27214	3014			79840	1271
7112	3	17	73	90	64							93400	1272
7112	3	17	72	93	61							112300	1273
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7112	4	17	74	122	63							88260	1275
7112	4	17	73	113	61							79840	1276
7112	4	17	72	78	14107	12280	305		1522			93400	1277
7112	4	17	71	45	10966	10218	72		670			112300	1278
7112	5	17	74	83	9336	7643	159		1384			109740	1279
7112	5	17	73	92	13057	5615	124	6794	46	280		88260	1280
7112	5	17	72	100	18197	17522	607		8			79840	1281
7112	5	17	71	16	3544	3544						93400	1282
7112	6	17	74	10	3615	3536	79					112300	1283
7112	6	17	73	14	3678	3315	363					109740	1284
7112	6	17	72	24	692		362					88260	1285
7112	6	17	71	26	2510		2510					79840	1286
7112	7	17	74	24	526				620			93400	1287
7112	7	17	73	23	1984				1984			112300	1288
7112	7	17	72	26	1365				647			109740	1289
7112	7	17	71	40	384	659			325			88260	1290
7112	8	17	74	39	1476	728			728			79840	1291
7112	8	17	73	50	3126	10			900			93400	1292
7112	8	17	72	57	14409				9893			112300	1293
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7112	9	17	74	40	3260	499			1072			88260	1295
7112	9	17	73	36	11012	2407			0			79840	1296
7112	9	17	72	10	2316				2316			112300	1297
7112	9	17	71	14	2246	534			1712			109740	1298
7112	10	17	74	8	3227	767			2453			88260	1299
7112	10	17	73	50	399	161			0			93400	1300
7112	10	17	72	4	442	179			203			112300	1301
7112	10	17	71	4	564	156			406			109740	1302
7112	11	17	74	4	472	225			252			88260	1303
7112	11	17	73	4	414	194			220			79840	1304
7112	11	17	72	4	910	221			989			93400	1305
7112	11	17	71	4	1322	1223			97			112300	1306
7112	12	17	74	3	1300	1300			0			109740	1307
7112	12	17	73	3	1200				0			88260	1308
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7112	12	17	73	274	26505	5612	7470	22516	1194			112300	1311
7112	12	17	72	225	59606			42063	16214	0		109740	1312

71112	14	17	74	443	74843	19409	5937	30012	3694	0	0210	93400	1313
71112	14	17	72	203	53822	16450	538	32330	3510	150	0194	109740	1314
71112	14	17	71	243	53258	45660	159	21385	10422	220	182	88260	1315
71112	14	17	70	243	54000	48690	496	10173	5230	829	521	79840	1316
71112	1	1	74	71	10071	0	0	14183	2491	0	0	93400	1317
71112	1	1	73	96	17244	270	0	12439	4467	0	0	112300	1318
71112	1	1	72	93	13961	349	0	13335	577	0	0	109740	1319
71112	1	1	71	93	16719	1144	0	13365	1689	0	0	88260	1320
71112	1	1	70	100	24439	1140	0	20123	1170	0	0	79840	1321
71112	1	1	74	100	13430	0	0	13096	5340	0	0	93400	1322
71112	1	1	73	440	31535	0	0	23529	7706	0	0	112300	1323
71112	1	1	72	443	21705	0	0	14511	7194	0	0	109740	1324
71112	1	1	71	500	17038	0	0	14441	2597	0	0	88260	1325
71112	1	1	70	47	18408	0	0	15787	4621	0	0	79840	1326
71112	1	1	74	336	14393	0	0	7079	7319	0	0	93400	1327
71112	1	1	73	342	14573	713	0	5524	9043	0	0	112300	1328
71112	1	1	72	346	17446	713	0	5581	7147	0	0	109740	1329
71112	1	1	71	460	33304	673	0	20400	12051	0	0	88260	1330
71112	1	1	70	477	19904	983	0	0	19015	0	0	79840	1331
71112	1	1	74	19	10559	2057	0	0	7591	0	0	112300	1332
71112	1	1	73	11	1612	403	333	0	1004	0	0	93400	1333
71112	1	1	72	14	5690	4417	0	0	3273	0	0	112300	1334
71112	1	1	71	13	2069	0	0	0	2064	0	0	109740	1335
71112	1	1	70	29	5353	147	335	0	4170	0	0	88260	1336
71112	1	1	74	43	4339	1501	0	0	2210	0	0	79840	1337
71112	2	2	74	41	12230	0	0	12279	1	0	0	93400	1338
71112	2	2	73	43	17938	0	0	5423	6095	480	0	109740	1339
71112	2	2	72	45	14327	629	0	11342	1530	0	0	88260	1340
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71112	2	2	70	56	11015	907	0	9384	0	0	0	93400	1342
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71112	2	2	72	47	12934	1977	0	7915	3042	0	0	88260	1345
71112	2	2	71	56	23533	6319	0	9338	7222	0	0	79840	1346
71112	2	2	70	19	3107	0	0	6821	1258	0	0	112300	1347
71112	2	2	74	38	12403	0	0	9066	2782	0	0	109740	1348
71112	2	2	73	38	37043	0	0	28915	6050	127	0	88260	1349
71112	2	2	72	33	11534	43	0	0	11491	0	0	79840	1350
71112	2	2	71	27	483	0	0	0	0	0	0	93400	1351
71112	2	2	70	23	1274	1271	0	0	3	0	0	79840	1352
71112	2	2	74	7	32	32	0	0	0	0	0	79840	1353
71112	2	2	73	13	6750	30	0	7513	1113	0	0	93400	1354
71112	2	2	72	10	5710	478	300	0	559	0	0	112300	1355
71112	2	2	71	9	3420	3103	210	0	39	0	0	109740	1356
71112	2	2	70	15	3090	3103	0	0	39	0	0	88260	1357
71112	2	2	74	17	4090	3272	0	0	169	0	0	79840	1358
71112	3	3	74	90	604	64	0	0	0	0	0	93400	1359
71112	3	3	73	93	61	61	0	0	0	0	0	112300	1360
71112	3	3	72	97	102	01	0	0	41	0	0	109740	1361
71112	3	3	71	122	08	01	0	0	7	0	0	88260	1362
71112	3	3	70	119	39	01	0	0	28	0	0	79840	1363
71112	4	4	74	35	600	030	0	0	0	0	0	93400	1364
71112	4	4	73	35	6910	030	0	0	0	0	0	109740	1365
71112	4	4	72	63	8081	8873	0	0	46	7	0	88260	1366
71112	4	4	71	63	9939	8477	0	0	1522	0	0	79840	1367
71112	4	4	70	29	3190	3190	0	0	0	0	0	93400	1368
71112	4	4	74	49	4751	4494	257	0	0	0	0	112300	1369
71112	4	4	73	34	5211	4879	433	0	0	21	0	109740	1370
71112	4	4	72	30	6130	7097	433	0	0	0	0	88260	1371
71112	4	4	71	3	511	200	105	0	0	0	0	79840	1372
71112	4	4	70	3	1023	921	102	0	0	0	0	93400	1373
71112	4	4	74	9	1560	1560	234	0	0	0	0	109740	1374
71112	4	4	73	14	104	104	0	0	0	0	0	79840	1375
71112	4	4	72	14	5122	5122	0	0	0	0	0	93400	1376
71112	4	4	71	2	1971	1971	0	0	0	0	0	109740	1377
71112	4	4	70	2	2654	1906	72	0	0	0	0	112300	1378
71112	4	4	74	5	2878	1494	0	0	676	0	0	93400	1379
71112	4	4	73	5	930	336	0	0	1384	0	0	109740	1380
71112	4	4	72	3	720	720	0	0	0	0	0	88260	1381
71112	4	4	71	16	3544	3544	0	0	0	0	0	79840	1382
71112	4	4	70	16	3615	3530	79	0	0	0	0	93400	1383
71112	5	5	74	14	5678	3315	303	0	0	0	0	112300	1384
71112	5	5	73	2	692	0	0	0	0	0	0	109740	1385
71112	5	5	72	26	2510	0	2510	0	0	0	0	88260	1386
71112	5	5	71	24	020	0	0	0	0	0	0	79840	1387
71112	5	5	70	23	1934	0	0	0	620	0	0	93400	1388
71112	6	6	74	46	1305	0	0	0	1984	71	0	112300	1389
71112	6	6	73	40	904	0	0	0	047	0	0	109740	1390
71112	6	6	72	34	1476	059	0	0	325	0	0	88260	1391
71112	6	6	71	22	3113	748	0	0	728	0	0	79840	1392
71112	7	7	74	19	1190	0	0	2210	897	0	0	93400	1393
71112	7	7	73	21	8730	0	0	7332	4022	0	0	112300	1394
71112	7	7	72	21	6448	493	0	107	1800	33	0	109740	1395
71112	7	7	71	19	3634	2407	0	0	4547	3725	0	88260	1396
71112	7	7	70	18	2413	0	0	1919	2502	0	0	79840	1397
71112	7	7	74	16	0	0	0	0	494	0	0	93400	1398
71112	7	7	73	16	0	0	0	0	0	0	0	112300	1399

APPENDIX C--Continued

[illegible]

APPENDIX C--Continued

[illegible]

APPENDIX C--Continued

7531	16	1	74	7	14242	0	1434	0	12463	0	0	23467	1577
7531	16	1	73	4	1692	133	0	0	13022	0	0	13312	1575
7531	13	1	74	15	17575	07113	0	0	3343	0	0	23467	1579
7531	13	1	73	15	20570	06255	0	0	32553	0	0	13312	1580
7531	13	1	74	12	17745	20000	0	0	31933	11958	0	23467	1581
7531	13	1	73	13	23574	14000	524	13192	3358	0	0	13312	1582
7531	21	1	74	35	353	0	0	0	353	0	0	23467	1533
7531	21	1	74	38	40931	0	0	25014	15317	0	0	23467	1534
7531	21	1	73	38	33082	0	0	18747	14935	0	0	19312	1535
8412	0	17	75	10	55911	09499	400	322334	153613	0	0	31500	1586
8412	0	17	74	10	512300	59808	0	0	305877	148623	0	47500	1587
8412	0	17	73	10	467012	52330	0	0	290508	158903	0	43000	1588
8412	0	17	72	10	524381	74113	927	0	176943	0	0	40000	1589
8412	1	17	74	364	179313	5701	0	0	129958	39580	0	47500	1590
8412	2	17	73	350	172973	3440	0	0	115729	47330	0	43000	1591
8412	2	17	75	172	881055	8440	408	0	51310	33207	0	51500	1592
8412	2	17	74	192	85674	7577	0	0	41606	36491	0	47500	1593
8412	2	17	73	134	80449	4708	0	0	36414	45327	0	43000	1594
8412	2	17	72	185	93022	11937	0	0	24423	50662	0	40000	1595
8412	3	17	75	103	30980	0	0	0	27255	97332	0	51500	1596
8412	3	17	74	103	34751	0	0	0	38949	17832	0	47500	1597
8412	3	17	73	106	47135	0	0	0	15715	11470	0	43000	1598
8412	4	17	74	109	39165	618	0	0	25738	12311	0	40000	1599
8412	4	17	73	341	192502	4	0	0	97364	52750	0	47500	1600
8412	4	17	72	300	186939	384433	0	0	45510	54281	0	43000	1601
8412	4	17	71	300	179104	51430	927	0	63231	58583	0	40000	1602
8412	1	1	74	172	92843	3752	0	0	95579	17512	0	47500	1603
8412	1	1	73	135	84102	14200	0	0	55000	19743	0	43000	1604
8412	1	1	72	180	82534	10093	0	0	306903	17550	0	40000	1605
8412	1	1	71	161	87113	0307	0	0	306744	22002	0	51500	1606
8412	1	1	74	161	75343	29	0	0	37081	15233	0	47500	1607
8412	1	1	73	155	71551	0	0	0	50436	21113	0	43000	1608
8412	1	1	72	29	10953	0	0	0	3950	6997	0	51500	1609
8412	1	1	71	31	11133	0	0	0	7238	3835	0	47500	1610
8412	2	1	74	10	17200	0	0	0	10293	6973	0	43000	1611
8412	2	1	73	10	65223	0	0	0	49344	15684	0	40000	1612
8412	2	1	72	125	58473	324	0	0	32783	17450	0	51500	1613
8412	2	1	71	125	52221	7493	0	0	24109	20619	0	47500	1614
8412	2	1	74	109	47532	11030	0	0	20115	22703	0	43000	1615
8412	2	1	73	113	60078	0	0	0	16015	39623	0	40000	1616
8412	2	2	75	47	29632	0	408	0	18527	10757	0	51500	1617
8412	2	2	74	50	23933	84	0	0	12335	11511	0	47500	1618
8412	2	2	73	00	22613	0	0	0	10295	12523	0	43000	1619
8412	2	2	72	57	46032	0	0	0	4008	16725	0	40000	1620
8412	2	2	71	17	9523	0	0	0	5102	4361	0	47500	1621
8412	2	2	70	15	10099	0	0	0	0	10069	0	43000	1622
8412	2	2	69	15	312	0	0	0	0	0	0	40000	1623
8412	2	2	68	58	20101	0	0	0	13486	6312	0	51500	1624
8412	2	2	67	00	34145	0	0	0	20800	11333	0	47500	1625
8412	2	2	66	00	12910	0	0	0	7067	5843	0	43000	1626
8412	2	2	65	70	21853	0	0	0	14901	6382	0	40000	1627
8412	2	2	64	45	16825	0	0	0	13767	3058	0	51500	1628
8412	2	2	63	43	22600	0	0	0	16143	6463	0	47500	1629
8412	2	2	62	38	14275	0	0	0	8040	5627	0	43000	1630
8412	2	2	61	33	17232	0	0	0	10335	5323	0	40000	1631
8412	2	2	60	10	783374	204099	239	0	474813	255835	4927	12000	1632
8412	2	2	59	10	707527	21055	550	0	401243	250074	3103	10900	1633
8412	2	2	58	10	628505	21110	2281	0	342609	291033	579	10500	1634
8412	2	2	57	559	477081	9932	317	0	292611	174821	0	14000	1635
8412	2	2	56	546	426470	10859	21	0	269088	146512	0	12000	1636
8412	2	2	55	524	399927	9319	0	0	255383	135225	0	10900	1637
8412	2	2	54	498	361936	8922	124	0	234971	117919	0	10500	1638
8412	2	2	53	191	163303	0	344	0	102860	60153	0	14000	1639
8412	2	2	52	211	135324	0	0	0	88381	49343	0	10900	1640
8412	2	2	51	288	118644	1343	0	0	63043	50825	0	10500	1641
8412	2	2	50	138	136733	11425	0	0	38414	34700	2178	14000	1642
8412	2	2	49	160	166342	749	108	0	93452	87103	4927	12000	1643
8412	2	2	48	151	131628	1148	179	0	50745	76453	3103	10900	1644
8412	2	2	47	140	116233	2905	817	0	44478	67223	579	10500	1645
8412	2	2	46	132	19990	8250	1811	0	108	9757	0	14000	1646
8412	2	2	45	275	114476	9932	310	0	90340	13894	0	14000	1647
8412	2	2	44	270	115337	10859	0	0	34212	10326	0	12000	1648
8412	2	2	43	260	102220	9319	0	0	61770	11123	0	10900	1649
8412	2	2	42	254	100238	8922	124	0	77791	13461	0	10500	1650
8412	2	2	41	90	92544	0	0	0	83356	3688	0	14000	1651
8412	2	2	40	85	100347	0	0	0	88462	11885	0	12000	1652
8412	2	2	39	70	100177	0	0	0	78458	21719	0	10900	1653
8412	2	2	38	64	82319	0	0	0	64575	17744	0	10500	1654
8412	2	2	37	30	45177	0	0	0	14224	3928	0	14000	1655
8412	2	2	36	40	40416	0	0	0	22462	17954	0	12000	1656
8412	2	2	35	52	53389	0	0	0	29573	23316	0	10900	1657
8412	2	2	34	52	50371	0	0	0	21750	22621	0	10500	1658
8412	2	2	33	29	30533	0	0	0	21407	7181	0	14000	1659
8412	2	2	32	36	32677	0	0	0	23607	3870	0	12000	1660
8412	2	2	31	32	39351	0	0	0	23308	10963	0	10900	1661
8412	2	2	30	32	38442	0	0	0	32379	5504	0	10500	1662
8412	2	2	29	28	43609	0	0	0	26146	17463	0	14000	1663
8412	2	2	28	33	46570	0	0	0	20251	26319	0	12000	1664

APPENDIX C---Continued

04413	1	3	73	33	4	3237	0	0	15016	34371	0	0	10000	1005
04413	1	3	72	33	4	3237	0	0	15016	23353	0	0	10000	1006
04413	1	0	75	20	3	1533	0	0	15236	19541	0	0	10000	1007
04413	1	0	73	33	2	1533	0	0	12014	19533	0	0	10000	1008
04413	1	0	72	33	2	1533	0	0	11747	17961	0	0	10000	1009
04413	1	7	73	33	2	1533	0	0	11032	13494	0	0	10000	1070
04413	1	7	74	33	2	1533	0	0	24206	31711	0	0	10000	1071
04413	1	7	73	20	1	14033	0	0	7276	5057	0	0	12000	1072
04413	1	7	72	10	0	0384	0	0	3323	4210	0	0	10000	1073
04413	1	3	74	33	2	1533	0	0	3169	3215	0	0	10000	1074
04413	1	3	73	12	0	8098	0	0	0	3098	0	0	10000	1075
04413	1	3	72	11	0	8098	0	0	0	4883	0	0	10000	1076
04413	1	0	75	4	0	439	0	0	0	403	0	0	10000	1077
04413	1	10	74	10	0	3704	0	0	0	3764	0	0	10000	1078
04413	1	10	73	10	0	3204	0	0	884	3204	0	0	10000	1079
04413	1	10	72	4	0	7902	0	0	30910	7073	0	0	10000	1080
04413	1	11	75	4	0	13383	0	0	30910	30467	0	0	10000	1081
04413	1	11	74	0	0	1572	0	0	0	41551	0	0	10000	1082
04413	2	1	75	0	0	75070	315	0	47970	27300	0	0	10000	1083
04413	2	1	74	0	0	7317	0	0	45905	29101	0	0	10000	1084
04413	2	1	73	10	0	04004	0	0	45905	12794	0	0	10000	1085
04413	2	2	75	0	0	83705	0	757	52770	21348	0	0	10000	1086
04413	2	2	74	0	0	83705	0	0	01326	21022	0	0	10000	1087
04413	2	2	73	0	0	58733	0	0	41036	17123	0	0	10000	1088
04413	2	2	72	0	0	6313	134	0	32035	14337	0	0	10000	1089
04413	2	3	75	1	0	0373	0	0	0	0373	0	0	10000	1090
04413	2	3	73	24	0	7373	0	0	0	7373	0	0	10000	1091
04413	2	3	72	23	0	0531	0	0	0	0531	0	0	10000	1092
04413	2	4	75	1	0	3333	0	344	2120	4524	0	0	10000	1093
04413	2	4	74	1	0	13470	0	0	4733	3733	0	0	10000	1094
04413	2	4	73	13	0	8036	0	0	4335	3701	0	0	10000	1095
04413	2	4	72	20	0	13723	0	0	7400	0202	0	0	10000	1096
04413	2	5	74	4	0	303	0	0	0	503	0	0	10000	1097
04413	2	5	73	0	0	1353	0	0	0	1353	0	0	10000	1098
04413	2	1	75	3	0	37569	0	0	30101	05500	0	0	10000	1099
04413	2	1	74	3	0	33127	0	0	20157	14640	0	0	10000	1700
04413	2	1	73	3	0	30994	0	0	19001	14240	0	0	10000	1701
04413	2	2	75	3	0	33445	5927	0	11555	18311	0	0	10000	1702
04413	2	2	74	4	0	42750	138	0	21562	15269	0	0	10000	1703
04413	2	2	73	52	0	33213	723	0	21473	10346	1603	0	10000	1704
04413	2	3	75	4	0	30878	1540	0	15455	10941	0	0	10000	1705
04413	2	3	74	2	0	12769	0	317	10550	17770	0	291	10000	1706
04413	2	3	73	25	0	31800	0	0	10155	2614	0	0	10000	1707
04413	2	3	72	25	0	34135	0	0	17500	14232	0	0	10000	1708
04413	2	4	75	3	0	32721	5498	0	12050	22145	0	0	10000	1709
04413	2	4	74	33	0	43473	431	0	14144	13373	1346	0	10000	1710
04413	2	4	73	18	0	55743	303	100	26536	10115	0	0	10000	1711
04413	2	4	72	4	0	25125	1557	0	34243	20964	0	0	10000	1712
04413	2	5	75	1	0	7725	0	0	3549	21272	0	0	10000	1713
04413	2	5	74	6	0	212	0	0	0	0369	0	0	10000	1714
04413	2	5	73	10	0	271	0	0	0	212	0	0	10000	1715
04413	2	5	72	8	0	1107	0	0	0	271	0	0	10000	1716
04413	2	6	75	1	0	174	0	0	0	1107	0	0	10000	1717
04413	2	6	74	1	0	323	184	0	0	049	0	0	10000	1718
04413	2	6	73	5	0	6347	110	179	0	030	0	0	10000	1719
04413	2	6	72	5	0	6347	0	0	275	0072	0	0	10000	1720
04413	2	6	71	5	0	6347	0	0	275	0072	0	0	10000	1721
04413	2	6	70	5	0	6347	0	0	275	0072	0	0	10000	1722

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