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THE USE OF DEMOGRAPHIC CONSUMER VARIABLES
AS SEGMENTATION CRITERIA FOR
FROZEN FOOD PRODUCTS
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RICHARD DALE LEININGER

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THE USE OF DEMOGRAPHIC CONSUMER VARIABLES
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By

Richard Dale Leininger

A DISSERTATION

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ABSTRACT

THE USE OF DEMOGRAPHIC CONSUMER VARIABLES AS SEGMENTATION CRITERIA FOR FROZEN FOOD PRODUCTS

By

Richard Dale Leininger

The most common operational source of market segmentation identification, demographic consumer characteristics, has not generally been established to be an effective delineator of purchasing behavior. But while there exists a significant amount of doubt, controversy, and confusion, with regard to the use of demographics in market segmentation research and practice, there would also seem to be both opportunity and potential for the demographic-based research of segmentation relationships.

The primary purpose of this study was to investigate the use of demographic consumer variables, as a means of segmenting and predicting the purchase of consumer products. A further purpose of the study was to investigate the value of demographic and inter-product purchasing variables in relationship to the purchases of frozen food products, thus providing analysis of the value of demographics for the specific industry of frozen foods, far beyond reported prior studies relating to the market for frozen food products.

Using a data base provided by the Akron Beacon Journal, relationships were examined using the analysis of variance and linear

discrimination programs provided by the Statistical Package for the Social Sciences. Specific tests were made to determine the statistical significance of each relationship, as well as the linearity, bivariate predictive power, and multivariate classification ability of demographic and product-purchase variables, in relationship to each of twelve specific categories of frozen food products.

The primary conclusion was that demographic variables can be used to successfully predict and segment the purchasing behavior for frozen food products. A combined use of thirteen demographic variables was able to correctly identify the product purchasers of the twelve product categories at an average rate of 61.3 percent, compared to 65.5 percent by means of product-purchase variables. However, an additional finding was that many of the tested demographic relationships were substantially non-linear, with half or more of the bivariate predictive power often lost via linear statistical measurement.

Thus, it is suggested that the use of additional demographic variables and non-linear multivariate discriminant methods could be expected to significantly increase demographic-based buyer classification and segmentation success.

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Particular thanks must be given for the efforts by the additional members of the dissertation committee, Dr. George D. Wagenheim and Dr. David J. Closs. Their professional expertise and continued positive suggestions during the course of the research were very much appreciated and will not be forgotten.

The Akron Beacon Journal generously furnished access to the data base used in the study, without which this study could not have taken place.

Acknowledgment must also be made of the encouragement and efforts on my behalf by my friends and colleagues at the University of Wisconsin at Oshkosh, particularly Dr. Stanley D. Sibley and Dr. Eugene F. Drzycimski.

Mrs. Grace Rutherford typed the final draft of this dissertation. Her outstanding knowledge of dissertation form was both notable and very much appreciated.

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CHAPTER I

INTRODUCTION

An Introduction to the Problem

One of the greatest single needs of the American marketing system is to be better able to understand the American consumer, not only to provide continuing profits for the companies involved, but also to better satisfy the wants and needs of the consumers. Thus, it seems somewhat paradoxical that while marketing literature speaks of "broadening the concept of marketing"¹ and advancing beyond mere profits to now include environmental and societal needs, that our knowledge of the consumer, and the practical application of what we do know, still remains so strikingly limited.

In particular, the "average" or "middle-class" stereotypes of many companies' strategic marketing efforts have been supplanted in the actual consuming public by a vast and increasingly heterogeneous consumer market. As noted by Schwartz (1962), "from a single homogeneous unit, the mass market has exploded into a series of segmented, fragmented markets, each with its own needs, tastes, and way of life."² Similarly, Toffler (1971) concludes that the segmentation of the mass market has begun to change the face of American industry beyond recognition, with an astonishing diversity of products offered to the consumer.³

The classic article by Wendell Smith, "Product Differentiation and Market Segmentation as Alternative Market Strategies" (1956) provides an explanation for this growing characteristic of the American, via his definition of market segmentation:

Segmentation is based upon development of the demand side of the market and represents a rational and more precise adjustment of product and marketing effort to consumer or user requirements. In the language of the economist, segmentation is disagregative in its effects and tends to bring about several demand schedules where only one was recognized before."

Today, the concept of market segmentation has become a basic principle of modern marketing, and is regarded as one of the marketing profession's "hottest products."⁵ Thus, Frank, Massy, and Wind (1972) suggest that "during the past ten years, it has had as great an impact as any other theoretical construct that has served as a tool for organized thinking about the nature of the marketplace."⁶

Both academic and industry practitioners of marketing have maintained an active and sometimes frustrating interest in segmentation research and application. For example, Waldo (1973)⁷ found that a sample of marketing executives indicated that they considered "recognizing, defining, and segmenting markets" to be the most important single problem facing the marketing decision maker. Similarly, Springer (1975)⁸ asserted that "segmentation is the key" for future marketing success.

However, despite this indicated interest, and a large number of reported academic and industry studies in the subject area of consumer market segmentation, the available, specific segmentation research, as

applied to specific product markets, has been strikingly limited in both scope and practical application.

Thus, in a 1976 article, Dhalla and Mahatoo concluded:

The poor performance of many segmentation criteria tested so far can be attributed to the fact that too often researchers are anxious to find a magic formula that will profitably segment the market in all cases and under all circumstances. As with the medieval alchemist looking for the philosopher's stone, this search is bound to end in vain. There is no single algorithm that can be applied across all market studies. Each case must be viewed as a unique and potentially different situation.⁹

Plummer (1974) seems to echo this conclusion, with the observation that "so often, segments developed from a study on one product category have little or no relevance to another category."¹⁰ Likewise, Wind and Green (1972)¹¹ suggest that it may be necessary to think of each segmentation study as an ad hoc study, having specific validity for only the particular problem, product, and situation.

Yet, as noted by Weisenberger (1977),¹² a constant temptation exists for a multi-product, multi-brand manufacturer to seek cost savings in consumer segmentation research for a family of products via one major study, rather than by several individual studies for specific products. He concludes that more product-specific segmentation studies would "offer a more finely tuned picture of the consumer in the particular situation," although general studies should still be sought to provide some insights to the general segmentation relationships that may exist.¹³

Thus, in an allegorical sense, failure to find the "Northwest Passage" to universal identification of consumer segmentation relationships, should not be perceived as a failure of the research "expedition."

Investigations of the existing but still uncharted markets for particular products may prove to be a practical and strategic route toward achieving useful generalizations of segmentation relationships, and may be the only effective route toward utilization of segmentation theory in the actual marketing management of those product categories for which segmentation relationships have not been specifically and accurately "mapped." Similarly, attempts to segment a product market by means of a segmentation map developed for another product market may result in a failure of the marketing program, not caused by the failure of the concept of market segmentation per se, but rather, caused by the use of the wrong "map" of segmentation relationships.

In addition, the conclusions of past segmentation studies are often guilty of semantic "license" in stating that certain segmentation variables were not valid predictors for segmentation purposes, rather than giving a more objective report that the particular statistical method, research design, and data sample of the research did not show useful results.

Thus, in a commonly cited study by Frank, Massy, and Boyd (1967), 57 grocery products were examined for demographic ties to product category consumption, with the reported and often quoted conclusion that "socioeconomic characteristics are poor predictors of consumption for a broad range of specific grocery products."¹⁴ They concluded that rates of consumption for other products were usually better predictors of consumption than were demographic variables.

However, for the sake of simplicity in using such common, statistical techniques as multiple regression (as was used in the Frank, Massy, and Boyd study)¹⁵ assumptions are often made as to the linearity of the test variables, as well as assuming that nominative, categorical variables are interval in nature--two assumptions that should severely limit the use of linear regression and similar techniques, relative to the testing of demographic variables.

Moreover, as noted by Bass, Tigert, and Lonsdale (1968), "for market segmentation, the essential question is whether it is possible to identify groups of consumers with different mean purchase rates dependent on certain variables such as income, age, and occupation."¹⁶ Thus, they suggest that since multiple regression provides a measure of the variation in individual purchases, this method does not provide adequate measure of the usage rates that are predictable for different market segment groups. Therefore, they conclude that the low R squares reported in the Frank, Massy, and Boyd study¹⁷ implies that variation within the segments is great, but does not necessarily mean that group mean values will not be significant, if properly tested and measured.

In addition to questions about the appropriateness of the linear regression methodology, and the assumption, without testing, of a linear data relationship, there are additional questions that might be raised about the Frank, Massy, and Boyd study,¹⁸ such as a limited sample size (491 households), admitted problems of coding and multicollinearity within the sample data, as well as the growing age of the data base used (1960); all adding to probable reasons for doubt, and a need for re-examination of this study's conclusions about the usefulness of

demographic variables as predictors of consumer purchasing behavior for grocery products.

Indeed, much of our current "knowledge" about market segmentation would be better classified as dictum, rather than established fact. For example, volume segments are thought to exist, logically believed to be important, dutifully discussed in virtually every marketing textbook, but have rarely been identified in the marketplace. Thus, unfortunately, if market segments cannot be properly identified and defined, let alone predicted, segmentation might be better classified as an empty concept, rather than an established principle that is taught as a basic strategic foundation for proper marketing theory and practice.

Justification for the Study

The most common, operational source of market segmentation identification, demographic consumer characteristics, has not generally been established to be an effective delineator of purchasing behavior. But while there exists a significant amount of doubt, controversy, and confusion with regard to the value of demographics in market segmentation research, there would also seem to be both opportunity and potential for demographic-oriented research of market segmentation relationships.

If predictive demographic relationships can be more firmly established, demographic variables might be expected to become the most practical segmentation technique for the marketing practitioner, since demographic data and projections can provide significant advantages of identifiability and accessibility relative to the use of other segmentation techniques.¹⁹

Moreover, as additional relationships can be established for specific product markets, both the theory of market segmentation and general marketing can be seen as taking an additional step toward scientific generalization of marketing behavior. As noted by Leone and Schultz (1980), "basic answers to questions of how marketing variables are related lead logically to new questions of why they are related. Like our fellow scientists, we must first describe marketing behavior in order to bring us closer to explaining it."²⁰

The specific purpose of this study will be to determine if demographic consumer variables can be shown to be an effective predictor of specific product purchases, and thus demonstrate a practical potential for actual definition of market segments.

The study will have the effect of re-examining past conclusions about the effectiveness of demographic variables for market segmentation purposes, particularly for food products, but with probable conclusions relating to all consumer products.

In addition, the specific methodology of this study will have the result of providing a more finely tuned picture of the value of demographic segmentation in the specific industry of frozen foods. Despite a number of prior reported studies of the frozen food consumer, the status of existing knowledge about the segmentation potential of this industry remains surprisingly vacant.

First of all, most prior studies of the purchasers of frozen foods have limited their measurements of purchasing or consumption to the very broad category of total frozen food consumption, despite the

wide variety of product offerings within the total frozen food market. As concluded by Weisenberger, segmentation of more product-specific segmentation relationships are more likely to provide effective segmentation relationships than for more generalized, multi-product, multi-brand families of products,²¹ such as the total frozen food market.

Second, among the published and available studies of the frozen food consumer, there seems to be virtually no reported statistical analysis of relationships that may exist. Most reported conclusions seem to have been drawn from general perusal of two-way cross tabulations of survey totals, with no reported tests of statistical significance or predictive strength of the relationships between demographic variables and frozen food consumption.

Third, within reported frozen food industry research, the use of multivariate analysis of segmentation relationships has been almost totally absent. With the exception of a few three-way cross tabulation tables, without any reported statistical analysis of the results, multivariate demographic relationships simply have not been investigated, either for the total purchases of frozen foods, or for the separate categories of frozen food products within the total category of frozen foods.

Thus, this study of demographic segmentation, via data for the purchases of frozen food products, has the specific potential of being a landmark study for the frozen food industry, since the past reported studies of the frozen food consumer would seem to be describable as generally descriptive, but with very limited statistical analysis of

the actual existence or predictive value of segmentation relationships that may exist for this product market.

If successful in properly identifying and predicting demographic segments for frozen food products, the results would thus be meaningful for both the frozen food industry and for the general practice of marketing. Meaningful explanation of buyer patterns and successful classification into purchasing segments could thus provide the basis for further research, better understanding of the consumer market, more effective operationalization of the principle of market segmentation, as well as more profitable marketing management within the frozen food industry itself.

However, if the techniques used and/or the survey data of this study does not demonstrate that demographics can effectively predict and segment frozen food purchasers, that result should be perceived as a valid contribution in itself.

If this study fails to establish significant segmentation values for demographics, it would have corroborated earlier studies that have come to this conclusion. As noted by Leone and Schultz (1980), "replication is the key to generalization (in marketing theory) for without it, in the broadest sense, we have no corroboration of research results . . . only by extending findings to other data sets do we perceive the generality of marketing relationships."²²

However, if demographics exhibit useful segmentation potentials in the study, both the use of demographics as a marketing tool, and the practical application of marketing segmentation as a management technique, would be greatly enhanced.

Finally, the study will provide specific, needed consumer profile information to the frozen food industry, with a method and observed results that may provide specific guidance for marketing practice and future consumer research within this specific industry. Even a finding of poor demographic potentials would in itself be valuable information to marketers in the frozen food industry, as an incentive to seek other segmenting factors for frozen food products, or in seeking other research techniques that may ultimately unlock the way to the effective, practical usage of demographic consumer variables for the market segmentation of frozen food products.

Thus, this study would seem to have potential for both the general study of market segmentation, and for the specific industry of frozen foods, as well.

Hypotheses of the Study

Hypothesis One

The major hypothesis of this study will be that demographic variables can be used to successfully predict and segment the purchasing behavior for consumer products. Specifically, this study will focus on the ability to predict and segment the purchasing behavior for specific categories of frozen food products, as a means of testing this major hypothesis.

During the course of testing this major hypothesis, four sub-hypotheses will be considered, relative to the degree that the demographic variables can be tested and proven effective in predicting product purchases. These subhypotheses will be as follows:

- a. There will be a statistically significant, bivariate relationship between the individual demographic variables and the purchases of specific frozen food product categories at the .01 significance level.
- b. There will be a bivariate predictive relationship between individual demographic variables and the purchases of specific frozen food product categories with a total, non-linear predictive power of 5 percent or more.
- c. There will be a linear predictive relationship for demographic variables that are significantly related to the purchase of specific frozen food products on a bivariate basis.
- d. There will be a multivariate predictive relationship between the total set of demographic variables and the purchases of specific frozen food product categories with the resultant ability to correctly classify 75 percent or more of the product purchasers and non-purchasers.

Hypothesis Two

The second hypothesis of this study will be that demographic variables will prove to be equal to or more effective than the use of product-purchase variables, in the ability to predict the purchases of frozen food product categories, and to classify them into segments of purchasers and non-purchasers of each specific frozen food category.

Hypothesis Three

The third hypothesis of the study will be that both the demographic variables and the specific frozen food product-purchase variables will prove to be more effective than the total food purchases by the consumer-respondents, relative to the prediction of the purchase of specific frozen food categories.

Hypothesis Four

The fourth and final hypothesis of the study will be that freezer ownership will not provide either a statistically significant or meaningful predictive relationship to the purchases of the specific frozen food categories.

Research Design and Methodology

The study will be based upon a survey of frozen food purchases conducted by the Akron Beacon Journal, published in summary, cross-tabulation form under the title, "Frozen Food Study 1977."²³ The Akron Beacon Journal has furnished access to a survey data base of 720 interviews, conducted on an in-home basis by Bardsley & Haslacher, Inc., a Pala Alto, California marketing research firm. The survey interviews were collected from January 1976 to June 1976, using a random selection process among permanent-residence households in the Akron, Ohio metropolitan area.

The survey provides coded data relating thirteen demographic variables to the purchases of twelve specific categories of frozen food products, as well as providing data for total grocery purchases by each household, and for ownership of a separate freezer unit.

Survey data will be processed and analyzed via the use of the Statistical Package for the Social Sciences,²⁴ using the subprograms of "Breakdown" and "Discriminant."

Subprogram "Breakdown"²⁵ will be used to apply a one-way analysis of variance, testing statistically whether the group means of frozen food purchasers and non-purchasers are significantly different among

the subpopulations of the survey which are represented by the categories within each of the demographic variables in this study. Next, this same subprogram will be used to calculate the total linear and non-linear bivariate predictive strengths of the demographic variables, with respect to each of the bivariate relationships in which a demographic variable is found to be statistically related to the purchase of a specific frozen food product category.

Finally, the SPSS subprogram "Discriminant"²⁶ will be used to calculate the linear, multivariate amount of purchasing variance which can be explained by the combined use of the thirteen demographic variables which will be employed in this study. Via the discriminant analysis program provided by "Discriminant," a mathematical function will then be derived that best segments the purchasers from the non-purchasers of each specific frozen food product category, based upon the discriminating, demographic variables.

The same subprograms, "Breakdown" and "Discriminant" will also be used to test the predictive value of knowing the purchases of the other frozen food product categories, relative to the purchases of each specific frozen food product category, on both a bivariate and a multivariate basis, comparable to the testing of the demographic predictive variables of this study.

Subprogram "Breakdown" will also be used to examine the bivariate statistical strength of total grocery purchases and freezer ownership, relative to the purchase of the specific frozen food product categories.

Perceived Limitations of the Study

The results of this study are subject to the following limitations, that may or may not significantly affect the results of the empirical analysis.

First, the results are based upon a study conducted in only one, limited geographic area, the Akron, Ohio metropolitan area. The possibility that a more national survey sample might give different observed results must be noted. In addition, the single geographic survey area prevents measurement of geographic differences that may exist between regions of the country, and of course, may bias the results via the single, mid-western Ohio area used to collect the survey. However, it may be noted that the primary purpose of this study is to test the ability to effectively segment between frozen food purchasers and non-purchasers, not to study the purchasers of frozen food products per se.

Second, the limited number of demographic characteristics used in the analysis must limit conclusions about the total possible segmentation abilities of all demographic variables that might be available to the academic researcher or the industry-level marketing practitioner. Beyond the variable of geographic region, which has already been mentioned in this section, other demographic variables that might prove useful would include the ethnic background, religion, number of children, age categories of children in the family, and the stage in the family life cycle.

Third, the purchase data was collected on a one-time basis, relying on the respondents' memory and truthfulness of recall of

the past month's purchases. Purchase data based upon a more longitudinal data base would, of course, be more accurate and desirable. However, the cost of obtaining such a sample over an extended survey period, with a large enough sample size, becomes financially prohibitive to all but the largest companies or governmental agencies, and in any case, such data were not available for this study.

A fourth factor with regard to the study that should be noted is the age of the data, collected during the first six months of 1976. This possible weakness would certainly be more significant in specific interpretation of the results as they apply to actual, current purchases of the specific frozen food products of the study. However, it may be noted that this study will nevertheless provide the most current and comprehensive analysis of frozen food purchases known to exist in the frozen food industry. Moreover, as a basis for demonstrating the potential ability to segment via demographic variables, this limitation seems much less relevant to the possible results of this study.

A fifth factor with regard to the data source that should be noted is the possibility of seasonal variation in the consumption of the specific product categories of this study, particularly with regard to the seasonal availability of fresh substitutes. However, the first six months of the year, during which this survey was collected, should present the least distortion in total food purchases, caused by seasonal, fresh substitutes, as well as avoiding possible problems due to hot weather, such as less use of home ovens, vacations, etc., that might possibly cause abnormal shifts from usual purchase patterns.

Finally, a sixth factor may be the actual linearity of the demographic relationships in the survey sample. The typical research strategy has been to assume that the bivariate relationships were, in fact, reasonably linear, and thus usable in linear, statistical techniques. The factor of linearity will be tested in this study, rather than being assumed.

While the bivariate predictive relationships of the demographic variables of this study are hypothesized to be reasonably linear, a finding of non-linearity would be expected to limit the accuracy of the linear, multivariate discriminant analysis to be used in this study. To the extent that the demographic variables are examined, and found to lose actual predictive strength via the use of linear measurements, the net conclusions about the multivariate discriminant analysis would thus be limited.

Organization of the Following Chapters

The remainder of the dissertation consists of four chapters. Chapter II provides a review of prior literature that is relevant to this research study, including the early development of the concept of market segmentation, general application and misapplication of the concept, and a specific review of prior market research studies in the product category of frozen foods.

Chapter III presents an explanation and discussion of the research design and methodology used in the study, including the source of the data base, computer programs employed, statistical techniques used, and the statistical criteria used for testing of the hypotheses.

Chapter IV contains the research findings of the study, while Chapter V presents the conclusions of the study, including a specific consideration of the research hypotheses. Chapter V also includes a discussion of the implications of this study, as well as presenting some suggestions for further research.

FOOTNOTES--CHAPTER I

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¹⁶ Frank M. Bass, Douglas J. Tigert, and Ronald T. Lonsdale, "Market Segmentation: Group Versus Individual Behavior," Journal of Marketing Research 5 (August 1968): 264-270.

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²⁰ Robert P. Leone and Randall L. Schultz, "A Study of Marketing Generalizations," Journal of Marketing 44 (Winter, 1980): 15.

²¹ Weisenberger, pp. 123-124.

²² Leone and Schultz.

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²⁴ Norman H. Nie, C. Hull, J. Jenkins, K. Steinbrenner, and D. Bent, Statistical Package for the Social Sciences (New York: McGraw-Hill Book Co., 1975).

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²⁶ Ibid., pp. 434-467.

CHAPTER II

A REVIEW AND ANALYSIS OF MARKET SEGMENTATION RESEARCH

Introduction

The purpose of this chapter is to present a review and analysis of the marketing research and literature in the area of market segmentation.

First, the early foundations and literature relating to the development of the concept of market segmentation will be examined.

Second, the general application and misapplication of the concept will be examined, focusing on the observed discrepancy between the academic ideals of segmentation and the observed problems that have occurred in actual marketing research and practice.

Third, alternative methods of market segmentation will then be generally examined, with particular focus on the value and use of demographic indicators of segmentation. A review and analysis will be presented, with regard to some exemplative studies and viewpoints about the use of demographic segmentation methods.

Fourth, a specific review and analysis will be given, with respect to prior market research studies in the product category of frozen foods, as they may relate to the empirical research of this study.

The Concept of Market Segmentation

The origin of the concept of market segmentation is usually traced to the publication of Wendell Smith's classic article, "Product Differentiation and Market Segmentation as Alternative Market Strategies" in 1956.¹ In this article, Smith defines market segmentation as "viewing a heterogeneous market (one characterized by divergent demand) as a number of smaller homogeneous markets in response to differing product preferences among important market segments."² He explains that segmentation is based upon demand-side adjustments of the product and marketing efforts of the firm, in response to consumer requirements, such that several demand schedules are perceived where only one market demand had been recognized before.

In a somewhat prophetic aside, Smith remarks that "to a certain extent, market segmentation may be regarded as a force in the market that will not be denied." Six years later, in 1962, Schwartz noted:

It is nothing less than a revolutionary transformation which has come over the mass market during the past five years. From a single homogeneous unit, the mass market has exploded into a series of segmented, fragmented markets, each with its own needs, tastes, and way of life.³

Similarly, Frank, Massey, and Wind (1972) noted that "during the past ten years it has had as great an impact on marketing thought as any other theoretical construct that has served as a tool for organizing thinking about the nature of the marketplace."⁴

Today, the concept of market segmentation seems to have progressed far beyond the status of an "alternative strategy" as originally suggested by Smith, such that it has become a basic principle of modern

marketing. For example, in a current marketing text, Nickels (1978) refers to market segmentation as "a universal marketing function that enables buyers and sellers to concentrate their efforts on people who are most likely to participate in a mutually satisfying exchange."⁵

Virtually every marketing text of reasonably current date would be expected to devote at least a chapter to the concept and application of the principle of market segmentation. Moreover, the general topic of segmentation has attracted a plethora of past and present articles, most of which cite Wendell Smith as the originator of the concept.

Earlier Foundations of the Concept of Market Segmentation

Although Smith can appropriately be credited as instrumental in bringing the attention of marketers to the concept of market segmentation, the origin of the concept and even the term, market segmentation, may be found in the earlier literature of economics and marketing.

The origin for the concept of market segmentation might be perceived in marketing literature as early as 1915, when Arch Shaw stated that the market was comprised of "market contours," based upon social and economic differences of people.⁶ He suggested that a firm should analyze its market by strata, and then adjust its selling strategies to match its market contours.

Arndt (1974)⁷ suggests that the concept of market segmentation can be traced back to the theories of imperfect and monopolistic competition, as developed by Chamberlain (1933)⁸ and Robinson (1933).⁹

Thus, Arndt suggests that Robinson's decision rule (1948)¹⁰ for price discrimination in price adjustments to different price elasticities that apply to mutually exclusive segments of the market, might be generalized to other market mix ingredients as well--thereby providing a conceptual base for market segmentation.

Schyberger (1977)¹¹ argues that the originator of the market segmentation concept seems to be Joel Dean. In the textbook, Managerial Economics (1951),¹² Dean stressed the need to analyze separate market segments, relating to homogeneous characteristics of pricing, promotion, and distribution. These segments were to be defined by geographic region, product use, channel of distribution, price sensitivity of the customer, etc. In this book, Dean specifically used the term, market segmentation, as well as a sound description of the concept.

Moreover, while few marketing academicians would dispute the designation of Smith's 1956 article as a classic addition to marketing theory and practice, Wroe Alderson's text, Marketing Behavior and Executive Action, published in 1957, is typically considered a landmark contribution to marketing literature.¹³ Within this text, Alderson presents a parallel discussion, of product matching and positioning of the firm in the market, that may have been as much or more important in drawing the attention of marketing theorists and practitioners to the concept and practice of market segmentation.

For example, discussing his theory of market behavior, Alderson describes consumer demand in the United States market as being radically heterogeneous, with this heterogeneity being substantially independent of the actions of marketers. He noted that marketers develop their

activities (i.e., product, location, price, package, etc.) to appeal to consumer needs better than competitors do, thus leading to heterogeneity of supply as well as demand.¹⁴ Thus, marketing middlemen attempt to match the heterogeneous consumer demand with heterogeneous segments, via the process of sorting (i.e., accumulation, sorting-out, allocation, and assorting) resulting in a set of homogeneous supply segments being marketed by the seller-sorter.¹⁵

In a similar theory, Alderson suggests that firms seek a position of safety and power, similar to a biological being, which he labels an "ecological niche."¹⁶ He suggests that this ecological niche is made up of a core and a fringe, with the core being that part of the market which is best suited to the activities, safety, and power of the organization. Thus, a firm should develop a niche in the market, and protect its survival by finding and meeting the needs of a selected core of customers. Therefore, Alderson must be credited with providing a theoretical analysis and logic for the concept of market segmentation, even though he did not label it by those exact words.

Early Contributions from the Social Sciences

In addition, prior to Smith's conceptual article, there were numerous examples from the literature of the social sciences, including economics, sociology, and psychology, that provided data and scholarly observations relating to the basic concept that consumers were substantially heterogeneous, and thus, could be expected to exhibit different but predictable buying behavior.

For example, Thorstein Veblen, educated as a traditional economist, was influenced by the new field of social anthropology in his description of leisure class buying behavior. His 1899 book, The Theory of the Leisure Class,¹⁷ is noteworthy for the concept of "conspicuous consumption," in relation to the theory that economic consumption is more by prestige-seeking than by economic-oriented purchasing behavior, emphasizing the strong emulating factor in the purchase of conspicuous, socially important products such as clothing and houses. In a more "modern" application of this concept, Whyte (1954)¹⁸ observed that some buyers avoided the purchase of conspicuous consumption items such as air conditioners or similar appliances until their neighbors did, thus exhibiting a form of "conspicuous non-consumption" to try to "fit in" rather than stand out among their relevant reference group. In a current update on this concept, it may be observed that "conspicuous non-consumption" of energy has become something of a fad beyond probable economic or patriotic motivations, with solar heating and four-cylinder Cadillacs being sold to consumers who would seem to be the least sensitive to the price of energy.

Another prominent pre-1956 contribution from the social sciences would be W. Lloyd Warner's social class system, an important contribution to sociology as well as marketing literature. Warner and Lunt (1941)¹⁹ described a system of six social classes in our society: the upper-upper, or old, well established socialite families; the upper-middle, or the business and professional families; the lower-upper, consisting of recently affluent families; the upper-lower class,

consisting of the wage earner and skilled tradesman; the lower-middle class, made up of white-collar salaried workers; and finally, the lower-lower class, consisting of unskilled laborers. To determine the social class ranking, Warner developed a classification system based on the type of income, rather than income per se, occupation, type of residence, and place of residence.

Under Warner's guidance, and based upon his social class stratification system, the Chicago Tribune conducted a series of studies regarding family buying patterns in the Chicago area.²⁰ As discussed by Martineau (1958),²¹ the Chicago studies brought together a body of evidence that showed that the lower-class person is significantly different in where he buys and what he buys, differing in the symbolic value of purchases, as well as economic considerations. In this analysis of the Warner studies, Martineau develops three basic premises which are highly significant to the application of the market segmentation concept:

1. There is a social class system operative in metropolitan markets, which can be isolated and described.
2. It is important to realize that there are far-reaching psychological differences between the various classes.
3. Consumption patterns operate as prestige symbols to define class membership, which is a more significant determinant of economic behavior than mere income.²²

Sibley (1972) notes that while market researchers have applied a wide variety of independent and dependent variables in testing and applying the concept of market segmentation, the most prevalent group of variables found in segmentation studies have been demographic and socioeconomic classifications of the consumer.²³ From this perspective, it becomes rather fascinating to note that a number of studies, relating

to the standard of living and general consumption have been conducted in the past 200 years, as relating to demographic changes within the consumer population.²⁴

For example, Zimmerman (1936) noted that Frederick LePlay and his followers had affected the study of the social sciences for nearly 150 years, relative to consumption and societal well being.²⁵ According to Zimmerman, LePlay and his associates had conducted family budget and expenditure studies in Algeria, Arabia, Austria, Bali, Belgium, Canada, China, Corsica, Egypt, Great Britain, the United States, and several other countries. Expenditures were classified by general product or expenditure type, and the family was classified by variables such as income, type of income, rank of the family, age, sex, and similar demographic variables. His studies provided an important foundation for further work by economists, sociologists, and other social scientists that followed, as well as contributing a strong influence upon present methodological procedures by the Bureau of Labor Statistics, even today.²⁶

Thus, Ernst Engel, an eighteenth century German statistician, strongly influenced by LePlay's earlier work, conducted budget studies while director of the Saxony Statistical Bureau from 1850 to 1858, leading to systematic relationships being established between income and expenditures.²⁷

Based upon the earlier work by Engel, Wright (1875) interpreted the basic relationships relating to consumption, and published the following four statements that have become known as "Engel's laws":

1. That the greater the income, the smaller the relative percentage of outlay for subsistence.
2. That the percentage of outlay for clothing is approximately the same, whatever the income.
3. That the percentage of outlay for lodging, or rent, and for fuel and light, is invariably the same, whatever the income.
4. That as income increases in amount, the percentage of outlay for sundries becomes greater.²⁸

Although Engel's original "law" only related to food, this relationship, as expanded and interpreted by Wright, has often been further "reinterpreted" for other products purchased by the family, and incorrectly attributed to Engel.²⁹ Such was the case in an early statistical study of consumer buying power conducted by Berridge, Winslow, and Flinn in 1925.³⁰

While many of these basic relationships, as developed by Engel and Wright, may have altered for present consumer segments, since they were developed to describe a more subsistence-oriented economy, they provided a theoretical foundation for later income-consumption theories by economists such as Keynes (1936)³¹ and Duesenberry (1952),³² and thus provided continued academic foundations for the broader concept that consumers were not all alike, and therefore could be expected to exhibit different patterns of consumption.

However, even though economics may have helped spawn, or at least lay, the theoretical foundations for the marketing principle of market segmentation, it seems somewhat paradoxical that many traditional economists continue to regard the applied technique of segmentation as

an imperfection within the market that is more likely to cause undesirable social consequences, rather than resulting in an increase in heterogeneous consumer need satisfaction.³³ However, despite this past and continuing normative bias against perceiving the existence of a heterogeneous consumer market, the 1930s brought a growing body of analytic evidence relating to the effect of demographic differences upon consumption.

In particular, the 1935-36 Consumer Purchase Study,³⁴ with its extensive tabulations, served as a catalytic springboard for analysis of the effect of demographic factors such as age, income, marital status, family size, and family type upon the consumption of the American family.³⁵ Significant differences detected in the income and consumption patterns by age and family type served as the groundwork for later, post-war study of these variables. Several such studies were contributed by the Survey Research Center at the University of Michigan, based upon the 1947, 1948, and 1949 Surveys of Consumer Finances, which served as a data base for later researchers.

For example, Fisher (1952) combined these surveys, made available by the Survey Research Center, along with the 1935-36 Consumer Purchase Study,³⁶ to develop a hypothetical family life cycle, and attempted to tie this empirically to consumption and saving by the family.³⁷

Another early study of consumption behavior was conducted by Scott (1948).³⁸ In this study, eight categories of frozen food products were examined, in relationship to demographic categories of income, race, occupation, age of homemaker, and whether or not the homemaker

was working outside the home. In addition, a set of attitudes were also tested, by income group, about the use and desirability of frozen food products. The method of analysis was simple two-way cross-tabulation, without statistical analysis, but definite differences were noted between demographic groups. For example, the average family which purchased frozen foods in the study, bought 2.4 pounds per week within the low income family set, while the high income consumers purchased an average of 7.9 pounds per week.³⁹ This particular study will be discussed in more detail, later in this chapter, with regard to the literature background relating specifically to the segmentation of frozen food products.

The continuing interest and growing body of evidence about consumer consumption differences stimulated the organization of a conference by Consumer Behavior, Inc. (the legal name adopted by the Committee for Research on Consumer Attitudes and Behavior) relating to economic, marketing, and sociological behavior of consumer family buying units,⁴⁰ which resulted in the book which grew out of this conference, edited by Lincoln Clark (1955).⁴¹

In a paper presented at this conference, Fisher outlined some of the research potentials relating to the effect of the family life cycle, including the study of shifting patterns of consumption.⁴² Based upon the 1953, 1954, and the 1947-50 Surveys of Consumer Finances, from the University of Michigan, Lansing and Morgan presented a study which treated family life cycle as an independent variable with respect to family income, savings, and consumption patterns.⁴³ They noted a bi-modal stream of income, caused by a dip in family earnings when the

wife typically stopped receiving wage or salary income after the birth of the couple's first child. An analysis of the purchases of homes, cars, and television sets indicated a sequential order for family purchase of these items, relating to the stage in the family's life cycle.

In a related study, Arton (1955) used data from the Marketing Research Corporation of America to provide specific examples of consumption differences between families of different age and family demographic composition, with respect to products such as strained baby foods, cereals, various prepared food items, and personal care items.⁴⁴ Similarly, Miller (1955) discussed the effect of the family life cycle upon advertising impact.⁴⁵

A Summary and Conclusion About the Origin of the Concept

The conceptual foundation for the marketing concept of market segmentation is based upon the hypothesis (or observation) that consumers are different, and therefore, that they will exhibit different consumption responses. The strategic principle of market segmentation then suggests that marketers should aim at the different needs of these different consumers with an offering of different products, aimed at targeted consumer groups in the marketplace.

While the classic 1956 article by Wendell Smith⁴⁶ is commonly cited as the origin of this strategic concept, there is ample published evidence that Smith neither originated the term of "market segmentation" or the concept. In fact, a close reading of the Smith article, and a contemporary book by Alderson,⁴⁷ shows that both of these early

marketing writers were reporting and explaining a marketing practice that was becoming more common in the American market. Both of these writers sought to point out and explain the strategic process of market segmentation as based upon ex post facto descriptions of observed practices by marketing firms of their time. Perhaps a fairer assessment of the literary roles of both Smith and Alderson is that they served as catalysts to marketing academicians, and to marketing practitioners, in recognizing, understanding, and applying a process that was fast becoming a characteristic of the burgeoning American marketplace after World War II.

As noted by Brandt (1967) the strategy of segmenting a market had been naturally applied since the application of mass production, earlier in the century.⁴⁸ He notes the natural transition from "open markets" (e.g., geographic segmentation) to "fragmented markets," based upon progression in both the communication and transportation methods available to the marketing practitioner.

Brogowicz (1977) similarly expresses the viewpoint that the basic ideas expressed by the Smith article were implicit in the writings and marketing practices of many early marketers.⁴⁹ He states the opinion that the concept and practice of market segmentation might have become popularized long before the mid-1950s, if it had not been for the lack of discretionary purchasing power during the depression, and the restraints upon consumer purchases caused by the consumer goods shortages that were characteristic of the market, during and after World War II. Thus, the conceptualization and practice of market segmentation was postponed by marketers until

the transition had been completed from the seller's market, caused by the pent-up demand of the depression and World War II, to the buyer's market that began to develop in the 1950s. Thus, the conclusion might be that the Smith article did not cause the increasingly heterogeneous supply and demand schedules that followed its publication, but rather, pointed out to marketers a process that was well under way. Therefore, in 1956, market segmentation was a strategy whose time had come, and was pointed out at a time when it was increasingly characteristic or applicable to many product markets.

Moreover, the basic postulate of market segmentation, that consumers are heterogeneous and thus exhibit heterogeneous demands, had been espoused on both a theoretical and empirical basis, within both business and social science literature, prior to Smith's catalytic article. Thus, the citations of pre-1956 contributors to this basic postulate are not suggested as being all inclusive, nor are they intended to take credit away from the early conceptualizers of the concept and practice of market segmentation, within the academic literature of marketing that was to follow and expand upon these initial foundations. Rather, it is to the credit of the relatively new but fast maturing discipline of marketing, that such a diverse foundation was to be perceived, integrated, and applied so forcefully, and so contradictory to the normative, homogeneous perception of the market, as had been typically postulated by marketing's academic ancestor, the field of economics.

The Application (and Misapplication)
of Market Segmentation

In the twenty-five years since Smith's classic article about the "alternative strategy"⁵⁰ of market segmentation, Wind (1978) observes that market segmentation as a concept has become a dominant part of marketing literature and practice, and notes that "besides being one of the major ways of operationalizing the marketing concept, segmentation provides guidelines for a firm's marketing strategy and resource allocations among markets and products."⁵¹

However, Michman (1971) has concluded that although the concept of market segmentation has spawned a plethora of papers and complex studies, an assessment of these efforts suggests that "policies of market segmentation have not been as successful as imagined."⁵² Brogowicz (1977) similarly concludes that "the fact is that all too often the published results of segmentation studies have been either discouraging, inconclusive, or suggestive of shrewd ex post facto analysis."⁵³ Echoing these conclusions, Arndt (1974) observes that while increasing numbers of increasingly high-powered statistical techniques have been applied to more and more "candidates" for predictor variables, "the search for identifiable, sufficiently strong correlates of purchase behavior has mainly turned out to be a wild goose chase."⁵⁴

Moreover, in his review of the state of segmentation research, Wind (1978) states that a discrepancy is revealed between academic developments and real world practice, with a substantial gap between academic-oriented research and the actual application to current

industry research and marketing practice.⁵⁵ He also notes that many industry studies, designed as baseline studies, are simply ignored when firms undertake other marketing studies such as product or concept testing, since many firms are unable to perceive relevant results to marketing operationalization.

In a similar conclusion, Mack (1968) notes that "when market segmentation knowledge exists at all, it is likely to be a good deal less than recent, a great deal less than accurate, and highly mis-trusted--even if trustworthy."⁵⁶ Thus, he surmises that in such a corporate climate, segmentation may be an idea that everybody talks about, but nobody does anything about, relative to actual, segmented marketing efforts.

In fact, the concept of market segmentation has not been universally accepted in marketing practice or academic marketing theory. In a sometimes quoted but typically ignored article, Reynolds (1965) concludes that much of what has been perceived as segmentation in the market may, in fact, simply be the result of a "variety strategy," with a heterogeneous array of products consumed by a typical American consumer, rather than different products consumed by separate, heterogeneous segments.⁵⁷ Thus, while not disputing the idea that segments may sometimes exist, he observes that even products quite different from each other may still be purchased by the same general group of consumers, and that this diversity of product may lead the marketer to falsely conclude that segmentation is present in the market. A salient conclusion from Reynolds' logic might be that the failure of certain methodologies to define distinct market segments for a specific product

may not mean a failure of the predictor variables tested, or the statistical technique used, but rather that true market segments do not exist for that particular product!

Thus, Wind notes that it is not uncommon to find markets in which no significant differences are found in the response elasticities to marketing variables,⁵⁸ relative to the observed differences in consumer characteristics.⁵⁹ Thus, doubt must be cast upon the premise that any given market is heterogeneous in demand and can be effectively segmented for all product markets.

Yet, numerous academic articles and studies heroically conclude that a particular predictor variable or statistical method was valueless for segmentation purposes, based upon observed consumer responses for a single product, or a product category so broad, and so generally consumed that distinct segments could not be expected (i.e., purchases of food or gasoline) beyond general purchasing quantity differences. Moreover, such "learned conclusions" are often made on the basis of data samples that are dated, relatively small, and nonrepresentative of the consumer market,⁶⁰ in studies that are typically not verified or repeated,⁶¹ compounded by the "lack of a systematic effort (by both academicians and practitioners) to build a cumulative body of substantive findings about consumer behavior"⁶² as it relates to market segmentation operationalization.

As discussed in a recent article by Leone and Schultz (1980), studies that emphasize "new" products and new research techniques are often regarded more favorably in the academic world than those which

"merely" duplicate previous studies.⁶³ Thus, for example, Boyd (1976) in a research editorial for the Journal of Marketing, complained that "too often manuscripts tend to replicate earlier studies, with but a small difference in either the research design or the product class involved,"⁶⁴ thereby presenting a clear message to marketing academicians, who wished a publication in this journal, not to replicate earlier studies! Yet, as noted by Leone and Schultz:

Replication is the key to generalization for without it, in the broadest sense, we have no corroboration of research results. We are left with one-shot studies that represent historical facts. Only by extending findings to other data sets do we perceive the generality of marketing relationships.⁶⁵

Therefore, the good segmentation studies are in need of replication, both for verification of validity for particular products, and also to determine if similar relationships can be established for other products, with additional data sets, and at different points in time, if the marketing literature is to provide an effective, "cumulative body of substantive findings"⁶⁶ about segmentation relationships that may (or may not)⁶⁷ exist in the real-world market. Moreover, the poor studies, unless re-examined, may continue to function as misleading guideposts, to academic researchers and marketing practitioners alike, thus blocking the route to more effective utilization of the market segmentation concept, or by continuing to point in less productive directions.

Thus, Wind notes that to date (1978) he is aware of only a few unpublished industry segmentation studies in which the same market was studied for segmentation relationships during a period of a few years.⁶⁸ Researchers often assume not only that a limited sample was

representative and valid, but also that the relationships that were defined and measured would remain stable over time, despite limited evidence to support this assumption. Although Wind mentions, for example, that some stability in benefit segments over a two year period has been found,⁶⁹ and that some behavioral segment stability had been documented over a three to four year period,⁷⁰ a recent study by Calantone (1976) noted that in a study of benefit segmentation for banking services, that while the relative desirability of persons wishing certain benefits remained somewhat constant, the individuals seeking those benefits had changed.⁷¹ Thus, a marketer assuming that benefits which attracted customers would also maintain them, may be in for a rude surprise by ignoring the possible dynamics of segmentation relationships.

In a follow-up study, Calantone and Sawyer (1978) observed that even when the existence of benefit segments remained constant, the importance of these benefits may change for selected targets, and that demographic characteristics of the benefit segments were likely to change, even over a few years.⁷² Therefore, media strategies, as well perhaps as message content, may require alterations to continue to effectively reach targeted segments. A logical, allegorical inference might be that the use of segmentation study "roadmaps" that are seriously limited in detail, as well as obsolete for the current market, may well be a more significant factor in the operationalized inefficiency of the segmentation concept than the effectiveness of the concept per se, assuming that a defined "map" even exists for a given product.

In a related vein, a recent study by Weisenberger (1977) observed the ongoing temptation for a multi-product, multi-brand marketer to seek cost savings in consumer segmentation research by seeking segmentation relationships for a family of products, via one major study, rather than conducting separate studies for separate products.⁷³ However, Weisenberger's conclusion was that this type of general, "all-purpose" segmentation is subject to much error and interpretive difficulty, and he suggests that the more micro-approach of product specific segmentation studies "offer a more finely tuned picture of the consumer in the particular situation."⁷⁴ While marketers might continue to seek insights to general segments that may exist, in an allegorical sense, failure to find the "Northwest Passage" to universal consumer segmentation should not be seen as a failure of the segmentation research "expedition." Investigation of the existing but uncharted aspects of particular products may prove to be a more practical and useful route toward achieving eventual segmentation generalizations, and may be the only route to the practical utilization of segmentation theory in actual marketing management of those product categories for which segmentation relationships have not been effectively "mapped."

This conclusion is echoed by Dhalla and Mahatoo (1976), who state:

The poor performance of many segmentation criteria tested so far can be attributed to the fact that too often, researchers are anxious to find a magic formula that will profitably segment the market in all cases and under all circumstances. As with the medieval alchemist looking for the philosopher's stone, this search is bound to end in vain. There is no single algorithm that can be applied across all market studies.⁷⁵

Similarly, Wind and Green (1972) suggest that it may be necessary to think of each segmentation study as an ad hoc study, having validity for the particular problem, product, and situation.⁷⁶ Likewise, Plummer (1974) states that "so often, however, segments developed from a study on one product category have little or no relevance to another category."⁷⁷

Thus, the failure to define "universal" relationships in market segmentation should not be regarded as a failure of the concept of market segmentation; nor should a failure of a particular set of segmenting variables be regarded as a universal failure in segmentation research, based upon limited value for a few product-market situations. As noted by Leone and Schultz (1980):

Only by extending findings to other data sets do we perceive the generality of marketing relationships. . . . Basic answers to how marketing variables are related lead logically to new questions of why they are related. Like our fellow scientists, we must first describe marketing behavior in order to bring us closer to explaining it.⁷⁸

Thus, they argue that "replication is the key to generalization, for without it, in the broadest sense, we have no corroboration of research results,"⁷⁹ thus we are limiting research to "one-shot" studies, rather than working toward a generalized body of marketing knowledge.

The Dilemma of Normative Theory Versus Descriptive Explanation

However, perhaps the most significant factor relative to the observed "efficiencies" of various segmentation techniques may be that unrealistic, normative criteria, for what an effective market segment "should" be, have gone beyond practical description of the actual

behavior of a normal (i.e., average or typical) market segment in the current United States consumer market. Thus, the concept of market segmentation may have fallen into a semantic and/or philosophical-theoretical trap, similar to that of micro-economic theory. For example, the concept of the "perfect" market, as developed by Marshall (1890), suggests a market of homogeneous supply and demand, for purposes of explaining market behavior with all other factors held constant.⁸⁰ Yet this simplified "ideal" market is interpreted by some economists and social critics as a normative standard of what the market should become; thus, many economists object to the process of market segmentation as causing the market to become more "imperfect," leading to undesirable social consequences.⁸¹ Thus, this normative standard has become an ideal, or sought-after goal for some, despite the fact that the "perfect" market concept is far from descriptive of the actual market. In particular, the Marshallian model assumes away customer differences, and ignores the fundamental question of how product and brand preferences are formed in an imperfect, real-world market.⁸²

In a similar, perhaps over-reactive fervor for the "ideal" usage of the segmentation concept, marketers may have assumed away much of the consumer similarity that exists for a typical consumer market. For example, Mayer (1963) notes the impressive uniformity of American spending patterns, and concludes: "By and large everybody . . . wants to buy the same things that everyone else buys. Americans exhibit a remarkable homogeneity of tastes, attitudes, and buying habits, regardless of occupation."⁸³ Moreover, it might be concluded

that mass media of the modern market, including television portrayal of the "typical" family home, etc., has done much to homogenize the tastes of the various geographic and ethnic segments of the United States, rather than create differences in consumer tastes, particularly in comparison to cultures that do not have access to such mass media of selling and communications.

Thus, Reynolds (1965) concludes that there are obvious, true examples of market segmentation, but that most markets are characterized by consumer preferences for variety, rather than exhibiting neat preferences for particular brands and products.⁸⁴

The purpose of this discussion, however, is not to dispute the value of the concept of market segmentation per se, but rather to suggest that the idealized, normative standards of what "perfect" segmentation should be is not a realistic, descriptive standard, relative to practical observation and judgment of segmentation efficiency or utility in a typical consumer market.

As concluded by Wind (1978), the normative segmentation models have rarely, if ever, been implemented, beyond limited academic studies, due to the difficulties in operationalizing such standards in the market.⁸⁵ Tolleffson and Parker (1978) have determined that the normative prescriptions for segmentation have been advanced and used in research as though ideal measurement and conceptual standards, and have been included without qualification, in statements about segmentation, relative to pricing, promotion, and other marketing activities.⁸⁶ But when tested, they note that such assertions of "ideal" differences between segments are generally not ideal, and they question if such

normative assertions can be demonstrated ideal in any setting. For example, they observe that similarity of response elasticities and response coefficients have been advanced in the literature for a number of years as ideal performance indicators of segmentation activity, but failed to demonstrate this in their study.

In a similar vein, numerous presumptions, or postulated standards have been advanced as requirements for proper use of the segmentation concept, but these "ideals" may not be reflected in reality, and thus may not be fair standards for the practical application or measured efficiency of segmentation for a typical product market, with expected, realistic degrees of consumer segmentation heterogeneity, variability, and homogeneity.

For example, in a current, marketing management text, Bell (1979) states that to meet requirements for meaningful segmentation, a segmented group must meet the following requirements:

1. A segment must be specifically identified and measured.
2. A segment must be reasonably stable over time.
3. A segment must react uniquely to marketing efforts.
4. A segment must evidence adequate potential.
5. A segment must be economically accessible.⁸⁷

In this same text, Bell declares that "all markets are composed of segments,"⁸⁸ and that these segments are usually composed of further sub-segments--a presumption that has not been universally accepted (i.e., Reynolds)⁸⁹ or effectively proven. In particular, mere observance of consumer categorical differences, such as age, or

consumer brand preference for a single purchase decision, may not constitute a true segment.

Moreover, Bell, as well as other academicians, seems to have adopted segmentation standards for "meaningful segmentation" in a logic similar to the micro-economic standards to define a "perfect market." If just one of the normative presumptions of the perfect market is absent, that market is defined as being "imperfect" in micro-economic theory. Similarly, Bell declares that to be a "meaningful" segment, that segment must satisfy each of the five requirements cited above,⁹⁰ with the parallel, implicit logic that a segment that does not, is not meaningful. Unfortunately, double entendres of semantic meaning of terms such as "imperfect" or "not meaningful" may give the broader semantic interpretation of being defective, undesirable, or not useful to meet the needs of the firm and the consumer. Thus, perhaps a more practical, liberal, and descriptive classification is needed to evaluate the desirability of particular segmentation techniques, such as "useful" versus "not useful," relative to the applied, rather than theoretical, segmentation goals of the marketing practitioner. As noted by Wind, there is a critical need for reexamination of the nature and value of normative segmentation, relative to understanding management's "use of and difficulties in operationalizing segmentation."⁹¹

Moreover, in a review of segmentation literature, no published segmentation study was found or mentioned that actually considered and tested for performance in each of the segmentation criteria, as set by Bell,⁹² let alone for the range of surrogate measures for these criteria that have been proposed and singularly tested in academic segmentation

studies. In fact, some of the criteria are rarely tested at all; for example, it has previously been discussed in this chapter that few segmentation researchers have attempted to validate the stability of a segment over time,⁹³ despite this being a stated requirement for meaningful segmentation!⁹⁴ In a sense, strict standards and requirements are like strict laws; if they are not perceived, applied, or enforced, they cease to have real significance, and thus, new, practical standards may be needed, to provide actionable parameters for the application of market segmentation.

The Suboptimization of Segmentation Efficiencies

Another significant weakness in the operationalization of the marketing segmentation concept, both by marketing practitioners and academic writers, has been the tendency to suboptimize the segmentation effort, both with regard to overall, systemic efficiency of the firm, and with regard to the total process of marketing to a targeted segment or segments in the market.

Mahajan and Jain (1978) have concluded that most current approaches to normative segmentation have involved two separate steps, the development of segments, and then the allocation of resources to reach these defined segments.⁹⁵ They suggest that the result may be nonfeasible segmentation schemes, suboptimal definition of the market, and probable inefficient utilization of the firm's marketing resources. It is suggested that segmentation programs should be aware of managerial, institutional, and environmental constraints, as well as resource constraints of the firm and the segmented consumer.

Similarly, Winter (1979) points out that segmentation per se should not be the only goal of the segmentation process, but rather, the firm should be aware of meeting company goals, such as profit, rather than merely maximizing sales to a particular segment.⁹⁶ He suggests that even if it is assumed that revenues would be very high from a company policy of providing a separate marketing mix for each segment, the costs of doing so may be prohibitive. Thus, the disaggregative process may need to be modified substantially, to become more aggregative, relative to cost-benefit criteria in meeting the firm's profit goals.

A similar warning was stated earlier by Mack (1968), when he concluded that an extensive market segmentation policy by a marketing firm was likely to substantially increase the cost of market research efforts, as well as the investment base and direct marketing cost increases likely to follow a strategy of multi-segment marketing, which should be weighed against the value of such a strategy to the firm.⁹⁷

Likewise, Mossman, Crissy, and Fischer (1973) argue that "profit contribution is the relevant measure of a segment's performance."⁹⁸ They observe that the American Accounting Association committee on marketing costs has suggested a format for analyzing segmental profit contribution,⁹⁹ that emphasizes cost attachment to each segment, along with cost control and behavior.

In this article and a later book (1978),¹⁰⁰ Mossman, Crissy and Fisher recommend that a "return on assets committed" should be

used to measure and evaluate the contribution of a market segment relative to the market value of the company assets that can be attributed to marketing expenditures and investments that directly relate to that specific market segment. They suggest that detailed, disaggregated analysis of each segment's actual performance is imperative to measure the success or efficiency of segmented marketing efforts. Yet, they conclude that past attempts to measure the success of segmenting strategies has taken the form of special statistical studies, imposed over aggregated accounting data, which can be expected to provide broad indicators at best, let alone to provide the continuing, integrated information system that is needed for marketing decisions. Even if a consumer segment can be sufficiently defined, relative to a predictable difference in demand, unless the marketing practitioner can achieve a reasonably accurate measurement of the profitability of this segmentation effort, both for the specific segment purchases, and for the profits of the total firm, the true value of segmentation may prove to be illusory. Thus, segmentation might be perceived as a suboptimizing factor within the "marketing concept" philosophy of marketing management, to the degree that sales may be increased, but the net effect on profits is generally unknown for most firms, and therefore, increased segmentation may well decrease profits in many instances.

Thus, the principle of market orchestration, as explained by Kotler,¹⁰¹ warns that a firm which employs a multi-segmented strategy must take care that the segments it chooses to market toward are reasonably compatible. The danger must be observed that marketing

toward an additional segment, beyond the incremental costs of the effort per se, may cause a net drop in company sales and profits. As an extreme example, even though a definite market for X-rated cartoons is discernable, such a product line extension by Walt Disney studios might be predicted to have catastrophic results on the marketing success of the G-rated movies and cartoons that are the core of Walt Disney marketing success. Even though a profitable market segment might be served with X-rated Bambi features, the net profitability for the total firm might be predicted to decline.

The effect of violating this principle of market orchestration was dramatically demonstrated in an industry experience of this author's. A Chicago-area grocery chain, following good marketing strategy and practice, had observed an attractive concentration of older, high-income consumers who were not presently buying on a frequent basis at any of the company's other area stores. After conducting an extensive customer survey among this group, the company attempted to "localize" a new store to specifically appeal to this segment of consumers, with store layout, product line, and services oriented to the stated desires and complaints of this target group. A special consultant was hired to help develop special circulars for distribution only in the high-rise apartments where these potential customers lived, emphasizing the gourmet foods, special services, and other advantages of shopping at this new store. Engraved invitations to a special open house and tea were sent only to these people, to introduce the store and the employees before the new store opened to the rest of the public.

However, in examining the demographic makeup of the area, large concentrations of orientals were noted, so an extensive line of oriental foods were added. Southern ethnic foods were added to appeal to consumers from the south and Appalachia. Then, to make sure the store had enough business, another circular was blanketed for miles around the new store, emphasizing giveaways of cheap bread, jelly, and similar items for several days after the opening. Special prices were offered, lower than other stores operated by the chain, on items such as round steak, private label ice cream, and bananas. The result was total chaos, with more than 25,000 customers the first week, and consistent totals of 20,000 or more customers attracted in following weeks by a continuing series of opening specials. But despite the large numbers of people, the store was not able to achieve sales totals high enough to make a profit, since the store was so crowded by bargain-hunters, people were not able to shop. An innovation of roof-top parking, with escalator service to the store was totally overloaded by the volume of customers, and literally became a barrier to entry, in the minds of many older customers. In particular, the attempt to reach many other people, as well as the high-income segment that was the core segment targeted by the company, resulted in the attractive customers being literally crowded out, frightened away, or offended by the poor service and hordes of bargain-hunting customers, many of whom were merely cannibalized from other nearby stores that the company operated in the area. Moreover, as the store floundered, special promotions were continued, to try to boost sales, which

continued to attract volumes of customers, but did not result in profitable sales volume. Thus, the principle of segmentation did not fail, as this store did, but rather, the company tried to appeal to too many segments at once, thus destroying the appeal to the segment that may well have made this store very profitable, and therefore resulting in a suboptimized result, as measured by the resultant store profit deficits, and the store's ultimate closing.

A similar warning against too much segmentation was made by Mack (1968) when he cautioned that additional segmentation efforts may carry some risks of cannibalism, whereby the sales of a product ostensibly aimed at only one segment, may also encroach upon the sales of another intra-company product offering, with possibly disastrous results upon total company sales and profits.¹⁰² A classic example of this would be the introduction of Alka-Seltzer Plus by the marketers of the already successful Alka-Seltzer. The new "Plus" product was perceived by many loyal Alka-Seltzer users as being a new form of the existing product, with added or improved features. As a result, most of the sales of the new product came at the expense of the older, regular Alka-Seltzer, resulting in limited additional sales to the company, and the danger of legal liabilities from consumers using the new "Plus" for inappropriate reasons, as well as probable confusion in the mind of consumers about the benefits or values of using "Alka-Seltzer." Trout and Ries (1972) refer to this type of additional product offering as the "line extension trap,"¹⁰³ but perhaps a more appropriate term would be the "additional segmentation trap," caused, in the ultimate sense,

by inappropriate definition of market segment parameters, due to a lack of mutual exclusivity between "defined" market segments.

Another type of suboptimization within the concept of market segmentation might be perceived in much of the academic research and literature. By the nature of the resources available, most academic studies have tended to focus on single aspects of segmentation, while often failing to explicitly study or analyze the integrated needs of the total segmentation concept. Ideal efficiencies have often been sought and sometimes proclaimed with regard to single components of segmentation, even though increased "efficiency" within one aspect, such as measurement or identification of segmented groups of consumers in a research study, while at the same time reducing the practical ability to identify or reach segments in the actual marketplace. Thus, an increased ability to predict segmented behavior may be something of a moot point, or even a negative practical contribution to the application of the segmentation concept, if the "defined" segment cannot be identified or accessed with a reasonable degree of success. Similarly, Mahajan and Jain have noted that a segmentation model should develop schemes of segmentation simultaneously with constraints of managerial, institutional, environmental, and resource constraints of the market.¹⁰⁴ Wind similarly reinforces this idea by stating that academic work on segmentation should be examined relative to management's information needs, to incorporate the separate developments in segmentation theory, to narrow the gap that exists between academic segmentation research and the practical application by marketing managers in the real world.¹⁰⁵

Thus, by focusing too sharply on individual aspects of segmentation theory, the result may be impractical definition of the market, infeasible segmentation, and suboptimization of the operationalization of the segmentation concept. Similarly, segmentation techniques that have particular weaknesses in individual situations or aspects of segmentation are often rejected as "inefficient" segmentation methods, without consideration of the total value to segmentation theory and practice; this tendency seems especially apparent in many academic researchers' evaluation of the usefulness of demographic consumer variables in segmentation applications.

The specific value of alternative methods of delimiting market segments, as reported and analyzed in previous market segmentation literature, will be examined in more detail in the next section of this chapter. In particular, attention will be focussed upon the use of demographic variables as segmentation criteria, since demographics have been the most frequent¹⁰⁶ albeit controversial, form of market segmentation, and also because demographics will serve as the heart of the empirical research of this dissertation.

Alternative Methods of Market Segmentation

As a general rule, market segments have been defined and researched on the basis of two basic types of descriptor variables:

1. General consumer variables, which seek to classify the market consumer by descriptive characteristics such as demographics, personality, life style, and social class.
2. Product-consumption variables, which seek to classify consumers on a basis related to consumption and/or purchasing in the

market. Such variables include the measurement of usage frequency, product benefits, brand loyalty, marketing mix factor sensitivity, or physical characteristics of the market.

Plummer (1974) refers to these two general classifications as the "people-oriented approach" versus the "product-oriented approach,"¹⁰⁷ which will be the terminology used henceforth, in this discussion, to refer to these two basic segmentation alternatives.

However, as might be expected, a continuing, but basically inconclusive, debate has ensued within the academic literature, as to which method of segmentation should be regarded as the "best" or "worst" general or specific method of segmentation.

As concluded by Brogowicz (1977), "there is no simple answer to this question,"¹⁰⁸ since no one method is likely to be the most effective in all situations. Thus, as noted early in the development of market segmentation by Yankelovich (1964), "the marketing director should never assume in advance that any one method of segmentation is the best."¹⁰⁹ He suggests that the marketer's first step should be to consider all probable segmentation methods, then choose the most meaningful alternatives to work with. Yankelovich observes that this approach is similar to the logic for research in the physical sciences, where the researcher chooses the hypothesis that seems to best explain the particular phenomena under investigation.¹¹⁰

Wind (1978) similarly presents the conclusion that:

In contrast to the theory of segmentation that implies that there is a single best way of segmenting a market, the range and variety of marketing decisions suggest that any attempt to use a single basis for segmentation (such as psychographic,

brand preference, or product usage) for all marketing decisions may result in incorrect marketing decisions as well as a waste of resources.¹¹¹

Moreover, Wind concludes that "surprisingly, despite thousands of academic and commercial studies by marketing and consumer researchers, one can draw very few generalizations as to which variables would have what effect under what conditions."¹¹²

Young, Ott, and Feigin (1978) deduce that segmentation studies have often been disappointing, because study results are simply not actionable from a marketing standpoint, due to researchers' common preoccupation with the techniques and methods of their favorite methodological approach per se, rather than developing a study method that is relevant to the competitive environment of a specific market.¹¹³ Thus, even if "results" are obtained, they are often not useful for practical, applied market segmentation programs. They conclude that:

no single approach can be used to segment all markets as the specific competitive structure and environment determine the appropriate approach. Thus, the marketing researcher must analyze the market carefully to insure that only approaches relevant from a marketing standpoint are used. In many cases, markets should not be segmented at all as appeal to all segments is required for marketing success. . . .¹¹⁴

Arndt (1974) concludes that in determining the usefulness of a particular method of segmenting markets, the researcher must take care to examine the identifiability and the accessibility of the segmentation variables, as well as their predictive efficacy.¹¹⁵ While predictive ability is considered an analytical consideration, the identifiability and accessibility of the segmentation variables employed may significantly affect the operational value of such a

method. In an admittedly subjective and informal evaluation of the usefulness of some of the common types of segmentation variables, he ranks these methods as follows, in Figure 1.¹¹⁶

Predictor Group	Predictive Efficacy	Identifiability	Accessibility
Demographic and socio-economic variables	Low	High	High
Social variables	Low to Medium	Medium	Low to Medium
Personality	Low to Medium	Medium	Low
Activities, interest, and opinion variables	Low to Medium	Medium	Low to Medium
Consumer learning indicators	Medium	Medium	Medium
Product perception variables	High	Medium	Low

Figure 1. Evaluation of Usefulness of Predictor Groups in Segmentation Analysis.

Thus, product-oriented variables, such as product perceptions, may rank high in predictive efficacy, but rank very poor in accessibility, thus making this method a difficult or almost impossible segmentation strategy to operationalize beyond limited, academic research studies. However, demographic variables may rank low in observed predictive efficacy, but be the most efficient method of identifying and accessing the market segments that are targeted by

demographic predictors, due to operational advantages to the marketing practitioner. Thus, the total value of a method should be considered, rather than a suboptimized focus on only one aspect, such as only predictive ability, without proper consideration of the operational aspects upon the overall ability or value of a specific segmentation method. Therefore, a product-oriented method may provide better predictive segmenting abilities, but the operational aspects, such as accessibility, may be so low as to provide an absolute veto for its practical application, and thus may be a moot alternative for most segmentation purposes by a marketing practitioner.

For example, the heavy-half theory, or volume segmentation, as popularized by Twedt (1964), suggests that one-half or less of the total market commonly accounts for 80 percent or more of the consumption in most product categories.¹¹⁷ The principal problem with this "technique" of segmentation, as pointed out by Haley (1968), is that not all heavy users are typically attracted to the same brand,¹¹⁸ thus resulting in a very heterogeneous volume "segment." Moreover, the heavy users of one product are not necessarily the users of another. Thus, as Twedt himself notes, "the heavy user is not readily identifiable in terms of characteristics other than being a heavy user,"¹¹⁹ thus defining the volume segment by the tautological basis of being a heavy, volume user of a specific product. Thus, volume segmentation may not be an operational method of segmentation.

Moreover, other segmentation methods, such as benefit segmentation, or other aspects of product-oriented segmentation, often employ consumer characteristics, such as demographics, as "descriptive"

variables to identify and access the purchasers of specific product segments. Thus, Haley (1968) suggests that demographics be used as "secondary" variables to identify those who have been found to purchase specific product benefits.¹²⁰ Another interpretation of Haley's logic might be to perceive his "benefit segments" merely as more accurate definitions of the relevant product market, thus allowing demographics or other consumer-oriented criteria to define and predict the users of certain categories of products in a more effective way than for a broad product class such as toothpaste. Thus, no method should be expected to "segment" the market for food or health and beauty aids into reasonably homogeneous segments; failure to do so should not be used to indicate the "failure" or inefficiency of the tested, predictive segmenting criteria, but rather, indicates that segmentation is not very operational for such a broad grouping of products and consumers. However, "sex-appeal" or "cavity prevention for kids" may present a more logical basis for partitioning the market into realistic, defined sub-sets of brand alternatives, such that demographic consumer segments might then be defined, predicted, and accessed in the market.

Thus, the predictive problems of consumer characteristics, such as demographics, may not be due to their inherent lack of predictive, segmenting ability per se, but rather the failure of many marketers to properly define or measure a relevant market. Relative failure to predict the purchasers of a cavity-fighting toothpaste such as Crest, may not have meant that demographics were poor segmentation predictors, but rather that the marketing researcher may have myopically defined the market for toothpaste as being merely "toothpaste,"

thus exhibiting "marketing myopia"¹²¹ in defining the relevant indicants of purchasing behavior.

Similar questions about the validity of demographic-based segmentation, or any segmentation method for that matter, might also be raised via the issues of data validity, data age, and the lack of verification over time,¹²² relevance to particular products that have had limited or no significant testing of such relationships, statistical methodology or research design,¹²³ as well as questions about the interpretation of prior demographic segmentation studies, both in terms of predictive efficacy and also the relevance to total, practical application of a segmentation strategy in the actual market.¹²⁴

These issues will be examined, as they relate to specific, exemplative, demographic segmentation studies that have been reported in the marketing literature relevant to the value of demographic consumer variables as segmentation criteria.

A Review and Analysis of Some Exemplative Demographic Segmentation Studies in the Marketing Literature

One of the most influential and commonly cited studies of the value of demographic variables in segmentation has been the 1967 study by Frank, Massy, and Boyd.¹²⁵ In an often quoted conclusion, this study reports that "socioeconomic and demographic characteristics are poor predictors for a wide range of specific grocery products."¹²⁶

However, the study continues, that "49 regressions were statistically significant [but] . . . not as useful . . . for these products as had been hoped." The demographic variables were reported

as explaining half or more of the consumption variation in 46 of the 57 product categories studied.¹²⁷

Next, it can be observed that the product categories tested in this study included such universally consumed products as toilet paper, catsup, laundry detergent, and toilet soap--all products that would be much more noticeable by their absence than by their presence in the typical shopping basket. It is similarly not surprising that family size and the age of the youngest child were the two variables most highly correlated with such products. Thus, an interpretation of these results might be that the results were merely providing a consumption function for products typically consumed by most households, rather than determining true segmentation for such products. The demographic variables used should not be regarded as defective for failing to define segments that were not likely to be there. Moreover, the relatively close substitutibility among many of the categories, such as canned corn, pork and beans, hot cereal, and cold cereals, may well show a product-to-product consumption relationship due to a general substitution and/or variety effect, rather than establishing homogeneous segments that could be identified and accessed in the marketplace.

Another major concern relative to this study is the age of the data (1960-61) and the comparatively small size of the sample (491 families) for the imposition of a multi-variate regression involving a total of 14 demographic variables, including some, such as occupation, religion, and race, that are nominal scale variables, which are not easily measured by regression analysis.

Another major concern, relative to the validity of the conclusion of this study has been expressed, and researched by Bass, Tigert, and Lonsdale (1968)¹²⁸ and by Wheatley, Chiu, and Stevens (1980).¹²⁹

Both of these studies assert that regression analysis may not give adequate measurement of the true segmentation relationships that may exist within some of the product categories. In particular, both studies suggest that group behavior, rather than individual household behavior, may be a more relevant and predictive basis for assessing the strength of demographic predictive relationships. Thus, Bass, Tigert, and Lonsdale state: "For market segmentation, the essential question is whether it is possible to identify groups of consumers with different mean purchase rates dependent on certain variables such as income, age, and occupation."¹³⁰ Thus, even though the within-group variance, as observed in multiple regression, may be large, both studies argue that the relevant choice-differences are between groups, not individuals, and effective segmentation can be performed based upon group means.

Based upon a data base of 6,264 responses, Bass, Tigert, and Lonsdale demonstrate that a regression analysis of ten grocery and health and beauty aid products resulted in a uniformly low R^2 predictive value, consistent with similar studies, such as Frank, Massy, and Boyd,¹³¹ but their conclusion is that this merely indicates that the variances within regression cells is great, not that the relationships are weak or valueless per se.¹³² Thus, an analysis of cross-classification tables was reported to effectively discriminate between patterns of group behavior. For example, the probability that a college

graduate will buy five or more cans of frozen orange juice is noted as twice the likelihood that the household head will be a high school graduate.¹³³

This study also indicates that the consumption of beer is a non-linear variable, a factor which is likely to lower or even destroy the ability of linear regression analysis to predict consumption based upon demographics. When the analysis of beer is extended to two or more independent, demographic variables, the difference in conditional means and probabilities, and thus the ability to segment, is further increased.¹³⁴ Thus, Bass, Tigert, and Lonsdale argue that the very strength of demographic group means of consumption may reduce the reported strength of segmentation in a method such as linear regression analysis.

Similarly, Wheatley, Chiu, and Stevens report the study of demographic segmentation criteria for the consumption of coffee and soft drinks, based upon a sample of 252 respondents. When tested via standard, linear multiple regression, as used by Bass, Tigert, and Lonsdale, they reported an R^2 of 14 percent for coffee, and about 20 percent for soft drinks, in this 1980 study.¹³⁵ However, when measured on a non-linear, group basis, they reported a total R^2 explanation of .846 for coffee, and an even more impressive .984 R^2 for soft-drink consumption, with the primary factor being the age of the consumer.¹³⁶

Thus, they suggest that target markets for some products may effectively be segmented by means of readily available demographic information about the consumer. Therefore, they conclude that the

usefulness of demographic variables as a basis for segmentation should be reconsidered, due to the demonstrated efficacy shown via their study, and that of Bass, Tigert, and Lonsdale.

Additionally, Wheatley, Chiu, and Stevens observe that the formation of segmentation strategies and the development of target-audience profiles within the media has been a long standing practice among marketing practitioners. Thus while not seeking to totally discredit earlier studies, which suggested that demographics were poor segmentation criteria, they suggest that this issue seems far from conclusive. They conclude that "the abandonment of the more accessible, less ambiguous, and less expensively obtained demographic and socioeconomic data seems premature,"¹³⁷ and suggest that other researchers seek to replicate the group approach with other products and with larger samples.

Another pioneering and often cited study about the value of demographic segmentation variables was the 1959 study by Evans, regarding possible differences between the purchasers of Ford versus Chevrolet automobiles.¹³⁸ It is reported by Michman that this study emphatically contended that demographics were not of practical use in market segmentation strategies,¹³⁹ but Arndt points out that this study also showed that the objective, demographic variables were better predictors than the personality-variables that were studied as a comparative technique for segmentation.¹⁴⁰ Thus, there seems to be a semantic confusion, between reporting that demographic variables were poor predictors, because they did not provide enough prediction in a given study and research design, versus perceiving that demographics were

better than other tested alternatives. This logic seems somewhat akin to complaining that a cup is half-empty versus regarding the benefits of a cup that is half-full; the value of a particular study may be perceived for what it lacks from the ideal of total, desired explanation, or it may be recognized for the contribution relative to practical, alternative methods, and prior knowledge.

Moreover, an actual finding of significant demographic distinctions between Ford and Chevrolet owners, if it had been documented, could have been regarded as a failure of Ford and Chevrolet marketing strategies, since the general basis of both companies' strategies has been to aim at the same segments of the auto market, in price, features, and other basic appeals. Perhaps a more distinctive, demographic segmentation could have been defined for Ford versus Cadillac, for example. In addition, the variety in the product lines for Ford and Chevrolet are the broadest in the auto market, as they both seek to apply a differentiated strategy of offering different products to separate segments of the market. Thus, expecting the demographic profile of a Chevrolet pickup to effectively predict the sales of a Corvette, beyond very limited accuracy, would seem to be very unlikely. These particular models are aimed at identifiable segments of consumers versus comparable brand and model alternatives, in reasonably distinct niches. Within the very broad and expectedly heterogeneous consumer market, supplied by an observed, differentiated and heterogeneous product line for both Ford and Chevrolet, it seems necessary to identify reasonably homogeneous product market categories, as suggested by

Haley's¹⁴¹ concept of benefit segmentation, before seeking to accurately identify a reasonably homogeneous consumer segment.

Thus, the limited ability to predict the purchase of a Ford versus a Chevrolet automobile might be interpreted not as a failure of demographics, but rather because the measure of segmentation purchasing behavior was too heterogeneous and indistinct to correlate with the demand patterns for possible demographic segments. Moreover, the relevant measurement of demand within a segment may not be a brand per se, but rather a set of brand and model alternatives that satisfy the needs of that segment, distinct from the alternative-set of another distinct segment.

Thus, a common complaint against demographic segmentation in particular, and against segmentation efficiency in general, is that the segmented groups are too broad or indistinct to accurately distinguish between the users of various brands.¹⁴² However, as Dhalla and Mahatoo (1976) observe, instead of being confined to a single brand, segmentation behavior may extend to a group of brands in the segment's "evoked set."¹⁴³ This would seem to be especially true if several brands were actively marketing to the same consumer segment.

Therefore, rather than demographics "failing" to measure the purchase of a particular brand, another interpretation might be that purchase of a particular brand is likely to be a limited measurement of a segment's purchasing behavior in a real-world, competitive market. Thus, an indistinct measurement of segment response cannot be expected to correlate to a higher degree with a demographic definition of segment membership; if the measurement of the response is ambiguous or

inaccurate, the predictive power of the segmenting method, such as demographics, will be "measured" inaccurately, as well.

A recent example of the problem of measurement, caused by ambiguity within the factors of demand response, is the study presented by Assael and Cannon (1979), in which demographics are studied for their ability to properly distinguish product usage and interest, and to match consumers to these "user" segments, via appropriate media selections.¹⁴⁴

The conclusion of this study is that demographics decreased the efficiency of the media-product match, when compared to the direct match of the media with consumers who are known to be members of the target group. However, as conceded by Assael and Cannon, direct matching may not be possible if data, on media readership and direct matching of product usage, are not available from the same source, which they typically are not.

Nevertheless, the most important question about the derived conclusions of this study relate to the usage and interest factors that were utilized to determine such efficiencies. Five criteria were used to indicate the dependent response of consumer market segments, including:

1. Purchased furniture in the past two years;
2. Purchased a color TV in the past two years;
3. Interested in attending plays and musicals;
4. Interested in attending movies; and
5. Interested in gardening.¹⁴⁵

Thus, the categories of user purchases and interests might be perceived as unlikely "measurement" criteria, since they are so broad and expectedly heterogeneous in scope, that they tend to become almost meaningless as effective delimiters of segmentation behavior. For example, color TV purchase and ownership has become almost a universal response in American household purchasing behavior, and virtually every household is likely to buy some furniture, either new or used, on a semi-regular basis. Thus, the very breadth of expected purchasing interest and behavior in these "defined" groups is more likely to be distinguished by observed similarity between demographic groups, rather than by distinguishable, significant differences.

Seventeen demographic variables were utilized, to pick the most effective media choices to reach these target segments, utilizing media alternatives such as Forbes, Golf Digest, Fortune, Scientific American, Sports Illustrated, and Gourmet, a very puzzling set of potential media to reach the listed usage and interest targets.

Moreover, it is highly unlikely that an advertiser, wishing to reach the defined usage and interest targets, would even have considered most of the media alternatives that were tested, even to reach "elite" parts of the target groups. For example, upper income furniture buyers or gardeners might be much more effectively reached in magazines like Better Homes and Gardens than Business Week or Smithsonian, let alone Sports Illustrated. It has long been noted that younger consumers form the heart of the movie-goer market, at least in-theater, yet there are no media tested that could be expected to effectively contact or interest young movie-goers.

As concluded by Arndt (1974), many segmentation studies seem to give the impression of "being no more than attempts to use data conveniently available, for instance in the form of consumer panels, and see what comes out of the computer."¹⁴⁶ Data for this study were obtained via Starch Inra Hooper, Inc., which provided data about the interests of a defined "elite" consumer group, relative to subscription and readership of a similar "elite" set of print media,¹⁴⁷ and surveyed only families with an income of \$15,000 or more (in 1974), in which the household head was employed in a professional or managerial capacity. Thus, the survey data cannot be expected to reflect the consuming habits of the normal population, or for the expected consumer demographics of these "product and interest categories." In all probability the data was used, because it was the only available source of such direct-matching data, otherwise not available to the researcher or market practitioner.

Thus, it might justifiably be perceived that Assael and Cannon were "successful" in reaching a non-representative group of consumers, with direct-matching techniques based upon data that is rarely available to marketing practitioners, via media choices that typically would not even be considered relevant alternatives to reach the "defined" user and interest segments.

Nevertheless, based upon the questionable consumer sample, media alternatives tested, and the ill-defined behavior segments, Assael and Cannon boldly conclude that it is "clear" that "the use of mediating (demographic) variables substantially reduces the efficiency of media selection."¹⁴⁸

However, the detailed analysis and critique of this study, and the others that have been noted in this discussion of exemplative segmentation studies, has not had the primary purpose of lauding or criticizing the results of these particular studies per se. Rather, beyond the literal results or validity of these specific studies, or any other segmentation study, care must be exercised in the consideration and interpretation of their purported, "proven" conclusions. Significant questions often exist about validity of prior study sampling, measurement criteria, statistical techniques, and interpretive logic, in addition to continuing issues of the age of prior studies, and the general relevance of findings for one type of product to another type of product or segmentation classification. Thus, "caveat emptor" seems a valid strategy for consideration of the conclusions that are cited in marketing literature, based upon prior, and perhaps questionable, segmentation research.

Segmentation Analysis of the Frozen Food Consumer--Prior Studies

Despite six reported studies of the frozen food consumer, the status of existing, operational knowledge about segmentation of the frozen food market remains surprisingly limited.

First of all, the results of most of the prior studies have been limited by the research limitation of considering the frozen food market as one basic product category. Yet, a 1975 survey of supermarkets showed an average of 816 frozen items, with the total number of items expected to show continued increases.¹⁴⁹ Moreover, significant evidence exists that segments for the purchase and

consumption of frozen food products are likely to vary substantially between separate product categories. Thus, "frozen food" may not prove to be a relevant measurement of purchasing behavior, relative to the definition of market segments, or the measurement of segmentation efficiency.

Secondly, among the published, available studies of the frozen food consumer, there seems to be virtually no reported statistical analysis of consumer data. Most conclusions seem to have been simply drawn from general perusal of two-way cross-tabulations or simple averages of survey responses, with no reported statistical testing of the significance or predictive ability that may exist within these tabulated survey responses. Beyond some broad generalizations about the possible meaning of survey responses, data are typically reported in raw, cross-tabulated tables, from which the reader is apparently expected to infer what he can. As noted by Arndt about so many segmentation studies, "the uncomfortable questions of relevance, and "so what" keep arising,¹⁵⁰ questions which seem commensurate with the prior studies of the frozen food consumer.

It seems especially frustrating to note the same basic questions asked again and again in the six reported studies, but with no significant conclusions derived, no recognition of prior study conclusions, and for the most part, no reported reference to the existence of prior studies. For example, all six studies specifically ask about the availability of freezer space, and/or the ownership of a separate freezer unit; yet, only the earliest

study, done in 1948, attempts to analyze the meaning of the survey response to this question.

Third, the use of any multivariate analysis technique has been almost totally absent in these studies. With the exception of a few three-way cross-tabulation tables (again, without significant analysis of any results), multivariate relationships simply have not been investigated in these studies for the purchases of "frozen foods" as a total, or for the separate categories of frozen categories within the total frozen food category of observed purchasing response. It may be noted that specific products, such as orange juice, have occasionally been examined as part of total food purchasing, but with limited reported results or conclusions relative to the specific frozen items, or for total purchases of frozen foods.

Thus, reported and published studies of frozen food segmentation would seem to be described, at best, as generally descriptive, with virtually no reported statistical analysis of study results, and with very limited operational guidelines as to the effectiveness of any segmentation technique for the actual definition or prediction of segmented purchasing patterns for frozen food products.

Thus, beyond being a valid contribution to general market segmentation research, this study has the potential of being a landmark study of frozen food market segmentation.

Specific Discussion and Analysis of the Prior Studies

The 1948 Scott Study

The earliest known study of the frozen food consumer was conducted by Raymond Scott, in Syracuse, New York. A consumer survey of 1,089 persons was conducted during the summer of 1947, and the results were published in February 1948.¹⁵¹ Beyond the early analysis of the frozen food market, via demographic consumer characteristics, the study may also be noted in the history of the concept of market segmentation as taking place well before the classic segmentation article by Wendell Smith in 1956.¹⁵²

From a research standpoint, the study is also noteworthy for the painstaking detail spent in collecting a valid, demographic sample that would be reasonably representative for characteristics such as race, income, and nationality of the survey respondents. A block sampling technique was used, with specific follow-up instructions to interviewers to reach homemakers who were not at home. Considering the age of the study, and the lack of tools, such as computer analysis, this study is amazingly well designed and analytic in its approach.

Data results are presented in a series of two-way cross-tabulation tables with no statistical analysis of the results, but Scott attempts to analyze each table to a considerable degree, relative to observed differences in demographic consumption patterns for the consumption totals of all frozen foods, as well as consumer attitudes about the then relatively new category of frozen foods. Moreover, the effect of the 1930s depression, and the product shortages of World War

II, must be considered in terms of the effect on consumer incomes, family demographics, available product variety, and even the pent-up demand for electric refrigerators that was characteristic of this period.

However, despite these constraints on the scope of the frozen food market, the study is also notable for the fact that it surveyed consumption of specific frozen food product groups, rather than merely a "total" frozen food consumption measure. Thus, in many ways, this study is the most complete, best designed, and most analytic of all the known studies of the frozen food consumer.

In terms of specific conclusions, Scott noted that income, nationality or race, occupation, and age were shown to be the most important factors in frozen food consumption. In particular, income proved to be a two-edged factor, since lower-income groups were observed as the least likely to own or have access to proper storage facilities, as well as being, by far, the least likely to consume frozen items, both in percentage of such households using frozen items, and in the total amounts used.

Per-capita purchases decreased as family size increased, and it was noted that working homemakers purchased twice the quantity of frozen items as a non-working homemaker-consumer.¹⁵³

Another interesting observation was that 96 percent of the families whose chief wage earner was a professional or an executive had used frozen food products of some kind during the past two years, while only one-third of the unemployed and two-fifths of the laborers had used any frozen food items. Scott suggested that these figures

were likely to be influenced (intercorrelated) by the income levels associated with these occupational groups,¹⁵⁴ as well as by the educational levels of such consumer groups.

Convenience was listed as the most important attitude factor in using frozen foods, which became increasingly important in frequency of mention as income of the family increased, varying from 34 percent mention by low-income families, to 68 percent for upper-income families. Primary reasons for not using frozen items were price, preference for fresh, lack of storage space, and home-canning.¹⁵⁵ This last factor seems especially relevant, since home-canning was much more common in this era, but was reported less frequently among high-income families, and more frequently among low-income families. Survey response may also have been affected by the fact that it was collected during June and August, when the greater availability of fresh items, home-canning, and lack of freezer space could all have been expected to reduce the incidence of frozen product usage, as compared to a winter survey's responses.

While the age of the survey, the vast change in consumer buying patterns, and the extraordinary growth in the size and variety of the frozen food market, all make literal usage of the Scott conclusions rather tenuous for a modern-day frozen food marketer, the general impression remains that many of the observed patterns between demographics and frozen food purchases could remain amazingly consistent in explaining modern characteristics of frozen food purchasing between these same demographic groups.. In any case, the Scott study seemed to definitely establish that important differences did exist between the

demographic groups studied in his survey, relative to their observed purchases of frozen food products.

The National Frozen Food Association Studies

Another major and continuing sponsor of research, about the frozen food consumer-purchaser, has been the National Frozen Food Association, Inc., an industry trade association. This group has sponsored and published three major studies of the frozen food purchaser, in 1973, 1975, and 1981, with reportedly, another major study under consideration, thus providing evidence of the continuing interest by frozen food marketers to better understand consumer differences within the frozen food market.

The first study, conducted in 1972 by B. J. LaLonde, was published in 1973, based upon 1,610 panel respondents furnished by National Family Opinion, Inc.¹⁵⁶ This study was intended to act as a benchmark to provide information to the industry about the frozen food consumer, including the specific issue of the influence of consumer demographic variables upon consumer frozen food purchasing patterns. The study also had the stated objective of examining the attitudes of consumers about frozen foods, as well as the impact of demographic characteristics upon frozen food usage patterns.

Although the study reports that survey data were analyzed "using standard statistical cross tabulation programs,"¹⁵⁷ the specific statistical methods used in the study were not disclosed, nor was any specific statistical test, measurement, or predictive value ever mentioned in the published study. The study goes on to report

that 600 tables were produced during the course of the research, with the most significant and interesting tables reproduced in the study report. However, most of the tables presented were merely distributional reports of specific question responses, such as the percentages of responses among the entire population, with regard to purchases of groceries, frozen food total, and ice cream, as well as raw data scores and distributions on attitude questions. The reasoning for inclusion of such tables was not given, nor was the relevance of them to the stated objectives ever really explained.

In a section labeled "detailed findings,"¹⁵⁸ cross tabulations on a percentage basis were reported between the purchase expenditure categories of the previously printed tables, relative to bivariate distribution among demographic factors such as age, income, education, and occupation. Similar bivariate tables were presented for the data responses to questions about frozen food attitudes. However, the simple distribution of consumption response that could be attributed to the raw, percentage distribution of demographic traits within the survey sample was generally not considered, nor were any statistical measures of predictive value ever presented in the study for any table. Moreover, there was no attempt demonstrated to correlate the attitudes about frozen foods to any pattern in frozen food purchases.

The only measure of frozen food purchases that was reported in the study was total frozen food purchases. Even though the original survey questionnaire asked specific questions about the purchase and home inventory of a relatively long list of specific frozen food products, this information was not even key-punched, and was totally

ignored in the published study. Similarly, even though the study had included a question about home freezer ownership, no results were mentioned in the study results.

Within the 32 published pages of the report, two pages explained the methodology and goals of the study, one page gave implied implications for segmentation (that seemed to have no direct tie to the study data), and one page was presented of very general conclusions. The rest of the study was simply page after page of tables.

Moreover, the "conclusions" that were cited were not explained, substantiated, or measured via survey results, at least as reported in the study. LaLonde notes that the "summary report of the research points clearly in the direction of market segmentation,"¹⁵⁹ but from the tables that were presented, and the broad, unexplained or unsubstantiated conclusions, this study seems to add little usable knowledge about the demographic segmentation of the frozen food market.

A follow-up study was conducted by LaLonde, Hansen, and Scott in 1975, resulting from 1,400 panel respondents, again furnished via National Family Opinion, Inc.¹⁶⁰ For the most part, this study duplicated the questionnaire of the 1973 study and tends to apply the same basic "analytical" techniques as the original study. For the most part, the same cross-tabulation tables are presented, with the results from the 1975 survey listed beside the results of the survey collected in 1972.

No statistical testing or measurement is reported in the study, either for the validity of demographic variables as segmentation variables, or to determine if the observed differences between the

two study's responses were statistically different or meaningful to the marketer. By simple perusal of the compared results, many of the observed differences could easily have been attributed to mere sampling variation, rather than indicating a meaningful change in segmentation response or attitudes. Moreover, the value to the marketer of noting the changes that were observed, even if valid, is very unclear, since most behavior patterns of purchase and attitude indicated substantial heterogeneity of response within every bivariate table presented. In such cases, mere averages of response may be very misleading, without statistical analysis of the variation.

Moreover, while "multivariate analysis" was supposedly applied, this apparently consisted of three-way cross-tabulation tables, with no reported statistical analysis, and with very limited, perceptual rather than empirical, conclusions as a result.

Thus, the results and conclusions of both LaLonde studies can be characterized as broadly descriptive of general patterns that were observed, but not statistically tested or measured, at least as reported in the published study reports. Nevertheless, with this caveat in mind, the 1975 report did arrive at some interesting conclusions.

Perhaps most important, the 1975 report concluded that frozen food usage is clearly product specific, based upon some testing of specific product purchasing that was surveyed, but otherwise not presented in the report. Thus, the measurement of total frozen food consumption seems to be less valid for the definition of frozen food market segments.

Next, education was noted as being positively associated with frozen food purchases, at least until the level of a doctor's degree. Similarly, income is noted as having a positive relationship relative to the purchase of frozen foods. Age was noted as having an important but curvilinear relationship to frozen food expenditures, having higher levels in the thirty to sixty year age brackets, with lower levels above and below this category; this age group was characterized as being the heavy user segment for frozen items.¹⁶¹ Thus, this study does develop some general, inferred relationships between demographics and frozen food consumption, but does not present statistical testing of the validity or the predictive efficiency of such relationships.

Finally, the National Frozen Food Association also sponsored a 1981 study via a Better Homes and Gardens panel of 500 reader-respondents, for each of two surveys, combined in the 1981 report to association members.¹⁶² However, even though this panel data contained demographic data about the respondents, survey questions were not cross-tabulated to the demographic factors, and thus this study did not make significant contributions to demographic segmentation of the frozen food consumer. Here again, the "report" consisted mainly of percentage breakdowns to survey questions, with little attempted analysis of the meaning of such responses. However, even if such responses had been correlated to demographic characteristics the nature of the panel, as well as the questions asked, would have made the results of the study very suspect.

In particular, the panel is observed to have 46.1 percent of its respondents with an income of \$25,000 or more, compared to 15.7 percent of the population in general. Moreover, the panel members were significantly older than the normal demographic distribution of the market, was much more highly educated, nearly always married, and owned their own homes in 91 percent of the cases.¹⁶³ Thus, the panel may have been representative of Better Homes and Gardens' readers, but did not represent the total market for frozen food items.

Next, the measured indicants of purchase response seemed very questionable in many cases. Again, the survey considered only the estimated total expenditures for all frozen foods, rather than testing for the purchases of specific products. In addition, the survey asked, "during an average week three years ago, how much did you spend on frozen foods,"¹⁶⁴ a question that is almost impossible to expect a typical consumer to accurately reply to. The survey also asked, "during an average week three years ago, how much did you spend for food," the response for which was dutifully tabulated, but not interpreted as meaning anything to this study's resulting conclusions.

While some attitudes about frozen food consumption, roughly comparable and often identical to the questions on the 1972 and 1975 studies, were asked in this recent study, only raw distributions and summary scores were presented, with no significant analysis of results. No attempt was made to compare these results to studies of these attitudes in the prior National Frozen Food Association reports. No statistical testing of any kind was reported. Thus, the 1981

Better Homes and Gardens' study did not appear to make a significant contribution to knowledge about the frozen food consumer, or to the practice of market segmentation.

The Akron Beacon Journal Studies

Finally, the last major reported studies of the frozen food consumer have been the two Akron-area studies conducted by the Akron Beacon Journal, as part of its regular surveys of buying patterns in its publication area. The same basic study was done in 1971-72 and in 1977,¹⁶⁵ reporting the consumption patterns for twelve categories of frozen food products, in relation to the variables of income, family size, and the age of the head of household. Ten other demographic categories, such as race, education, and occupation were collected as part of the survey data base, but were never reported in the published format of the studies.

The results of these studies are simply presented in cross-tabulation format, with absolutely no analysis or conclusions of any kind given in the published report. Thus, these two reports are best considered as data to be analyzed, rather than information published about the segmentation factors of frozen food products. But, in particular, one factor that is consistently observable in both reports is that for most products, a majority of the survey sample did not purchase any of the product category being studied. In fact, for some products, such as frozen fruits, frozen pizza, and poultry products, 20 percent or less of the study group, in each of the two reports, accounted for almost all of the observed purchases in these product categories.

However, unless these "heavy-user segments" can be identified or classified from the total population, no segment can be targeted by the frozen food marketer of these products. Thus, the practicality of such segmentation remains somewhat illusory at the present knowledge level about such consumer segments. We find again, as noted by Twedt, that volume segments seem to exist, but if they can only be identified by the tautological fact of being heavy users, such users cannot be identified and targeted as a viable market segment.¹⁶⁶

Thus, while the data base used in the Akron studies seems to be quite adequate with regard to survey collection methods, as well as the fact of responses collected about specific categories of frozen foods, rather than merely total frozen food purchases, the reports remain basically raw data tabulations, which have made no significant contribution at this point in time.

The data base used in the 1976 Akron Beacon Journal study will be employed as the empirical foundation for the research of this dissertation. As explained in the following chapter, the 720 questionnaire responses from this study will be employed to test the ability of demographic variables to segment the purchases of frozen food products, and thus operationalize the concept of market segmentation.

FOOTNOTES--CHAPTER II

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CHAPTER III

RESEARCH DESIGN AND METHODOLOGY

Introduction

The purpose of this chapter is to explain the research methodology employed in this study. The first section explains the source of the research data base, and explains the methods used in the collection of the survey data. The second section identifies the independent and dependent variables that will be utilized in the course of testing the research hypotheses. In the final section, the actual process of analyzing the data is explained, including the computer methodology and the statistical techniques and testing standards used in the empirical research.

Source of the Research Data

The research will be based upon a survey of frozen food purchases conducted by the Akron Beacon Journal, the results of which were published in non-analyzed, cross-tabulation form under the title, "Frozen Food Study, 1977."¹

The data base for the original, 1977 report was collected on a continuous twelve month basis from January 1976 to December 1976 by Bardsley & Haslacher, Inc., a Palo Alto, California marketing research firm. The survey consisted of 1,439 interviews, with each monthly sample designed to comprise a smaller sample of the total

survey sample. However, after receiving permission from the Akron Beacon Journal for the use of the total survey sample, it was discovered that the last six months of the data had been destroyed, and thus the data sample would be reduced to the results of the interviews collected from January 1976 to the end of June 1976. Therefore, the data base for this study will consist of 720 interviews.

Interviews were collected in the metropolitan area of Akron, Ohio, including the Ohio counties of Medina, Summit, and Portage, with a sampling universe consisting of all permanent-residence households with installed cooking facilities, in these counties. The total sample was allocated among the counties in proportion to the number of households with listed telephone numbers in each county, based upon the current telephone directories covering the survey area.

Using a random procedure, addresses were selected from each telephone directory in the survey area. Next, using current maps, the nearest street intersection was located for each address obtained from the phone directories. Maps for each start-point were then reproduced to assist interviewers in locating the selected households to be interviewed. Interviewers were then instructed to apply an interval to each original start-point, to select a cluster of eight households for interview.

Interviews were collected in person by the interviewers, in the home of each survey respondent. Media-audience and demographic characteristics were asked or recorded from all respondents, in addition to questions about specific product purchases. Relevant sections

of the questionnaire, relating to data used in this study, are reproduced in Appendix A.

Identification of Research Variables

Independent Variables

The primary set of independent variables to be tested in this study will consist of demographic characteristics of the survey respondents. Thirteen specific demographic variables will be examined, including measures of the following respondent characteristics:

1. Race,
2. Age of the head of household,
3. Occupation of the head of household,
4. Sex of the head of household,
5. Sex of the respondent,
6. Household income,
7. Education of the head of household,
8. Rent or own the household residence,
9. Length of residence at the same address,
10. Number of persons in the household,
11. Number of persons employed in the household,
12. Type of residence structure, and
13. Length of residence in the Akron metropolitan area.

Two commonly surveyed consumer purchasing characteristics will also be considered as independent variables, relative to their predictive relationship to the purchase of the dependent categories

of frozen food purchases. These consumer purchasing independent variables are:

1. Total grocery purchases, and
2. Ownership of a separate freezer unit.

In addition, the purchase responses for each of twelve specific frozen food categories will also be examined as independent, product-purchase variables, to determine the degree that one specific product purchase can be predicted by means of prior knowledge of the respondents' purchases of other frozen food product categories. These twelve product-purchase variables will also serve as the dependent variables, and will be listed in more detail, as dependent variables.

Dependent Variables

The dependent variables of this study will consist of the reported purchasing activity of the survey respondents in twelve specific categories of frozen food products. These specific frozen food purchase categories include:

1. Breakfast-baked goods,
2. Dessert-baked goods,
3. Seafoods,
4. Uncooked poultry, whole or parts,
5. Cooked (heat and serve) poultry,
6. Potatoes,
7. Vegetables,
8. Fruit juices,
9. Fruit or berries,

10. Pizza,
11. Complete dinners, and
12. Main courses, not including poultry.

Analysis of the Data

Computer Programs Used in the Analysis

Survey data will be analyzed by the use of the Statistical Package for the Social Sciences,² primarily via subprograms "Breakdown"³ and "Discriminant."⁴ First of all, data distribution will be examined for all variables used in the study, and then recoded by SPSS to eliminate obvious coding errors, non-responses, etc.

Next, using the SPSS program "Breakdown,"⁵ a one-way analysis of variance will be used to determine if the group means between the categories of the independent variables of the study are different in terms of their reported purchase patterns within the dependent, specific product purchase variables. For example, the data would be tested to determine if there was a statistically significant difference in the mean purchase of breakfast baked goods between white and non-white purchasers (race of the respondent). Actual testing of this statistical relationship would be done by computation of the "F-ratio," which is then compared to statistical tables of this measurement, to determine if a statistically valid relationship is present.

Thus, the F-test will be calculated for each of the thirteen demographic variables, in relationship to each of the twelve dependent variables of product purchases, for a total of 156 bivariate tests of significance. In addition, this same computer program would be used

to test the relationship of each product-purchase variable, in relationship to each of the other product-purchase variables of the study, for a total of 132 additional tests of statistical significance.

"Breakdown"⁶ will also be used to test the significance of the relationship of total grocery purchases and freezer ownership to the purchase of the twelve product-purchase dependent variables of the study, resulting in 24 more bivariate tests of statistical significance, via the F-test.

Next, the statistic Eta squared will be calculated by means of "Breakdown,"⁷ for each of the bivariate relationships which are found to be statistically significant in the F-test, to determine the total, non-linear bivariate variance in each of the dependent, product-purchase variables of frozen food purchase that can be explained by means of the tested, independent variable.

Each significant relationship will then be examined to determine the linear predictive power, as measured by the statistic R squared. A specific test of linearity for each statistically significant relationship will then be conducted, by comparison of the non-linear Eta squared value to the linear R squared value for each tested predictive relationship. If R squared is subtracted from the Eta squared value of a relationship, a measurement is thus obtained of the explanatory power that would be lost by an assumption of linearity for the bivariate, predictive relationship.

In the event that a meaningful difference in predictive power is excluded by use of the linear R squared measurement of the relationship, rather than the non-linear Eta squared value, that independent

variable will be recoded, when possible, to allow a closer fit between the linear R squared value for that predictor variable, and the total non-linear predictive Eta squared value of the variable, to provide a better linear predictive input for the linear multivariate methodology that will follow in this study.

Finally, the SPSS subprogram "Discriminant"⁸ will be used to determine the total, linear multivariate amount of purchase variance that can be explained by the combined use of either the total set of demographic variables or the product-purchase variables, in relationship to each of the dependent, product-purchase variables of the study.

For each category of frozen food purchases, a linear discriminant function will be calculated, which will be used by "Discriminant"⁹ to classify each consumer respondent as a purchaser or a non-purchaser of that product category, and then to calculate the accuracy of this predicted classification, relative to the actual, reported purchases by these respondents.

Based upon the accuracy of the consumer classifications observed in this classification test, the effectiveness, in total, of demographic variables will be compared to the relative effectiveness of the product-purchase variables, in determining which set of predictive variables was best able to correctly segment respondents into the proper classifications of purchasers and non-purchasers for each of the specific frozen food categories of this study.

In addition, "Discriminant"¹⁰ will be used to calculate the multivariate statistic of the canonical correlation, for each discriminant function, to determine the linear, statistical predictive

value that can be attributed to the demographic and the product-purchase variables, in relationship to each of the frozen food product categories. The canonical correlation, when squared, presents the statistical equivalent of a multivariate R squared measurement, for each tested multivariate relationship.

Statistical Techniques and Measurements

Statistical significance: One-way analysis of variance. The initial statistical technique to be employed in the study will be a one-way analysis of variance, a technique to determine if the group means of subsamples within a sample base are statistically different from each other.¹¹ In the case of this study, the goal would be to determine if purchasing of specific product categories of frozen food products differ among experimentally altered categories of the independent variables of the study, primarily the demographic variables of the survey sample.

Two variances are pitted against each other; one variance, presumably due to the experimental, independent variable, such as race, is tested against another variance that is presumed to be due to random error or chance¹²--in this case, the purchase of a frozen food product, such as frozen breakfast-baked goods. If nothing beyond chance is causing group mean scores to vary, then the variance in observed purchases of breakfast goods between-groups (between the racial categories) will not vary beyond the measure of chance error, that is the expected variance among any group, or the within-group variance. If an experimental manipulation has been influential, the

variance between-groups should show an increase, beyond the differences that can be attributed to chance; in the case of the given example, the test would be if group consumption means of breakfast goods vary significantly among different categories of race within the survey sample. Stated in formal null hypothesis form, the research would be testing the proposition that there is no significant difference between racial categories, relative to their reported purchases of breakfast-baked goods.

If the between-group means are found to be significantly different, this null hypothesis can be rejected, and the variable of race would be regarded as showing differences in purchasing, between the categories of race, that is statistically significant.

The test method provided by subprogram "Breakdown" is the F-test, where the F-ratio ($F = \text{between group means square} / \text{within-groups mean square}$) is computed and compared to the known sampling distribution of the F-ratio.¹³ If the F-ratio so computed from the sample data is as great or greater than the tabled entry of the F-table, the differences between the experimental group-means are regarded as significantly different; that is, the difference is greater than can be reasonably attributed to chance distribution of expected within-group variations between the categories of the independent, experimental variable.

The specific standard regarded as "statistically significant" typically is reported as the .05 or the .01 level. That is, an .01 level of null hypothesis rejection means that an observed between-group variation could be attributed to chance only one time in 100 samples, given the sample's within-group variation.

For purposes of this study, the defined standard for a finding of statistical significance for a relationship will be the more stringent level of .01. However, to allow comparability with other past and future studies using the more common, and more uncertain, significance standard of the .05 level, relationship levels at .05 will be reported in the findings, and also tested for their bivariate predictive strength.

However, it should be noted that a finding of statistical significance, even at the more stringent .01 level, does not provide a measure of the strength of the relationship measured per se; it only indicates that a relationship exists that is not likely due to mere chance--a nuance in interpretation of results that seems to have eluded far too many researchers.

Therefore, the next task of the research methodology of this study is to measure the strength of the relationship that may exist within statistically significant associations between the independent and the dependent variables of the study.

Strength of the relationships: Eta squared and R squared.

Subprogram "Breakdown"¹⁴ is again utilized to calculate the measurable strength of the observed, statistically significant relationships between the independent variables of the study and the dependent measures of product purchases. The methods used will be the general correlation ratio of Eta squared, and the linear correlation ratio of R squared.

Eta squared provides a general, non-linear measurement of the strength of the variance shared by the dependent and the independent variables being tested, and gives a measure of the proportion of variance in the dependent, product-purchase variable that can be attributed to variation in the independent, demographic variables that are the heart of this research, as well as for the additional variables tested as independent variables. This statistic is a bivariate measure of association calculated by dividing the between-group sum of squares (between categories of the tested independent variable) by the total sum of squares for all purchases of the tested dependent variable of the specific product purchased.¹⁵

For purposes of marketing application, a meaningful degree of predictability of the variation in the dependent, product purchase variables is needed, rather than the limited knowledge that "some" relationship exists. While no specific measurement of what strength of relationship is "meaningful" has been established, the rule that will be adopted by this study is that for a relationship to be regarded as meaningful, a bivariate Eta squared value of .05 or more must be obtained for statistically significant relationships within the survey data.

Linearity of the relationships. Next, a specific test of linearity will be conducted by calculation of the linear, Pearson's R statistic, which when squared provides a measurement of the linear proportion of variance in the dependent variable that can be attributed to the effect of the tested, independent variable.¹⁶ If R squared is subtracted from the Eta squared measure for the same independent-

dependent variable relationship, a measure is thus obtained of the degree of explanatory power that would be lost by use of the linear R squared measurement, as compared to the total degree of predictive power provided by Eta squared. The reason for this test is to determine if the R squared statistic provides a reasonably accurate measurement of the predictive power of the tested independent variables of the study, for further use in the multivariate, linear discriminant analysis to be used in the subsequent stage of this study. If a major disparity is observed between Eta squared and R squared, the commensurate independent variable would then be recoded, when possible, to derive a variable, or combination of variables, that comes closer to the non-linear, Eta squared predictive power of that variable, for use in the discriminant analysis to follow.

Discriminant analysis. The purpose of discriminant analysis can be generally described as providing a statistical ability to distinguish groups from one another on the basis of linear sets of measures. It can also be used to assign or segment group members on the basis of their scores on a combination of independent, predictor variables.¹⁷ Both uses will be applied in this study.

First of all, a multivariate function will be determined for each of the product purchase variables of the study, in such a way as to provide the maximum ability to distinguish or "discriminate" between study groups, in the sense of being able to tell them apart by means of the predictive variables, relative to the dependent trait or activity. In this study, discriminant analysis will be used to determine which combination of variables is best able to distinguish or segment users

from non-users of specific frozen food products. Additionally, the combined predictive measure of the multivariate function is determined in a statistic similar to the linear R square statistic of the bivariate analysis; a canonical correlation is calculated, which when squared indicates the proportion of product purchase variance which can be explained by the combined, multivariate function.¹⁸

Finally, the total, linear multivariate function is utilized to segment purchasers from non-purchasers for a given frozen food product category, by means of individual respondent scores, which will be calculated from individual traits of the survey respondents, as weighted by the discriminant function.

After all respondents have been classified, the degree to which product users and non-users were correctly segmented will then be determined, both as a measure of total effectiveness, and to determine whether demographic or product purchases of other products can provide the best method of segmenting the purchasers from the non-purchasers of specific frozen food product categories.

For purposes of this study, the defined standard of classification success, in predicting the correct classifications of specific product purchasers and non-purchasers, was set at a level of 75 percent or greater, to meet the hypothesized requirement for multivariate classification ability.

FOOTNOTES--CHAPTER III

¹"Frozen Food Study, 1977," Akron Beacon Journal, Akron, Ohio, 1977.

²Norman H. Nie, C. Hull, J. Jenkins, K. Steinbrenner, and D. Brent, Statistical Package for the Social Sciences (New York: McGraw-Hill Book Co., 1975).

³Ibid., pp. 249-275.

⁴Ibid., pp. 434-467.

⁵Ibid., pp. 249-275.

⁶Ibid.

⁷Ibid.

⁸Ibid., pp. 434-467.

⁹Ibid.

¹⁰ Ibid.

¹¹ Ibid., pp. 259-260.

¹² Fred N. Kerlinger, Foundations of Behavioral Research (New York: Holt, Rinehart, & Winston, Inc., 1973), pp. 220-229.

¹³ Nie et al., pp. 259-260.

¹⁴ Ibid., pp. 260-261.

¹⁵ Kerlinger, pp. 230-232.

¹⁶ Nie et al., pp. 260-261.

¹⁷ Ibid., pp. 434-441; and Kerlinger, pp. 650-653.

¹⁸ Nie et al., p. 442.

CHAPTER IV

PRESENTATION OF FINDINGS

Introduction

The purpose of this chapter is to present and discuss the empirical findings of this study. The first section presents research findings relating to the value of demographic consumer variables, relative to their ability to predict and segment the purchasing behavior for specific categories of frozen foods. Following the order of the research hypotheses about demographic variables, as set forth in Chapter I, these consumer characteristics are examined for the statistical significance and the bivariate predictive power relative to the tested categories of frozen food products. Demographic variables are then tested for their multivariate ability to predict the purchase of the frozen food products of this study.

The second section of this chapter examines the predictive value of demographic variables, in comparison to the predictive value of product purchase information. Demographic data and product-purchase information are compared by means of their relative bivariate predictive powers, and by their multivariate ability to classify the users and non-users of each specific frozen food product category.

The third section of this chapter presents findings about the ability to predict purchasing behavior for frozen food products, by

means of information about a consumer's total purchases of grocery products.

Finally, the fourth section of this chapter presents findings about the ability to predict frozen food purchases by means of information about the consumer's ownership of a separate freezer unit.

The Value of Consumer Demographic Variables

The major hypothesis of this study, as discussed in Chapter I, was that demographic consumer variables can be used to successfully predict and segment purchasing behavior for consumer products. Specifically, this section of the study reports on the observed ability to predict and segment twelve specific categories of frozen food products, by means of thirteen demographic consumer characteristics.

During the process of testing this major hypothesis, demographic variables are tested in three stages, or subhypotheses. First, an analysis of variance is performed, to determine if a statistically significant relationship exists for any of the demographic variables, in relationship to the surveyed purchases within each of the twelve frozen food product categories. Second, these same bivariate relationships, between the demographic and product purchase variables, are examined to determine if a meaningful degree of predictive power exists. The predictive power of the demographic variables are examined on both a total, non-linear basis, and also on a linear basis. Third, the multivariate value of all thirteen demographic variables is tested, relative to the ability to predict and segment the purchases of each of the frozen food categories.

Analysis of Variance--Test of Significance

Utilizing subprogram "Breakdown," within the Statistical Package for the Social Sciences,¹ an analysis of variance was performed to determine if the relationship of any of the demographic variables was statistically significant to any of the frozen food product categories. Actual statistical testing was done by computation of the F-ratio between group purchase means within each demographic variable category, in relationship to each of the product purchase categories. Thus, for example, purchases for breakfast-baked goods were examined to determine if group purchasing means differed significantly between racial categories of white versus non-white consumers. The F-ratio which is thus obtained is compared to statistical tables of this measurement, to determine if statistically valid differences in product purchases can reasonably be attributed to demographic differences in the consumer's race.

This analysis of variance, via the F-test, was performed for each of the thirteen demographic variables in the study, in relationship to the purchases within each of the twelve product categories. The results of these tests are presented in Table 4.1.

The specific standard regarded as statistically significant for this study has been set at a null-hypothesis level of .01. However, since many studies choose to accept relationships at the .05 level as being significant, Table 4.1 presents the significance levels up to the .05 level. In addition, it may be noted that several

Table 4.1 The Statistical Significance of the Demographic Variables, in Relationship to Frozen Food Purchases

Demographic Factors	Frozen Food Categories											
	Breakfast- Baked Goods	Dessert- Baked Goods	Seafoods	Uncooked Poultry	Cooked Poultry	Potatoes	Vegetables	Fruit Juices	Fruit or Berries	Pizza	Complete Dinners	Main Courses
Race	NS ^a	NS	NS	NS	NS	NS	.006	NS	NS	NS	NS	NS
Age	.008	NS	.000	.035 (NS)	NS	.000	NS	.009	NS	.000	.025 (NS)	NS
Occupation of head of the household	.015 (NS)	NS	.004	NS	NS	.000	NS	.009	NS	NS	NS	NS
Sex of head of the household	.037 (NS)	NS	NS	NS	NS	NS	NS	.008	NS	.049 (NS)	.038 (NS)	NS
Sex of respondent	NS	NS	.017 (NS)	NS	NS	NS	.001	NS	NS	NS	.047 (NS)	NS
Income	.006	.004	.001	NS	NS	NS	NS	.000	NS	.012 (NS)	NS	NS
Education	NS	.023 (NS)	.001	NS	NS	NS	NS	.000	NS	.012 (NS)	NS	NS
Rent or own residence	NS	NS	.026 (NS)	.015 (NS)	NS	NS	.018 (NS)	.020 (NS)	NS	NS	.028 (NS)	NS
Length of residence in home	NS	NS	.002	.026 (NS)	.030 (NS)	.000	NS	NS	NS	NS	.000	.038 (NS)
Number in household	.008	NS	.000	NS	NS	.000	NS	.020 (NS)	NS	.000	NS	NS
Number employed in household	NS	NS	.008	NS	.003	.002	NS	.000	NS	.001	NS	NS
Type of home	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Length of residence in the area	.016 (NS)	NS	.001	.019 (NS)	NS	.011	NS	.000	NS	.004	.026 (NS)	NS

^aSignificance levels less than the .05 level are reported as NS. Per requirements of the research hypotheses, an .01 level is required for determination of a significant relationship in this study. However, significance levels between .01 and .05 are reported in the above exhibit, but are noted as being not significant (NS) at the .01 level.

relationships were significant at the level of .012, .015, or similar levels that were extremely close to the .01 level. Therefore, relationships that were found at levels of significance between .01 and .05 are reported, but are also noted in parentheses as being not significant at the .01 level, as demonstrated in the survey sample used in this study.

Based upon the results presented in Table 4.1, the statistical validity of each of the demographic variables will be discussed in turn, as they relate to the purchase of the frozen food product categories of this study.

Statistical significance of race. Within the twelve frozen food product categories studied, the variable of race was shown to be significant for only one product category, that of frozen vegetables, at the .006 level. Even at the more liberal significance level of .05, no additional product category showed a significant level of relationship to the race of the purchaser, beyond group mean differences that could reasonably be attributed to mere chance in sampling. Thus, race did not seem to be an important variable, relative to most frozen foods.

Statistical significance of age. The variable of age was significantly related to five of the twelve frozen food categories at the .01 level, and exhibited a relationship to two additional products at the .05 significance level. At the .01 level, age was significantly related to the purchase of breakfast-baked goods, potatoes, seafoods, fruit juices, and pizza, with weaker .05 ties shown to uncooked poultry and complete dinners. However, even beyond the seven frozen product categories where at least a .05 level of significance was noted, it

seems somewhat curious that seemingly related items did not show a significant tie. For example, breakfast-baked goods was significant at the .008 level, but dessert-baked goods was not significant at all. Uncooked poultry was significant at the .035 level, but cooked poultry did not exhibit a statistically significant link to the variable of age. Similarly, frozen potatoes was significant at the .000 level, but frozen vegetables exhibited no significant relationship at all. Pizza was significant at the .000 level, as was frozen complete dinners at the .025 level, yet, main courses did not exhibit significant ties to the age of the purchaser.

Statistical significance of occupation. The occupation of the head of the household was significant at the .01 level with three product categories: seafoods, potatoes, and fruit juices. In addition, significance was noted at the level of .015 with breakfast-baked goods.

Statistical significance of the sex of the household head. Sex of the household head was significant for only one product, fruit juices, at the .01 level. However, three additional product categories were significant at the .05 level: breakfast-baked goods, pizza, and complete dinners. Thus, this variable also seemed to be one of the weaker demographic indicants of frozen food purchasing behavior.

Statistical significance of the respondent's sex. Sex of the respondent was significant for one product, frozen vegetables, at the .01 level, and was linked to seafoods and complete dinners at the .05 level. This variable might be regarded as somewhat of a control variable within the survey, where differences in reported purchases might be due more to bias, or even lack of knowledge on the part of the

respondent, especially regarding substantial differences from the purchase traits previously noted in relationship to the sex of the head of the household. Thus, strong differences were not actually expected relative to the sex of the respondent, and were not observed in the sample responses for most of the products.

Statistical significance of income. Income was shown to meet the .01 test of significance for four frozen product categories: breakfast-baked goods, dessert-baked goods, seafoods, and fruit juices. In addition, one additional product, pizza, barely missed the .01 level of significance, at .012.

Statistical significance of education. The educational level of the household head was shown to be significantly related at the .01 level with only two products: seafoods and fruit juices. One additional category, pizza, barely missed the .01 level, with a .012 test of significance. Dessert-baked goods also was significant at the .05 level. Nevertheless, eight of the twelve categories failed to demonstrate even an .05 degree of statistical significance with the variable of education.

Statistical significance of renting or owning the residence. Renting or owning the residence did not exhibit any significant ties to the frozen products of the study at the .01 level of significance. However, five product categories showed a significance level between .01 and .03. These product categories were seafoods, uncooked poultry, vegetables, fruit juices, and complete dinners.

Statistical significance of the length of residence in the home. The length of residence in the respondent's current home was significant at the .01 level for three product categories: seafoods, potatoes, and complete dinners. Three additional products were shown to have a significant tie at the .05 level: uncooked poultry, cooked poultry, and main courses. It might be noted that length of residence in the home was the only demographic variable, even at the .05 level, to exhibit a significant relationship to both uncooked and cooked poultry products, and was one of only two factors to exhibit even a .05 significance with the category of cooked poultry.

Statistical significance of the number living in the household. The number of persons living in the household was significant at the .01 level with four product categories: breakfast-baked goods, seafoods, potatoes, and pizza. Fruit juices was also significant at the .05 level.

Statistical significance of the number of persons employed. The number of persons employed was statistically significant at the .01 level for five product categories: seafoods, cooked poultry, potatoes, fruit juices, and pizza. No additional relationships were observed, even at the .05 level of significance.

Statistical significance of the type of home. The type of home, such as single-family, apartment, etc., was not significant for any of the twelve product categories of the study, the only demographic variable within the study to have this distinction.

Statistical significance of the length of residence in the area. Length of residence in the metropolitan area of the survey was significant at the .01 level for three product categories: seafoods, fruit juices, and pizza. Additionally, four other product categories exhibited relationships that were very close to the .01 level. Breakfast-baked goods showed a .016 level of significance, uncooked poultry was .019, potatoes barely missed the .01 cutoff with a .011 reported significance level, and complete dinners exhibited a .026 significance level with length of residence in the area. Thus, this variable, along with length of residence in the present home, seem to be two of the strongest links to frozen food product purchases.

Number of significant demographic variables per product.

Table 4.2 shows the number of demographic characteristics that proved to have a significant statistical relationship to each of the frozen food product categories, at both the .01 and the .05 level of significance. As can be seen in this table, the number of significant demographic variables varies substantially within the set of frozen product categories. For example, the product category of seafoods exhibited a total of ten of the thirteen demographic variables with a significance of .05, and eight of these ten demographic variables exhibited statistical significance at the hypothesized .01 level. However, none of the tested demographic variables exhibited statistical significance in relationship to the purchase of the product category of fruit or berries. Similarly, only one demographic factor, length of residence in the current home, exhibited as much as a .05

Table 4.2 Number of Demographic Variables Significant

Product Categories	No. of Variables Significant at .01	No. of Variables Significant at .011-.05	Total
Breakfast-baked goods	3	3	6
Dessert-baked goods	1	1	2
Seafoods	8	2	10
Uncooked poultry	0	4	4
Cooked poultry	1	1	2
Potatoes	5	1 ^a	6
Vegetables	2	1	3
Fruit juices	7	2	9
Fruit or berries	0	0	0
Pizza	4	3 ^b	7
Complete dinners	1	5	6
Main courses	0	1	1

^aAt the .011 level.

^bTwo were at the .012 level.

significance level in relationship to the purchase of frozen main courses.

Even apparently similar product categories exhibited markedly different numbers of significant relationships to the tested demographic independent variables. Thus, breakfast-baked goods had a total of six demographic variables exhibited a significant relationship at the .05 level, and with three factors at the .01 level. However, dessert-baked goods had a total of only two demographic variables demonstrate significance at the .05 level, and only one at the .01 level. Moreover, only one demographic factor, income, was significantly related to the purchase of both breakfast-baked and dessert-baked goods.

Similarly, frozen potatoes had five demographic variables exhibit statistical significance at the .01 level, and a sixth factor at the .011 level. Yet, frozen vegetables had only two variables significant at the .01 level, and one additional tie at the .05 level. Moreover, none of the demographic variables that exhibited a statistical significance, even at the .05 level, exhibited statistical significance for both frozen potatoes and frozen vegetables. Another odd quirk is that both variables that showed a .01 level relationship to the purchase of frozen vegetables, race and the sex of the respondent, did not exhibit a .01 relationship to any other product. In fact, race did not exhibit any other significant relationship, even at the more liberal .05 level, to any other frozen product category in the study.

Significance of the relationship between demographic variables and frozen food products--a summary of findings. Based upon the analysis of variance, as measured by the F-test, and as presented in Tables 4.1 and 4.2, a basic summary of the results of the significance testing phase of this study would be that there are significant relationships between demographic consumer variables and the purchase of specific frozen food product categories.

However, the significance of the relationship between demographics and the frozen product purchases seems to vary substantially between product categories, both in the number of demographic factors that proved significant per product category, as well as which specific demographic variables proved to be significantly related to the purchase of each specific frozen product category.

There was no universal demographic variable that was significant at either the .01 or the .05 level for all frozen product categories. In fact, the maximum number of significant relationships at the .01 level was exhibited by the factors of age and the number of persons employed in the household, each of these two factors showing an .01 relationship to five frozen product categories. Several other demographic variables exhibited .01 relationships to three or four product categories, with additional relationships noted if the accepted significance level is expanded to .05.

Demographics exhibited a total of ten significant relationships at the .05 level for the purchase of seafoods, nine .05 relationships to fruit juices, and seven relationships to the purchase of frozen pizza, based upon the thirteen demographic variables that were tested.

Only the product category of fruit or berries was not linked at the .05 level to at least one demographic factor. Only the type of home was found to exhibit no significant relationship at the .05 level of significance testing, although the factor of renting or owning the consumer's residence failed to show a relationship at the .01 level originally set as the significance level criteria for this study. Yet, even the factor of renting or owning the residence proved to display five relationships, between .01 and .03 significance levels, among the twelve product categories tested.

At the .01 level of significance testing, demographic variables were found to relate significantly to nine of the twelve frozen product categories, with at least one demographic factor found to be significantly related. If the more liberal, and common, .05 significance level is accepted, eleven of the twelve product categories will have at least one demographic variable significantly related. Thus, the preponderance of the empirical testing of the frozen food purchase data indicates that the demographic variables of this study are generally able to define at least one significant relationship, relative to the purchase of specific frozen food product categories.

The next stage of this study will be to determine the strength and the relative predictive power of such relationships as were found to exist in the significance testing, as reported in Table 4.1.

Analysis of Variance--Strength of
Significant Relationships

Subprogram "Breakdown" of the Statistical Program for the Social Sciences² is again utilized, to calculate the measurable strength of the independent, demographic consumer variables, relative to their predictive value toward the dependent, product purchase categories of the study. The statistical methods used are the general correlation ratio, Eta squared, and the linear correlation ratio of R squared.

Eta squared is used to provide the measurement of the total, non-linear proportion of variance in the product purchase categories that can be attributed to variation in the demographic characteristics of the survey sample.

Next, a specific test of linearity is conducted by means of calculating the R squared value of the relationship between the demographic variables and the product purchase categories. If R squared is subtracted from the Eta squared value for the same relationship, a measure is thus provided of the amount of explanatory power that would be lost in the multivariate, linear discriminant analysis that is used in the subsequent stage of this study.

The results of these calculations are presented in Table 4.3, providing a measurement of the linear and non-linear relationships between each of the thirteen demographic variables of this study, relative to each of the twelve frozen food product categories.

Table 4.3 The Measured Strength of Demographics as Predictors^a

Demographic Factors	Frozen Food Categories											
	Breakfast-Baked Goods	Dessert-Baked Goods	Seafoods	Uncooked Poultry	Cooked Poultry	Potatoes	Vegetables	Fruit Juices	Fruit or Berries	Pizza	Complete Dinners	Main Courses
Race	NS	NS	NS	NS	NS	NS	.006 .010	NS	NS	NS	NS	NS
Age	.008 .029 .010	NS	.000 .048 .043	.035 .023 .015	NS	.000 .055 .044	NS	.009 .028 .013	NS	.000 .056 .029	.025 .024 .003	NS
Occupation of head of household	.015 .029 .017	NS	.004 .034 .029	NS	NS	.000 .056 .026	NS	.009 .028 .013	NS	NS	NS	
Sex of head of household	.037 .006	NS	NS	NS	NS	NS	NS	.008 .009	NS	.049 .005	.038 .006	NS
Sex of the respondent	NS	NS	.017 .008	NS	NS	NS	.001 .014	NS	NS	NS	.047 .005	NS
Income	.006 .036 .014	.004 .038 .016	.001 .043 .012	NS	NS	NS	NS	.000 .077 .058	NS	.012 .034 .011	NS	NS
Education	NS	.023 .020 .005	.001 .035 .023	NS	NS	NS	NS	.000 .077 .058	NS	.012 .034 .011	NS	NS
Rent or own residence	NS	NS	.026 .007	.015 .008	NS	NS	.018 .007	.020 .007	NS	NS	.028 .006	NS
Length of residence in present home	NS	NS	.002 .020 .016	.026 .012 .011	.030 .010 .006	.000 .040 .027	NS	NS	NS	NS	.000 .032 .004	.038 .012 .006
Number in household	.008 .029 .020	NS	.000 .049 .023	NS	NS	.000 .050 .020	NS	.020 .025 .008	NS	.000 .039 .026	NS	NS
Number employed in household	NS	NS	.008 .019 .001	NS	.003 .020 .011	.002 .023 .006	NS	.000 .029 .012	NS	.001 .025 .016	NS	NS
Type of home	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Length of residence in area	.016 .017 .004	NS	.001 .027 .023	.019 .016 .010	NS	.011 .018 .012	NS	.000 .036 .019	NS	.004 .020 .014	.026 .015 .022	NS

^aThe first reported figure for each variable refers to the significance level of the analysis of variance. Significance lower than the .05 level is reported as "NS." The second value is the Eta squared score, giving the total, non-linear predictive value. The third value, when present, gives the linear, R squared measurement, if different from Eta squared.

Within Table 4.3, the first reported value for each of the demographic variable to product category relationships refers to the significance level of the analysis of variance, as measured by the F-test. Significance levels lower than .05 are reported as not significant, or NS in the table, and no further tests are made for the strength of the relationship. The second line in Table 4.3 for each relationship of at least .05 significance level, presents the Eta squared value, giving the total, non-linear predictive strength of the relationship pair.

The third line for each relationship pair in Table 4.3, if present, is the linear, R squared measurement of the predictive strength of the relationship. However, several of the demographic variables are coded into only two responses. In this situation, a separate R squared measurement is not made, since the Eta squared value will be the same as the R squared value.

Thus, for example, Race is coded into only two categories of white and non-white respondents. Table 4.3 shows that a relationship was significant at the .006 level for the purchase of frozen vegetables, with an Eta squared value of .010. No additional value is given for this relationship for R squared, since Eta squared and R squared have the same value. Thus, Race provides a statistically significant relationship to the purchase of frozen vegetables, but provides a predictive strength of only 1 percent, although this relationship is linear, due to coding into only two categories of the independent variable.

Based upon the Eta squared scores of each significant relationship, as presented in Table 4.3, the evaluation is then made, whether or not such demographic variables can provide a meaningful degree of predictability about the purchase of the frozen food product categories of this study. As discussed in Chapter III, the standard set for a relationship to be regarded as meaningful is that a bivariate Eta squared value of .05 or greater must be obtained, for statistically significant relationships.

Strength of demographic variables relationships to frozen food purchases--a summary of findings. Based upon an examination of the Eta squared scores for the demographic variables tested in this study, demographics did not generally exhibit a meaningful predictive value relative to the purchase of the twelve frozen food categories surveyed. Of the 156 relationships examined in this study (thirteen demographic variables times twelve frozen food categories) only six relationships were found to meet the stated criteria of providing an Eta squared value of .05 or greater. Two other relationships had measured Eta squared values of .048 and .049, with only one additional relationship testing as high as .040.

The highest Eta squared value was found for both income and education, as these two factors related to the purchase of fruit juices, with scores of .077 indicating that either income or education gave 7.7 percent predictive value regarding the purchase of fruit juices.

The demographic factors of age, income, education, and the number of persons in the household all had at least one Eta squared

relationship score of .05 or larger, with only the factor of age demonstrating two relationships with scores of .05 or larger. The strongest relationships were noted for the categories of frozen potatoes and fruit juices. Potatoes had .05 or larger Eta squared scores in relationship to the demographic variables of age, occupation, and the number of persons in the household. Length of residence in the home also gave a .04 score for the purchase of frozen potatoes. As noted previously, income and education had .077 scores relative to the purchase of fruit juices.

The only other product that had a .05 relationship to any of the demographic variables was pizza, which had a .056 score, as related to the age of the household head. However, it should be noted that several other demographic variables showed Eta squared scores of .02 and .04 for other frozen product categories than those cited for .05 relationships, thus providing some potential for predictive power on a multivariate basis in the discriminant analysis performed by this study.

The actual predictive Eta squared scores are reported in Table 4.3, for all relationships which proved to have statistical significance at the .05 level. However, results of testing the predictive power of such relationships show that all relationships meeting the predictive criteria of .05 Eta squared scores, as required to be considered meaningful predictors of product purchases, also exhibited significance in the F-test of .000. Relationships that

exceeded the .01 significance level rarely showed predictive value as high as 1 percent.

The Linearity of the Predictive Relationship

The test of linearity employed in this study was to compare the linear measurement, R squared, to the total non-linear predictive measurement provided by Eta squared. The results of this test may also be seen in Table 4.3.

The general conclusion is that many of the relationships between demographic variables and the purchase of frozen food products are non-linear to a substantial degree. Thus, the explanatory power of R squared often is somewhat less than the total predictive value of the non-linear measurement. Moreover, the degree of linearity varied between product categories, making it very difficult to make generalizations about specific demographic factors for all product categories.

However, the general pattern that was observed within the group mean consumption scores in raw categorization format was that relationships were often curvilinear. That is, consumption tended to increase over the categorical range of most demographic factors, then declined again at the highest or largest classification groups. While the limited sample size within the user groups, combined with relatively small numbers of respondents in some demographic categories make over-generalization very tenuous, the basic conclusion seems apparent that the evaluation of the predictive power of demographic variables on solely a linear measurement basis would be likely to understate or

even ignore much of the possible predictive ability from demographics. Table 4.3 shows that half or more of the predictive power was often lost in utilizing the R squared value as the measurement method, as compared to the total, non-linear value provided by Eta squared.

For example, the number of persons in the household showed a 5 percent predictive value toward fruit juices, and a 4.9 percent value for predicting the purchase of seafoods. However, the R squared predictive values for these relationships were 2 percent and 2.3 percent, respectively, for a net loss of about 60 percent of predictive power. The basic conclusion would then seem to be that non-linear statistical methods would increase the predictive abilities of demographic variables, and should be employed when possible. The implications and conclusions about past and future demographic research, as a result of this finding, will be discussed in Chapter V.

However, the implication for this research study was that reasonable attempts should be made to recode demographic variables to allow a closer fit between the non-linear, Eta squared value and the linear, R squared value, to allow more effective use of the linear, multivariate discriminant analysis to follow in this study. The basic tactic employed was to study the group means of purchases within each category for a given demographic factor, and to combine categories with similar purchase means, thus reducing some of the non-linearity of the observed responses.

Thus, for a demographic variable such as age, it was noted that purchase means increased with age, and then generally declined after

the age of 55. Over 55 year old purchasers were thus combined with the younger purchasers, who had purchase means similar to that of older consumers for many product categories, thus reducing the curvilinearity of the data, and giving a closer fit with the total, non-linear Eta squared measurement. Similarly, households with three or more persons employed were combined with households with none employed, since it was observed that group means of purchasing usually decreased if more than three persons were employed, to about the same levels of purchase frequency as for families where no one was employed, or the head of the household was retired.

While some detail was no doubt lost by such recodings, the intent was not to alter the measurement results of the bivariate analysis of demographic variable predictive power, but rather to utilize a multivariate measurement and classification method, discriminant analysis, in a way that would utilize a greater amount of the predictive power of demographics in a linear methodology. The results of such recodings generally tended to reduce the measured Eta squared value of the demographic factor, but produced an R squared value that was higher than before, although still substantially lower than the Eta squared values reported in Table 4.3.

The results of the multivariate use of demographic variables to predict and classify the purchasers of the specific frozen food products of this study are presented in the next section of this chapter.

Discriminant Analysis: Multivariate
Classification of Buyers Versus
Non-Buyers

Using subprogram "Discriminant" of the Statistical Package for the Social Sciences,³ all thirteen demographic variables were employed in a linear, multivariate analysis to determine the total ability to distinguish between the buyers and the non-buyers of the twelve specific categories of frozen food products. The direct method of discriminant analysis was used, whereby all discriminating variables are employed at once, to determine the total predictive power from all the variables employed in the analysis.

Tables 4.4 and 4.5 show the results of this analysis. In Table 4.4, the ability of the demographic variables to correctly distinguish between the buyers and the non-buyers of frozen food products is shown for each of the specific product categories. First, the percentage of all consumers who were correctly classified as buyers or non-buyers, based upon their demographic characteristics, is reported. Next, the specific percentage of buyers correctly classified is presented.

Table 4.5 presents the canonical correlation of the combined, multivariate use of the demographic predictors, a value which can be generally interpreted as a multivariate R correlation. This value, when squared, presents the total, linear predictive ability of the demographic variables, relative to observed variation in the purchase of frozen foods. The next figure presented in Table 4.5 is the percentage of non-buyers who were incorrectly predicted to be buyers.

Table 4.4 Total Classification Efficiency of the Discriminant Analysis,
Utilizing the Demographic Variables

Frozen Food Category	Percentage of All Consumers Correctly Classified	Percentage of Buyers Correctly Classified
	<u>%</u>	<u>%</u>
Breakfast-baked goods	55.9	62.4
Dessert-baked goods	56.8	60.8
Seafoods	61.1	66.8
Uncooked poultry	59.9	57.4
Cooked poultry	58.9	64.7
Potatoes	58.9	66.0
Vegetables	63.0	65.1
Fruit juices	64.8	66.6
Fruit or berries	59.3	56.3
Pizza	58.9	66.5
Complete dinners	64.4	48.5
Main courses	63.8	55.4
Average of all products	60.5	61.3

Table 4.5 Statistical Strength and Distribution of the Discriminant Analysis Using the Demographic Variables

Frozen Food Category	Canonical Correlation	Percentage of Non-Buyers Incorrectly Classified	Percentage of Buyers in Sample
		<u>%</u>	<u>%</u>
Breakfast-baked goods	.185	46.3	24.8
Dessert-baked goods	.182	44.7	27.7
Seafoods	.317	43.3	44.0
Uncooked poultry	.176	39.6	17.0
Cooked poultry	.189	41.7	9.5
Potatoes	.250	47.0	45.1
Vegetables	.231	42.1	70.2
Fruit juices	.313	38.5	64.2
Fruit or berries	.176	40.1	16.6
Pizza	.244	43.8	26.2
Complete dinners	.202	29.5	27.9
Main courses	.185	33.1	27.2
Average of all products	.220	40.9	33.3

Finally, Table 4.5 presents the actual percentage of the survey sample which was reported to purchase at least one package of each specific product during the 30 days prior to the survey.

Classification efficiency of the discriminant analysis. As discussed in Chapter I, it was hypothesized that the multivariate discriminant analysis, using demographic variables as the predictive factors, would be able to provide a meaningful ability to distinguish between buyers and non-buyers of the specific frozen food product categories. For purposes of this study, meaningful was defined as providing at least a 75 percent ability to correctly classify buyers and non-buyers.

As shown in Table 4.4, demographic variables were not able to classify the buyers and the non-buyers for any of the twelve product categories with a 75 percent ability. Thus, in this study, the above hypothesis failed for every product category.

However, while demographic predictors failed to provide classification ability at the 75 percent rate, Table 4.4 shows that eight of the twelve product categories were correctly identified as to the buyers of the product, at rates of 60 percent or greater, with four instances where buyers were correctly identified at a rate of 66 percent or greater. This success rate is far greater than mere chance, since the actual proportion of buyers in the sample was less than half of the respondent sample for ten of the twelve categories, with a percentage of buyers as low as 9.5 percent for the product category of cooked poultry, as shown in the last column of Table 4.5. Yet, buyers of

cooked poultry were correctly identified, by means of their demographic characteristics, at a rate of 64.7 percent.

Overall, the lowest success rate for classifying both buyers and non-buyers was for the product of breakfast-baked goods, with 55.9 percent of sample respondents correctly classified, for a product category where only 24.8 percent of the sample purchased any of the product. Moreover, 62.4 percent of the buyers were correctly identified.

Fruit juices showed the highest classification rate overall, with 64.8 percent of buyers and non-buyers correctly classified, and also showed a 66.6 percent rate of success in correctly classifying the buyers of this product category, for a category where 64.2 percent of respondents were known to be buyers.

Similarly, the buyers of frozen pizzas were correctly identified and classified as buyers in 66.5 percent of the instances in which survey respondents actually reported the purchase of at least one pizza, even though only 26.2 percent of the sample were actually buyers.

On an average, demographic variables were able to correctly classify all consumers as buyers or non-buyers with a success rate of 60.5 percent for the twelve frozen food product categories, and with a 61.3 percent ability to correctly classify product buyers.

Thus, while demographics failed to provide the 75 percent rate of classification that was hypothesized and hoped for in this study, the average 61.3 percent ability to correctly identify buyers does seem to be a useful segmentation technique, even if it failed to reach the "highly meaningful," 75 percent classification ability.

Statistical predictive ability of the discriminant analysis.

As shown in Table 4.5, the canonical correlation from the multivariate use of demographic variables was relatively low, averaging .220 for the twelve product categories examined. When squared, this figure indicates an average explanation of the observed purchases of frozen foods of 4.84 percent on a linear basis.

The highest canonical correlation was .317, for seafoods, giving a net predictive value of 10.05 percent. The lowest canonical correlation was for uncooked poultry and fruit or berries, both categories showing a .176 correlation to the demographic variables, for a net predictive value of 3.1 percent, a value which is not surprising, since these categories showed few statistically significant relationships to the demographics in the bivariate stage of this analysis.

Implications and the meaning of this low observed canonical correlation will be discussed later, in Chapter V. However, it should be noted that the net predictive value of the demographics is limited to the linear variation due to demographics, even though Table 4.3 suggests that much of the observed, predictive value of demographic variables in this study was actually non-linear. Moreover, the net predictive value, as measured by the linear, canonical correlation, of all demographic variables used in the study was higher than the total of any one demographic variable, even on a non-linear basis. Thus, even with admitted problems of linearity, the multivariate discriminant analysis gave an improved ability to predict the consumption of frozen food products, compared to the use of any single demographic factor.

The Value of Demographic Variables Compared to
Product-Purchase Variables as Predictors
of Frozen Food Purchases

First of all, in this section of the study, analyses are made of the bivariate predictive power of using product purchasing information to predict the purchase of individual, frozen food categories, in comparison to the predictive power of demographic variables utilized for the same function. A test of statistical significance of the relationship between the purchase of a given frozen food product category and the observed dependent relationship to the purchase of the other frozen food categories of the study represents the first stage in this analysis, to determine if such relationships exist.

Second, the bivariate predictive power is calculated for any product-to-product relationships that are proven to be statistically significant.

Third, a comparison is made between the frequency and the strength of predictive relationships that exist between product purchases in relationship to other product purchases, in comparison to the frequency and strength of the relationships found to exist between demographic variables and the purchase of the product categories.

Fourth, the multivariate ability of product-purchase variables to predict and classify the purchase and non-purchase of specific products is determined in relationship to each of the twelve frozen food product categories of this study.

Finally, the multivariate ability to predict and classify the purchase and non-purchase of each of the specific frozen food product categories, by means of purchasing information about other frozen food product categories, is compared to the equivalent ability of demographic variables to predict and classify the purchase and non-purchase of the twelve frozen food product categories of this study.

Analysis of Variance--Test of Significance

Utilizing the same analysis of variance computer program that was used to test the demographic variables, the F-test is used to determine if group purchasing means for each of the specific frozen food product categories is significantly different between the purchasers and the non-purchasers of the other eleven product categories of the study. Following the same significance rule that was applied to the significance testing of the demographic variables, an .01 level of significance is required to regard the relationship of any product-purchase category as being statistically significant to the tested, dependent product category.

The results of this series of 132 F-tests is presented in Table 4.6 (twelve product categories times eleven product categories), as the first reported value for each relationship pair. As was done in reporting the relationship significance for the demographic variables in Tables 4.1 and 4.3, relationships up to the .05 level are reported, but are not regarded as significant, according to the significance standard of this study, beyond the .01 level.

Table 4.6 The Significance and Measured Strength of Product-Purchase Variables Used to Predict Other Purchases

Frozen Foods as Independent Variables	Frozen Food Categories											
	Breakfast- Baked Goods	Dessert- Baked Goods	Seafoods	Uncooked Poultry	Cooked Poultry	Potatoes	Vegetables	Fruit Juices	Fruit or Berries	Pizza	Complete Dinners	Main Courses
Breakfast-baked goods	---	.000 .139	.000 .035	.000 .018	.000 .040	.000 .051	.000 .020	.000 .043	.000 .057	.000 .047	.000 .061	.000 .022
Dessert-baked goods	.000 .139	---	.000 .044	.000 .044	.000 .037	.000 .043	.000 .032	.000 .047	.000 .076	.000 .024	.000 .042	.000 .036
Seafoods	.000 .035	.000 .044	---	.000 .045	.000 .018	.000 .081	.000 .051	.000 .058	.000 .037	.000 .057	.019 .008	.000 .032
Uncooked poultry	.000 .018	.000 .044	.000 .045	---	.000 .014	.001 .014	.002 .014	.005 .011	.000 .022	.000 .029	.000 .030	.000 .018
Cooked poultry	.000 .040	.000 .037	.000 .018	.000 .104	---	.000 .021	.000 .019	.013 .009	.000 .056	.000 .048	.000 .050	.000 .063
Potatoes	.000 .051	.000 .043	.000 .081	.001 .014	.000 .021	---	.000 .050	.000 .057	NS ^a	.000 .042	.001 .015	.000 .019
Vegetables	.000 .020	.000 .032	.000 .055	.002 .014	.000 .019	.000 .050	---	.000 .063	.000 .034	.000 .019	.000 .020	.000 .037
Fruit juices	.000 .043	.000 .047	.000 .058	.004 .011	.013 .009	.000 .057	.000 .063	---	.000 .029	.000 .022	.044 .006	NS
Fruit or berries	.000 .057	.000 .077	.000 .037	.000 .022	.000 .057	NS	.000 .034	.000 .029	---	.000 .018	.008 .010	.002 .013
Pizza	.000 .047	.000 .024	.000 .057	.000 .029	.000 .048	.000 .042	.000 .019	.000 .022	.000 .018	---	.000 .041	.000 .073
Complete dinners	.000 .061	.000 .042	.019 .008	.000 .030	.000 .050	.001 .015	.000 .020	.044 .006	.008 .010	.000 .041	---	.000 .116
Main courses	.000 .022	.000 .036	.000 .032	.000 .018	.000 .063	.000 .019	.000 .037	NS	.002 .013	.000 .073	.000 .116	---

^aSignificance levels less than the .05 level are reported as NS. The first reported figure for each variable refers to the significance level of the analysis of variance.

As may be seen in Table 4.7, most product-purchase variables prove to be highly significant to the purchase of other product-purchase variables of this study. Only 9 of the 132 tested pairs of product purchase to product purchase relationships did not meet the .01 significance level. Only four relationship pairs did not show significance at least at the .05 level. In fact, rather amazingly, 110 of the 132 bivariate relationship pairs tested were significant at the .000 level, with many of the remaining relationships proving significant at the .001 or .002 level.

Breakfast-baked goods, dessert-baked goods, and pizza all proved to have relationships at the .000 level, relative to the purchase of each of the other eleven frozen product categories. The average product purchase variable, used as a predictor of the purchase of the other product categories, was able to show a .01 significance of relationship to ten of the eleven other products in the study, with an average of 9.25 of these bivariate relationships at the .000 level of significance.

Thus, a basic conclusion seems apparent, that the buyers of one frozen food product tend to buy other frozen food products, with a strength of statistical relationship that is far greater than could reasonably be attributed to chance distribution of purchases within the total survey sample.

Analysis of Variance--Strength of Significant Relationships

Next, again using the analysis of variance subprogram "Breakdown" from the Statistical Package for the Social Sciences," the bivariate predictive strength is calculated for all product-to-product relationships that were tested significant in the F-test.

The Eta squared statistic is calculated for each significant pair with a minimum of .05 significance, although a .01 level is required by the significance standard of this study. As can be seen in Table 4.6, relationships with a significance level less than the .01 level never displayed an Eta squared, predictive value as great as 1 percent of the observed variation in purchasing patterns of the dependent product category, thus providing verification for the appropriateness of the .01 significance rule within this study.

As noted previously in this chapter, Eta squared provides a measure of the total, non-linear predictive value of the difference in the group purchasing means in the dependent product category, that can be explained via differences in the independent, predictive variable, in this case the purchase of another frozen food product category. A test of linearity was not necessary for these relationships, since all product variables were coded into two categories, of purchase of any quantity of the product versus non-purchase of the product class. Thus, by definition, the relationship strength measured, as coded, can only be linear.

The Eta squared value for each significant pair is reported as the second figure for each relationship pair, in Table 4.6. As may

be noted, each relationship value is reported twice within the table, since each product category is tested as both a dependent and an independent variable in relationship to each of the other product categories.

Summary of the Product-to-Product Relationship Strengths

The strongest relationship shown in Table 4.6, was the link between breakfast-baked goods and dessert-baked goods, with an Eta squared score of 13.9 percent of variation in one of these product categories explained by the predictive variation in consumption in the other product within this relationship pair.

Another strong relationship was noted between frozen main courses and frozen complete dinners, where an 11.6 percent predictive relationship was found. Only one other product-to-product relationship reported as much as a 10.0 percent predictive Eta squared score. As might have been expected, cooked poultry showed a 10.4 percent relationship to uncooked poultry.

Utilizing the definition of a .05 Eta squared score being required to determine the existence of a meaningful predictive strength of relationship, there were a total of 17 product-to-product relationships that showed a predictive strength of .05 or greater, among the 66 exclusive relationship pairs that were tested in the study. Several relationships can be noted as hovering slightly above or below this .05 standard.

Another fact that can be observed within the results shown in Table 4.6 is that no one product variable provides a meaningful strength of relationship to all the other product categories. Thus, it seems necessary to know the specific predictive relationship of a given frozen food product category to another specific frozen food category, rather than assuming that the knowledge of any given frozen product can be used to provide a meaningful degree of predictive power to any other frozen food product.

A Comparison of Demographic Versus
Product Variables as Bivariate
Predictors of the Purchase of
Frozen Food Products

Based upon the results of the analysis of variance, as presented in Tables 4.3 and 4.6, product purchase data, for the specific purchases of the frozen food product categories, proved to be a generally more effective predictor of the purchase of any given frozen food product category, as compared to the bivariate predictive strength of the demographic variables of this study.

Comparing the results of the significance testing, via the F-test, product purchase variables used as predictors were notable as significant more frequently, and with a typically higher degree of statistical significance. For the product variables examined, significance levels of .000 were observed in 55 of the 66 separate product relationships tested, while Table 4.2 shows that only 32 of the 156 demographic-to-product relationships were able to meet the .01 significance level, and Table 4.3 shows that only 13 demographic relationships were found at the .000 level.

Again comparing the results of Tables 4.3 and 4.6, the Eta squared scores for the product variables as predictors are consistently higher than for the average demographic variables, and produced higher individual relationships, with three product-paired relationships over 10 percent, and with 17 relationships noted at the 5 percent predictive value defined as constituting a meaningful predictive relationship on a bivariate basis.

By contrast, within the twelve product categories examined, relative to the thirteen demographic variables tested as predictors, the highest Eta squared predictive score was 7.7 percent, and only seven relationships were noted as giving a predictive value of 5 percent or greater, from the 156 demographic-to-product relationships examined.

Thus, while some demographic relationships did prove to be meaningful predictors at the 5 percent predictive level, and were sometimes more predictive for specific products than some of the product-predictive relationships, the general conclusion from the bivariate analysis of variance is that product-purchase variables usually were more effective as predictors of specific purchases of frozen food products than were the demographic variables tested in this study.

Thus, the hypothesis, that demographic variables would prove to be equal to or more effective than the use of product-purchase variables as predictors of frozen food purchases, must generally be considered as not true, based upon the results of this study.

Discriminant Analysis: Multivariate
Ability to Predict and Classify
Buyers, Based Upon Product-
Purchase Variables

The next step in examining the predictive value of the product-purchase variables as independent variables is to apply the linear, multivariate analysis provided by discriminant analysis, as provided by subprogram "Discriminant" of the Statistical Package for the Social Sciences,⁵ in the same way that this method was applied to the multivariate use of the demographic variables, earlier in this chapter.

All product variables, except for the specific product category being examined, are used to jointly predict and classify individual purchasers, relative to their purchase of a specific frozen food product category.

The results of this discriminant analysis are shown in Tables 4.7 and 4.8. Table 4.7 shows the percentage of purchasers who were correctly classified by means of the product-purchase variables. The first column on this table presents the total percentage of both buyers and non-buyers of a specific frozen food product category who were correctly classified. The second column gives the percentage of buyers who were correctly classified as buyers of a specific frozen food product category, based upon knowledge of other frozen food categories purchased.

Table 4.8 presents the canonical correlation of the combined, multivariate use of the product-purchase predictive variables, a value which can be generally interpreted as a multivariate R correlation.

Table 4.7 Total Classification Efficiency of the Discriminant Analysis,
Utilizing the Product-Purchase Variables

Frozen Food Category	Percentage of All Consumers Correctly Classified	Percentage of Buyers Correctly Classified
	<u>%</u>	<u>%</u>
Breakfast-baked goods	74.4	66.3
Dessert-baked goods	72.7	65.3
Seafoods	70.0	68.7
Uncooked poultry	76.6	54.9
Cooked poultry	82.7	63.5
Potatoes	68.4	67.9
Vegetables	67.8	69.0
Fruit juices	66.4	67.4
Fruit or berries	73.2	60.5
Pizza	69.9	63.3
Complete dinners	71.4	64.0
Main courses	72.0	64.6
Average of all products	72.1	65.5

Table 4.8 Statistical Strength and Distribution of the Discriminant Analysis Using the Product-Purchase Variables

Frozen Food Category	Canonical Correlation	Percentage of Non-Buyers Incorrectly Classified	Percentage of Buyers in Sample
		<u>%</u>	<u>%</u>
Breakfast-baked goods	.474	23.0	24.8
Dessert-baked goods	.481	24.5	27.7
Seafoods	.441	28.9	44.0
Uncooked poultry	.395	19.0	17.0
Cooked poultry	.453	16.3	9.5
Potatoes	.414	31.2	45.1
Vegetables	.382	35.0	70.2
Fruit juices	.386	34.6	64.2
Fruit or berries	.398	24.4	16.6
Pizza	.404	27.7	26.2
Complete dinners	.428	24.5	27.9
Main courses	.449	25.2	27.2
Average of all products	.425	26.2	33.3

This value, when squared, presents the total, linear predictive value of the product-purchase variables, relative to the observed variation in the purchase of the specific frozen food product categories. The second column presented in Table 4.8 is the percentage of non-buyers who were incorrectly predicted and classified as being buyers.

Finally, the third column presents again the actual percentage of the survey sample who actually did report purchasing at least one package of the specific frozen food product category during the 30 days prior to the survey.

Classification of the discriminant analysis, using the product-purchase variables as predictors. As defined in Chapter I, the standard for determining the existence of a meaningful multivariate predictive relationship was to demonstrate at least a 75 percent ability to correctly classify the buyers and non-buyers of the specific frozen food product categories examined in this study. This section of the study will examine the ability of the knowledge about consumer purchasers in eleven frozen food categories to predict the purchase of frozen products in another specific purchase category.

As shown in Table 4.7, product-purchase variables were able to correctly classify buyers and non-buyers into the correct categories, at the 75 percent level of success, for two of the twelve product categories examined, uncooked poultry and cooked poultry, with correct classifications of 76.6 percent and 82.7 percent, respectively. In addition, breakfast-baked goods was almost able to meet the 75 percent criteria level, with a total classification success rate of 74.4 percent.

The average classification success, for both buyers and non-buyers was 72.1 percent for the twelve product categories, with the high of 82.7 percent for cooked poultry, and a low of 66.4 percent for fruit juices. The ability to correctly classify the buyers of the specific frozen food categories was somewhat less effective, with an average classification success of only 65.5 percent, with the greatest success of 73.5 percent for cooked poultry, and the poorest success for uncooked poultry, with a 54.9 percent correct classification rate.

In all twelve product categories, the knowledge of the other product purchases of the respondent was not able to provide correct classification of the buyers at the rate of 75 percent, as was hypothesized in this study. However, despite the general failure to provide correct classification at the 75 percent rate, knowledge of other frozen food purchases did seem to provide classification success for specific frozen food product categories that could be useful to the marketer of frozen food products. The implication of this observed classification success will be discussed in Chapter V.

Statistical predictive ability of the product-purchase variables. As shown in Table 4.8, the multivariate ability of the product-purchase variables to explain the variation in specific product category buying was substantially above any of the bivariate predictive ability of any one product-purchase variable, as shown in Table 4.6. The highest bivariate relationship shown in Table 4.6 was 13.9 percent, with only three bivariate relationships proven to provide predictive value greater than 10.0 percent. However, the average canonical

correlation for the twelve product categories was .425, which when squared, indicates a total linear, statistical predictive value of 18.06 percent.

The highest canonical correlation was noted for the product category of dessert-baked goods, at .481, indicating an explanation of the observed variance in purchases of 23.14 percent. The poorest canonical correlation was noted for frozen vegetables, with a score of .382, representing a 14.60 percent explanatory power from the knowledge of the purchases in the other eleven frozen food product categories.

Comparison of demographic versus product variables as predictive variables in the multivariate discriminant analysis. Based upon the results of the multivariate discriminant analysis, as presented in Tables 4.4 and 4.5 for the demographic variables, and in Tables 4.7 and 4.8 for the product-purchase variables, the product-purchase variables proved to be generally more effective in the classification and prediction of purchases of the specific frozen food products categories.

Comparing the results of the classifications, product-purchase variables were able to classify buyers and non-buyers at an average rate of 72.1 percent, and correctly classified product buyers at an average rate of 65.5 percent. Non-buyers were incorrectly identified as buyers at an average rate of 26.2 percent. An average, multivariate canonical correlation of .425 was obtained by the use of product-purchase variables, representing a statistical predictive power of 18.06 percent.

Alternatively, the demographic variables were able to correctly classify both buyers and non-buyers at an average rate of 60.5 percent, and were able to correctly classify the buyers with an average success of 61.3 percent. An average canonical correlation was obtained of only .220 from the demographic variables, giving a net predictive statistical efficiency of only 4.84 percent, with the highest reported predictive value of only 10.05 percent, well below the average 18.06 percent predictive value of the product-purchase variables. Non-buyers were incorrectly classified as buyers at an average rate of 40.9 percent by the use of demographic variables, compared to a 26.2 percent rate by the product-purchase variables.

Thus, on an average basis, the hypothesis, that demographic variables would provide a multi-variate ability to classify and predict that was equal to or greater than the ability shown by product-purchase variables, must be regarded as not true, based upon the results of this study.

However, it may be noted that demographic variables did exhibit better results for specific product categories than did the product-purchase variables. For example, demographic variables correctly classified the buyers of uncooked poultry at a rate of 57.4 percent, compared to 54.9 percent by means of product-purchase variables. Pizza buyers were correctly classified by demographics at a rate of 66.5 percent, while the product-purchase variables were correct only 63.3 percent. Seafoods, potatoes, vegetables, and pizza buyers were correctly classified at rates of over 66 percent by means of

demographics, success rates higher than the average showed by the product-purchase variables, and very close to the classification success demonstrated for these product categories by the product-purchase variables.

Moreover, it should be noted that the relatively close classification efficiency of buyers, 61.3 percent by demographic variables, on an average, compared to 65.5 percent by means of the product-purchase variables, must raise certain questions and cautions before coming to a firm conclusion as to which set of predictive variables is the best or most useful basis for the practical segmentation of the buyers and non-buyers of frozen food products in actual marketing practice.

Additionally, beyond the substantial issue of the availability of demographic data compared to specific product-purchase data in the marketplace, substantial questions must be raised about the relatively modest sample size which this study is based upon, especially when the distribution of buyers and non-buyers, as low as 9.5 percent for one product category, or 68 respondents, limit the statistical certainty of the differences noted in the classification efficiencies. Moreover, as noted previously, demographic variables often exhibited non-linear effects, thus limiting the ability to classify by means of linear, multivariate methods. These issues will be discussed, relative to implications and conclusions from this study, in Chapter V.

The Value of Total Food Purchases as a Predictor
of Specific Frozen Food Product Categories

It was hypothesized that both demographic variables and specific frozen food purchase variables would prove to be more effective than the total food purchases by the consumer respondents, relative to the prediction of the purchase of specific frozen food categories. As shown in Table 4.9, total food purchases, as a predictor variable, tended to be a relatively modest predictor of the purchases of the specific frozen food categories of this study.

Within Table 4.9, the first value indicated for each product category is the result of the F-test of significance, via the same analysis of variance program that was used to examine the effect of the demographic and the product-purchase variables on a bivariate basis. Significance levels are reported up to the level of .05, but the defined level of significance, for purposes of this study, to require a statistically significant relationship at the .01 level. Within Table 4.9 it can be noted that only four of the twelve product categories exhibited a relationship that was significant at the .01 level, with two more categories showing weaker relationships within the .05 significance level.

The second value presented for each product category, if a minimum of a .05 significance level was exhibited, is the Eta squared value for the relationship, representing the total, non-linear predictive value of knowing total food purchases, relative to the ability to predict or explain the variation in the purchases of the specific frozen food categories.

Table 4.9 The Predictive Effect of Total Food Purchases and Home Freezer Ownership on Frozen Food Purchases

Dependent Variables Frozen Food Category	Predictive Variables	
	Total Food Purchases	Ownership of a Separate Freezer
Breakfast-baked goods	.000 .056 .031	NS
Dessert-baked goods	.037 .028 .011	NS
Seafoods	NS	NS
Uncooked poultry	NS	NS
Cooked poultry	NS	NS
Potatoes	.019 .031 .023	NS
Vegetables	.001 .044 .017	NS
Fruit juices	.001 .042 .022	NS
Fruit or berries	NS	NS
Pizza	.001 .044 .027	NS
Complete dinners	NS	NS
Main courses	NS	NS

As Table 4.9 shows, the highest Eta squared value found was in relationship to the purchase of breakfast-baked goods, with a value of 5.7 percent. Yet, dessert-baked goods did not exhibit an .01 level of significance, and only showed a 2.8 percent Eta squared value, with a significance of .037. Frozen vegetables and pizza showed a 4.4 percent predictive ability, as measured by the Eta squared score, and a score of 4.2 percent was exhibited, relative to the purchase of fruit juices. Frozen potatoes also failed to meet the .01 significance test, with a reported .019 significance level, but showed a 3.1 percent predictive value of Eta squared. No other relationships were able to meet even the less significant F-test level of .05.

The third value reported for significant purchase relationships to total food purchases is the R squared value, which measures the linear predictive value of knowing the consumer's food purchases. As can be seen in Table 4.9, there was substantial variation, and loss of predictive power, by the use of the linear R squared measurement compared to the non-linear Eta squared measurement. Among the four relationships significant at the .01 level, an average non-linear predictive score of .046 was noted, but only a .024 average linear score, an approximately 48 percent loss in predictive value. Thus, among the relationships that were significant, the relationship was relatively non-linear.

By comparison with Tables 4.3 and 4.6, the value of total food purchases as a predictor of specific frozen food purchases, compared to the use of demographic variables, or the use of specific product-purchase variables, would not seem to be very effective.

Specific demographic variables often exhibited stronger predictive relationships to specific frozen food product categories. Moreover, total food purchases exhibited relationships at the .01 level to only four frozen food categories, and only two more at the .05 level. By comparison, demographic variables exhibited .01 relationships to nine of the twelve frozen food product categories, and a total of eleven categories showed at least a .05 level of significance to at least one of the demographic variables tested.

The product-purchase variables exhibited an average of 9.25 percent relationships at the .000 level, between a specific frozen food category and the other eleven categories used as predictive variables. An average of over ten categories was significant at the .01 level, with most relationships providing predictive values that were higher than the few reported predictive relationships based upon total food purchases.

Thus, total food purchases did not seem to be as effective as either demographic variables or specific product-purchase variables in predicting the purchase of specific frozen food product categories, thus supporting the hypothesis about the relative effectiveness of total food purchases as a predictor of frozen food purchases.

The Value of Freezer Ownership as a Predictor of the Purchase of Specific Frozen Food Product Categories

Although every reported study of frozen food purchases has asked about the existence of a separate freezer unit in the household, none of these studies has reported any test of the significance or the

predictive value of this relationship, if any relationship exists. In fact, since this question always seems to be part of past frozen food studies, the assumption by past researchers seems to be that a relationship is present between freezer ownership and the purchase or consumption of frozen foods.

The hypothesis of this study was that freezer ownership would not provide a statistically significant or meaningful predictive relationship to the specific frozen food product categories of this study. As shown in Table 4.9, the ownership of a separate freezer unit did not exhibit a single statistically significant relationship, at either the .01 or the .05 level, to any of the specific frozen food categories, thus conclusively proving the hypothesis of this study about the predictive value of freezer ownership; there was none.

CHAPTER IV--FOOTNOTES

¹Norman H. Nie, C. Hull, J. Jenkins, K. Steinbrenner, and D. Brent, Statistical Package for the Social Sciences (New York: McGraw-Hill Book Co., 1975), pp. 249-275.

²Ibid.

³Ibid., pp. 434-467.

⁴Ibid., pp. 249-275.

⁵Ibid., pp. 434-467.

CHAPTER V

CONCLUSIONS AND IMPLICATIONS

Introduction

The purpose of this chapter is to present the conclusions and the implications of this study. The first section reports the overall conclusions about the research hypotheses of the study, based upon the empirical research findings presented in the previous chapter. The second section discusses the research implications of the study for further use of demographic variables as a basis for market segmentation. Next, the third section presents the management implications of the findings. Finally, the fourth section offers some suggestions for further research.

Conclusions

The Use of Demographic Variables as Purchase Predictors

The major hypothesis of this study was that demographic variables can be used to successfully predict and segment the purchasing behavior for consumer products. Specifically, the research of this study focused upon the ability of demographic variables to predict and segment the purchasing behavior for twelve specific categories of frozen food products, as a means of testing this major hypothesis.

During the course of testing this major hypothesis, four subhypotheses were considered, relative to the degree that demographic variables could be tested and proven effective in predicting product purchases. These four subhypotheses were as follows:

- a. There will be a statistically significant, bivariate relationship between the individual demographic variables and the purchases of specific frozen food product categories at the .01 significance level.
- b. There will be a bivariate predictive relationship between individual demographic variables and the purchases of specific frozen food product categories with a total non-linear predictive power of 5 percent or more.
- c. There will be a linear predictive relationship for demographic variables that are significantly related to the purchase of specific frozen food products on a bivariate basis.
- d. There will be a multivariate predictive relationship between the total set of demographic variables and the purchases of specific frozen food product categories with the resultant ability to correctly classify 75 percent or more of the product purchasers and non-purchasers.

Conclusions from the empirical testing of each of these four subhypotheses will be presented in order, followed by an overall conclusion about the ability of demographic variables to successfully predict and segment the purchases of the frozen food categories of this study.

Statistical significance of the bivariate relationships. As noted above, the first subhypothesis of the major research hypothesis of this study considers the statistical significance of the bivariate relationships between the individual demographic variables and the specific frozen food categories of this study, to determine if

relationships exist beyond what could reasonably be attributed to chance variation in sampling. A total of 156 bivariate relationships were examined (thirteen demographic variables times twelve frozen food categories) in an analysis of variance, via the F-test.

The basic conclusion from this series of statistical tests is that significant relationships do exist between some individual demographic variables and the purchase of specific frozen food product categories, thus generally proving this subhypothesis of the study.

Altogether, 32 relationships were found to be significant at the .01 level, and a total of 56 relationships were noted at a more liberal .05 significance level. However, it should be noted that the existence of significant relationships varied substantially between specific product categories, both in the number of demographic variables which exhibited a significant relationship, and also in terms of which particular demographic variables were shown to be related.

No single demographic factor proved to be significantly related at either the .01 or the .05 level to all of the twelve tested product categories. In fact, the maximum number of products significantly related to a single demographic variable was only five, exhibited by both the variables of age and the number of persons in the household.

Moreover, the demographic factors were more likely to show statistical relationship to certain product categories, rather than others. Thus, at the .05 level, ten of the thirteen demographic variables exhibited significant relationships to the purchase of seafoods, while not one demographic variable exhibited this level of significance in relation to the purchase of frozen fruits or berries.

At the hypothesized .01 significance level, demographic variables exhibited at least one significant relationship to nine of the twelve tested frozen product categories. At the more liberal .05 significance level, demographic variables proved to have at least one significant relationship to eleven of the twelve product categories.

Predictive power of the bivariate relationships. The second subhypothesis regarding the use of demographic variables as purchase indicators was that there would be a bivariate predictive relationship between individual demographic variables and the purchase of specific frozen food product categories, with a total, non-linear predictive power of 5 percent or more. All relationships were examined that exhibited at least an .05 significance level.

Of the 156 bivariate relationships that were originally examined by this study, only six instances were found where a demographic variable was able to provide at least a 5 percent predictive Eta squared value for the purchase of a given category of frozen foods.

Thus, the general conclusion from this study was that on a bivariate basis, most demographic relationships that were tested, even though statistically significant, did not provide meaningful statistical predictive strength, even at the seemingly modest standard of providing a 5 percent or greater predictive power.

In fact, study findings show that relationships which failed to meet the hypothesized significance standard of .01 on the F-test rarely provided predictive strength as high as 1 percent, relative to the observed variance in purchases of the tested product categories,

thus providing empirical justification for adopting the relatively strict .01 significance standard.

Thus, while a few instances of meaningful demographic, bivariate relationships were found, this subhypothesis must generally be regarded as having failed. However, sufficient bivariate predictive power was found to provide some potential for the multivariate prediction of product purchases, to follow in this study.

Linearity of the bivariate relationships. Most prior studies of the relationship of demographic variables to product purchases have made the basic assumption that the predictive value of such relationships was substantially linear, both for the sake of simplicity in research, and also to allow the use of many statistical techniques that require the existence (or assumption) of a linear relationship. In fact, the multivariate method to be used in this study requires such an assumption, since it considers only the linear predictive powers of the independent variables in calculating multivariate predictive efficiency.

The third subhypothesis of this study, regarding the use of demographic variables as product purchase predictors, was that the predictive power of the demographic variables was indeed linear, thus testing this common, but typically unverified research assumption.

Therefore, the linear R squared predictive value of each significant relationship was calculated and compared to the total non-linear Eta squared value for the relationship. To the degree that R squared is less than Eta squared, predictive power is lost from the assumption of a linear relationship.

The general conclusion of this test was that many of the relationships between demographic variables and the purchase of the tested frozen food categories were substantially non-linear. The result was that half or more of the total, predictive value of a demographic variable was often lost by use of the linear R squared measurement, compared to the non-linear Eta squared measurement of predictive value. For example, the number of persons in the household was shown to have a 4.9 percent predictive Eta squared value relative to the purchase of seafoods, and a 5.0 percent value relative to the purchase of frozen fruit juices. Yet, the R squared values were only 2.3 percent and 2.0 percent, respectively, thus indicating a net predictive loss of about 60 percent of the non-linear value. Similarly, income gave a 4.3 percent non-linear value for the purchase of seafoods, but showed only a 1.2 percent linear value.

A basic conclusion, then, is that the assumption of linearity is often a significant cause of loss of predictive power for most of the tested bivariate relationships in this study that exhibited a significant statistical relationship, thus generally disproving this subhypothesis of the study. A resultant conclusion would be that non-linear statistical methods would increase the net predictive power of demographic variables, and should be employed when possible.

Unfortunately, the availability of appropriate non-linear multivariate techniques is very limited, and often requires much larger sample sizes to be statistically appropriate, limitations that both apply to this study. The issue of linearity will be discussed later

in this section, as a limitation affecting the multivariate portion of this study, and also will be discussed as an implication of this study, later in this chapter.

The immediate solution for this study was to recode some of the response categories for the demographic variables which exhibited the most drastic loss of predictive power by the assumption of linearity, by combining categories with similar purchase means. The result is loss of detail, as well as some loss of predictive efficiency, with the remaining predictive values continuing to be less than true, non-linear predictive values. Thus, unfortunately, the linear, multivariate discriminant analysis to follow in this study must be considered flawed by the relative failure to include the total bivariate predictive values of the demographic variables.

Multivariate classification of product purchasers. The fourth subhypothesis about the use of demographic variables as product purchase predictors was that the multivariate use of the demographic variables would provide a multivariate ability to predict product purchases of the specific frozen food categories of this study, with the resultant ability to correctly classify 75 percent or more of the product purchasers and non-purchasers.

The results of this test showed that the total set of demographic variables was not able to classify the purchasers and the non-purchasers for any of the twelve frozen food product categories with a 75 percent rate of success. Thus, by the standards of the subhypothesis, the empirical results of the discriminant analysis failed to support the subhypothesis.

However, while demographic variables failed to provide the defined, highly meaningful classification ability of 75 percent, the research findings did show that eight of the twelve product categories were correctly classified, as to the purchasers of the category, at rates of 60 percent or greater, with four instances of a 66 percent ability to correctly distinguish category purchasers. Buyers were correctly identified at an average rate of 61.3 percent, and all respondents were correctly identified as buyers or non-buyers at an average rate of 60.5 percent.

Thus, while demographics failed to provide the 75 percent or greater rate of classification accuracy that was hypothesized and hoped for in this study, the classification rates that were obtained seems to provide at least a useful ability to distinguish product purchasers from non-purchasers, based upon knowledge of the purchasers' demographic characteristics.

Another conclusion that might be inferred from the demonstrated classification rates, combined with the relative failure of the sub-hypothesis relating to linearity of the demographic predictors, would be that the ability to include the total, non-linear predictive values of the demographic variables might allow total classification efficiency that could reasonably be projected to at least come closer to the hypothesized rate of classification, based upon the proportional differences between the linear and the non-linear bivariate predictive values.

The square of the canonical correlation can be used to indicate a predictive efficiency that is equivalent to a multivariate R squared. By this measurement, the predictive value from the use of the demographic characteristics remained low, averaging 4.84 percent predictive ability for the twelve tested product purchase categories, with a high predictive score of 10.05 percent relative to the multivariate, linear predictive value for the purchases of seafoods. However, even with admitted problems of linearity, the multivariate linear value for each of the product categories was higher than any one demographic variable could offer per product on a total non-linear basis.

Thus, even though the lack of linearity limits the total accuracy of the linear discriminant analysis technique, it still provided better predictive totals than the non-linear measurement on a bivariate basis. Moreover, the 61.3 percent average ability to identify the purchasers of specific product categories, when the average proportion of purchasers was only 33 percent of the survey sample, indicates that the multivariate classification functions derived from the demographic characteristics of the survey sample gave a resultant ability to identify and classify product purchasers that was somewhat higher than the 4.84 percent statistical predictive value might otherwise suggest.

Summary--The use of demographic variables as purchase predictors. Based upon the findings and conclusions from the testing of the four sub-hypotheses relating to the use of demographic variables as purchase predictors, the overall conclusion would be that demographic

variables can be used to successfully predict and segment the purchasing behavior for consumer products.

A number of statistically significant relationships were found, but it should be noted that such relationships varied greatly between product categories, thus indicating that the broad category of total frozen food purchases, as used by several previous studies of the frozen food purchaser, may be too heterogeneous to be regarded as a distinct product category. No single demographic factor was significantly related to more than five of the twelve frozen food categories tested as dependent variables of this study.

Demographic variables generally failed to provide a meaningful predictive power of 5 percent or greater on a bivariate basis, but despite the relative lack of linearity, were still able to provide sufficient classification power in a linear discriminant analysis to correctly identify and classify the purchasers within the twelve frozen food categories at an average success rate of 61.3 percent. While this classification rate was less than hypothesized or hoped for, it would still appear to be evidence of a useful ability to identify the purchasers of these product categories.

Finally, it was concluded that the use of non-linear methods would be likely to increase the success of classification.

A Comparison of Demographic Variables
to Product-Purchase Variables as
Predictors of Frozen Food Product
Purchases

The second hypothesis of this study was that demographic variables would prove to be equal to or more effective than the use of product-purchase variables, in the ability to predict the purchases of frozen food product categories, and to classify them into segments of purchasers and non-purchasers of each specific frozen food category.

For purposes of testing this hypothesis, statistical tests were performed that were parallel to the tests used to examine the use of demographic variables as predictors, with the results compared on both a bivariate and a multivariate basis. Purchases for each specific product category were employed as independent, predictive variables, relative to the purchase of the other product categories used in this study, testing a total of 66 product-to-product relationships.

The overall conclusion is that this hypothesis failed. Product-purchase variables were generally found to be better predictors in all tests, although the predictive advantages were not found to be so great that the use of demographic segmentation techniques should be abandoned as totally inferior.

Comparative statistical significance of product-purchase variables. In the tests of statistical significance, the average product-purchase variable was found to be significant at the .01 level with ten of the other eleven product categories, with an average of 9.25 percent of these relationships at the .000 level. Thus, an apparent conclusion is that buyers of one frozen food product tend

to buy other frozen food products. Moreover, the proportion of bivariate relationships based upon product-purchase predictors that were found statistically significant at the .01 level, was substantially higher than shown by the demographic predictor variables.

Comparative bivariate predictive strength of product-purchase variables. Using the standard of a 5 percent or greater Eta squared value as an indication of meaningful predictive strength, 17 product-to-product relationships gave a meaningful predictive value, compared to only six demographic relationships. The highest Eta squared score by a product purchase variable was 13.9 percent, compared to the highest demographic predictive relationship of 7.7 percent.

However, it may be noted that no single product-predictor gave a meaningful predictive value to all the other product categories, thus requiring that specific product-to-product relationships be known, rather than assuming that the knowledge of any frozen product purchase can be used to provide a power of predictive ability that is meaningful to any other product. In addition, specific demographic to product relationships were frequently equivalent or higher than given product-to-product relationships for the same specific frozen food category.

The coding form and structure of the product-to-product relationships resulted in an Eta squared measurement that could only give a linear relationship, thus the assumption of linearity was not an issue for the linear, multivariate discriminant analysis using the product-purchase variables.

Comparative classification efficiency of product-purchase variables. Product-purchase variables were usually superior to the use of demographic variables for the classification of product purchasers and non-purchasers of the specific frozen food product categories of this study, although specific instances were found where demographics proved to be basically equivalent or slightly better for classification purposes.

The average classification success rate, for both purchasers and non-purchasers was 72.1 percent for the twelve studied categories, compared to a 60.5 percent average by means of demographic variables. However, in the identification of the actual purchasers, probably the most important factor to an actual marketer of frozen foods, the product-purchase variables gave only a 65.5 percent rate of success in classification of the purchasers, compared to a 61.3 percent rate by means of demographics. This difference could have been caused by basic sampling and/or coding error, as well as by the previously noted loss of predictive power by the demographics, caused by the assumption of linearity for the discriminant analysis.

Thus, based upon the sample and the statistical method used by this study, product-purchase variables were found to be generally more effective in multivariate classification of the product purchasers and non-purchasers. However, the caution is made that a different sample of respondents, a larger sample, or the use of non-linear discriminant methods, might all be expected to reduce much of the observed differences in the classification abilities of demographic variables compared to the use of product-purchase variables.

Another factor that should be noted in this comparison is that the canonical correlation value of the product-purchase variables was substantially higher than for the demographics. The average multivariate linear predictive value of the product-purchase variables was 18.06 percent, compared to the average of only 4.84 percent by means of demographic variables, thus indicating a clear predictive superiority for the product-purchase variables. Again, it should be noted that the assumption of linearity can be expected to reduce the reported predictive value of the demographic variables, due to substantial non-linearity of the bivariate demographic relationships to the product purchases.

The Value of Total Food Purchases
as a Predictor of Specific Frozen
Food Purchases

The third hypothesis of this study was that both the demographic variables and the specific frozen food product purchase variables would prove to be more effective than the total food purchases by the consumer-respondents, relative to the prediction of the purchase of specific frozen food categories. This hypothesis was tested by means of the same bivariate tests of significance and predictive power that were used to examine the use of demographic and product-purchase variables.

This hypothesis was basically proven to be true. At the .01 level of significance, total food purchases was significantly related to four frozen food product categories, a frequency of relationship that was matched or bettered by several demographic variables, and by all the product-purchase variables. Even at the .05 level, total food purchases exhibited a relationship to only six of the twelve categories,

compared to an average product-purchase variable that exhibited an .01 relationship to ten of the other eleven product categories.

In terms of bivariate predictive power, the highest strength of relationship was only 5.7 percent, a value that was matched or exceeded by several demographic and product-purchase variables. The average predictive value among the six relationships at the .05 level was 4.1 percent, but it may be noted that the linear portion of this explanatory value declined to 2.2 percent, a net loss of 46 percent of predictive power from the non-linear value.

Thus, the use of total food purchases did not seem to offer any clear advantage to the use of either demographic or product-purchase variables, and in most cases, would provide less net predictive value than either of these tested alternatives.

The Value of Freezer Ownership as a Predictor of Specific Frozen Food Purchases

The fourth and final hypothesis was that freezer ownership would not provide either a statistically significant or meaningful predictive relationship to the purchases of the specific frozen food categories of this study. This hypothesis was also tested by means of the tests of significance and bivariate predictive power, as was used in the prior three hypotheses.

The conclusion of this study is that no significant relationship exists between freezer ownership and any of the frozen food product categories at the .01 or the .05 levels of significance, thus, the hypothesis must be regarded as being rather conclusively proven.

Since no statistical significance was found to exist, no predictive power was calculated.

Research Implications of the Study

The Use of Demographic Variables as Segmentation Criteria

The major implication of this study is that demographic variables may have the potential, if not the demonstrated ability, to segment product purchasers and non-purchasers, with a useful degree of accuracy.

As noted in the conclusions, the use of a linear, multivariate discriminant analysis was handicapped by the fact that much of the predictive power of the demographic variables used in this study was found to be non-linear. Yet, the use of demographic characteristics of the survey sample still resulted in an average ability to distinguish product purchasers, of the specific product categories, that was correct 61.3 percent of the time. This degree of classification success would seem to provide at least a useful tool for the marketing researcher or practitioner, even if a higher predictive ability is desirable, for purposes of basic sales projections, as well as media selections relative to the expected demographic characteristics of predicted purchasers.

Moreover, as cautioned previously in Chapter I, relative to expected limitations of this study, the set of demographic variables employed in this study was limited, and did not include other factors such as regionality, ethnic background, religion, age, or number of

children, or the stage in the family's life cycle; such additional demographic factors might be expected to provide additional variance in product purchases, and additional classification accuracies, by means of demographic variables.

Although the demographic factors employed did not prove to provide the same degree of predictive power as exhibited by the use of product-purchase variables, this should not imply that product-purchase variables should be used by future practitioners or researchers as a more desirable or more practical basis for market segmentation, based upon the findings of this study.

Rather, as noted by Arndt,¹ the evaluation of the total usefulness of predictor variables for segmentation purposes must be considered relative to the combined operational requirements of identifiability, accessibility, and predictive efficacy. Thus, although the product-purchase variables exhibited a higher degree of predictive ability, expected problems of identifiability and accessibility may severely limit or even preclude the use of the product-purchase variables as a practical, operational method of market segmentation. The limited ability to identify who does buy the other products, without surveying individuals, rather than representative samples, may leave the marketer with the problem noted previously by Twedt;² volume buyers may only be identifiable as being volume buyers, thus limiting the ability to operationalize segmentation efforts toward consumers who are defined as being product buyers. Similarly, even if buyers can be identified, accessibility,

via media alternatives, can be expected to raise additional problems in reaching the desired segments of the market without virtual blanketed, promotional efforts. The result may well be that a product-purchase based segmentation effort would need to be translated to demographic terms, in order to solve the operational needs of identifiability and accessibility, as well as applying predictive efficacy.

Thus, the average ability of the product-purchase based classification to distinguish buyers at an average 65.5 percent rate, compared to a 61.3 percent rate by the demographics, may not prove to be sufficient predictive advantage relative to the use of a demographic based classification of product buyers, when the additional operational advantages of the demographic variables are considered. The relative closeness of the classification ability of the demographic variables, compared to the use of product-purchase variables, would seem to provide a significant implication, that demographic variables may be the most useful, operational method of distinguishing and marketing to market segments.

Moreover, if the use of additional demographic predictor variables can be integrated with the use of non-linear, multivariate techniques, the demographic variables may prove to exhibit predictive efficacy that is very comparable to product-purchase based segmentation methods.

Thus, the use of demographic variables should certainly not be ignored or abandoned as potential segmentation criteria, despite several studies, including this one, that report a higher predictive efficacy

via the use of product-purchase variables. If the predictive efficacy of demographic variables can achieve values that are reasonably close to the multivariate classification of buyers and non-buyers by means of product-purchase variables, as was done in this study, the implication must be that demographic variables may provide an operationally more useful method of segmentation.

Specific Versus General Segmentation

A second implication of this study's findings would be that segmentation efforts directed toward specific products are likely to be more accurate than segmentation of general product markets.

Using either the demographic or product-purchase variables, it was obvious that associated predictive relationships varied substantially, both in frequency of significant bivariate relationships, as well as in the predictive values. Moreover, the classification success of the multivariate discriminant analysis varied even more dramatically, between the tested specific product categories of this study.

Thus, this implication seems to echo the conclusion by Weisenberger,³ who suggested that the more micro-approach of specific product segmentation is more likely to offer an accurate definition of the consumer, compared to attempts at general segmentation of a broad, product class.

Therefore, segmentation efforts toward specific product categories, such as frozen seafoods, are more likely to be successful than attempted segmentation of more general categories of products,

such as total frozen foods. Similarly, segmentation relationships that are established for a product category such as seafoods, may not provide practical segmentation efforts toward frozen fruit and berries, a product category for which no statistically significant demographic relationship was found, among the demographic variables used in this study.

Thus, while it may be tempting for a multiproduct, multibrand manufacturer or industry to conduct a single study, trying to establish a single consumer profile for a broad line of products, the results are likely to continue to be less than satisfactory. General categories of measured purchase response can only be expected to achieve, at best, general predictive ability. Relative failure of demographic variables to predict some product categories as well as others might suggest that some categories are too heterogeneous in the range of included products, such that specific relationships for specific products are lost within a relatively diverse category-group of products.

For example, cheap TV dinners are likely to appeal to a different demographic profile than Weight Watcher diet dinners. Thus, the limited ability of demographic variables to accurately predict the purchases of frozen complete dinners may relate to a growing diversity of product price, function, prestige, and universality of product use within this combined category of frozen food products.

Thus, the moderate degree of classification success of purchasers does not imply that higher levels of classification

efficiencies do not exist within the product categories tested in this study. Similarly, the diversity of both bivariate and multivariate relationships toward the purchase of the specific product categories of this study, on either a demographic or product-purchase variable basis, suggest that segmentation of a typical "frozen food" purchaser would only be accomplished in more general and less accurate terms.

Therefore, a broader implication of this study may be that the observed failure of demographic variables in other, past segmentation studies to accurately predict product purchases may be due not to the lack of predictive ability for demographic variables per se, but rather to the generality of the defined product markets that were utilized as the dependent variable.

Statistical Significance Versus Predictive Strength

A third basic implication of this study's findings is that many prior studies of demographic variables, as well as those who accept their conclusions, may have fallen into a "semantic trap," by incorrectly perceiving that a finding of statistical significance can be translated to mean an important or meaningful relationship has been determined to exist, that therefore would be useful to the marketer in explaining the purchase behavior of the consumer.

The term, statistical significance, does not directly imply that meaningful predictive strength is present in the relationship, but only that the relationship was shown to exhibit a tie that was beyond normal expectations of random variation that could be expected

to result from chance in the sampling process. Thus, even at the .05 level of significance, probably the most popular level of significance for academic research, the observed relationship could have been expected to occur, due to chance, five times in one hundred.

Although 56 of the 156 bivariate relationships between demographic variables and specific frozen food categories were shown to be statistically significant at the .05 level, only six of these relationships proved to provide the hypothesized predictive strength of 5 percent or greater, that was regarded as a meaningful strength of relationship. Similarly, the study findings showed that relationships which exhibited a significance level higher than .01 rarely had a predictive strength that reached as high as 1 percent.

Therefore, the implication of this finding is a simple warning that statistical significance is generally only a first step in the research process, to determine if a relationship is likely to exist beyond expected variations due to chance. Additional statistical analysis is required before assuming that a statistically significant relationship is an important or useful relationship. However, if a statistically significant relationship is not found to be present, the presence of an important, predictive relationship is highly unlikely.

Thus, reported levels of statistical significance might be more properly regarded as indicating that some relationships probably do not exist, rather than a direct implication that relationships that meet the established test of statistical significance should be regarded

as important for explaining variation in the tested, dependent variable.

Linearity of the Demographic Relationships

The fourth basic implication of this study flows from the finding that a substantial part of the predictive power of the relationship between the demographic variables and product purchases was non-linear. Thus, the use of a linear, statistical measurement of the predictive strength of the demographic variables in this study was shown to reduce the predictive strength of these tested relationships, compared to the total, non-linear statistical measurement of these relationships.

Beyond the obvious limitations upon the use and interpretation of the linear, multivariate discriminant analysis used in this study, the finding of significant non-linearity also has important implications for past and future studies of the relationship of demographic variables to product purchases.

Most reported studies have simply made the assumption that the relationships were linear, without specific testing of the actual relationship linearity. To the extent that the predictive powers of the demographic variables are non-linear, research conclusions based upon linear techniques, such as R squared, linear discriminant analysis, and linear regression, must be considered somewhat suspect. Reported conclusions about predictive strength or ability must be perceived as conclusions about linear strength of the relationship, not necessarily

the actual, total strength that might be derived from a non-linear measurement of the relationship.

However, the major implication, from a finding of significant loss in actual predictive strength via linear statistical methods, would be that non-linear methods should be used, when available to the researcher, and when consistent with the size and format of the research data base. This implication will be discussed further, as a suggestion for further research, later in this chapter.

Management Implications of the Research Findings

Demographics as an Operational Management Technique

Implications of this study for marketing management generally parallel the research implications, as discussed in the previous section. However, it seems appropriate to bring attention to some specific implications of the research findings, relative to suggested application and meaning for the industry level marketing practitioner, relative to the use of demographic segmentation.

The basic implication is that demographic segmentation seems to have a very real potential for prediction of product purchases. Even if other methods of segmentation delineation seem to offer some predictive advantages over the use of demographic techniques, demographics are likely to offer significant advantages in the identifiability of the consumer in existing, or even projected markets, by readily available demographic profiles for most metropolitan areas. Moreover, the dimension of accessibility to targeted consumer segments is usually another

major advantage of demographic techniques, since most media that offer consumer data about their audiences have limited their data to demographic characteristics of their audience-market." Thus, as long as reasonable predictive efficacy can be obtained via demographic segmentation criteria, demographics may be the most practical operational method of predicting consumer response, as well as targeting marketing efforts.

The demographic variables that were researched in this study did provide a useful degree of predictive efficacy for most of the frozen food categories that were utilized in the empirical research of this study, with the results leading to related implications about methodologies that could be expected to increase the level of predictive efficacy that was demonstrated in this study. The results, combined with the comparative analysis of prior industry studies in the frozen food industry, also resulted in some strong implications for the marketing manager, to avoid some of the mistakes that have limited the past value of demographic segmentation attempts.

The Need for Basic Statistical Testing

One of the strongest implications of this study is that greater acceptance, use, and understanding of statistical techniques is a necessity for the practical, effective use of demographic segmentation. A sentiment expressed by many industry researchers and managers is that industry practitioners do not care about statistics, they only want results, as a rationale for ignoring or refusing to use even basic statistical techniques.

This common but unfortunate practice in market research is satirically discussed by Robert Ferber, in "How Not to Do Research--An Editorial."⁵ In this discussion, Ferber facetiously suggests to market researchers:

In analyzing the data, don't bother to make significance tests. If people will not accept your word on the reliability of the data, too bad. Any results are meaningful in some sense, so with a little rationalization you can have a truly significant piece of work.⁶

Unfortunately, published "results," reported conclusions, or management decisions that are based upon statistically invalid and/or untested relationships, cannot be reasonably expected to effectively contribute to the practical knowledge or management expertise of the marketing practitioner. Published or company level studies that purport to present findings or conclusions about demographic relationships to product purchases, without any reported process of statistical testing, should be regarded with a high degree of scepticism. The marketing practitioner need not be a statistical expert to at least recognize the necessity of basic statistical testing methods, as well as to appreciate the potential of more elaborate, multivariate techniques.

The Need for Multivariate and Non-Linear Techniques

Another research implication for marketing managers is that multivariate statistical methods will probably be a necessity for accurate use of demographic segmentation methods. As shown in the research of this study, no one demographic variable was significantly related to all of the product categories. Moreover, the bivariate

demographic predictive powers were generally too low, individually, to give practical predictive value. Yet, the multivariate use of techniques such as discriminant analysis may be able to combine several bivariate relationships of limited predictive power to provide a multivariate basis for predicting purchases and classifying buyers that may be very useful to marketing management, with an increase in net predictive results for industry operationalization.

Moreover, the empirical research of this study showed that much of the predictive power for the demographic variables was lost by means of linear measurement techniques. Thus, the implication that non-linear techniques should be used, when possible, seems quite clear, since greater predictive power would be expected to result from the same set of demographic variables, as well as delineating possible relationships that may have been hidden by linear statistical analysis.

Modern computer facilities are available to most marketing firms today, even on a time-sharing basis, along with a growing support base of statistical programming, such that the suggestion of non-linear and multivariate techniques should not be unreasonably difficult or costly to obtain, particularly in comparison to the cost of collecting a modern market research survey, or in relationship to the possible value to the firm of being able to more accurately segment the market for its product or to better predict product sales.

Some Practical Management Uses for
Demographic Segmentation

Beyond the value of delineation of market segments as targets for active marketing efforts, demographics may prove to be especially effective in the prediction of future sales, based upon the data provided by regional surveys or test markets relating product sales to demographic traits of the purchasers. Thus, as a new product is expanded beyond a test market, the information relating to who purchased the product could be used to select media alternatives, adjust image, or alter other marketing efforts to better appeal to those persons who should be the target of the firm's marketing efforts, if a definite buyer segment can be defined within the general population. Similarly, knowledge of the demographic characteristics of who purchased the product in one region or test market could allow better prediction of expected sales in a new region, based upon the demographic purchasing characteristics of the data base, extrapolated to the demographic characteristics of the new regional target market.

Thus, sales territories could be more accurately evaluated for the marketing potentials of sales territories, for purposes of expansion or contraction of marketing efforts or product offerings, by means of the demographic profiles of the consumers known to live in the territories under analysis. For example, changes in price, taste, image, or distribution could be tested in a reasonably representative area, related to demographic variables of the purchasers, and then used to project results of such changes much more accurately than for simply the "average" consumer. Demographic adjustment of test

market results should also make it much easier to utilize test markets, since demographic profiles of the test market need not be as representative of the total market, as long as the relationships between demographic variables and purchases can be assumed to be consistent between the test market and the market area for which a marketing projection is sought.

Demographic projections of consumer purchases could also be very useful to marketing management in the prediction of future sales trends for a given product market, by means of the very accurate projections of demographic changes that are expected in the market which are readily available to the market researcher through such sources as government planning agencies, or the academic research in the field of Demographics. However, it should be noted that longitudinal studies, of demographic purchasing relationships over time, are noticeably vacant in the marketing literature, not only for demographic segmentation, but for all segmentation techniques.⁷

Failure to Find the "Northwest Passage"

The failure to find a demographic-based "Northwest Passage" to market segmentation should not be perceived as a failure of this research. Rather, the road to effective use of demographic segmentation criteria is likely to come from the path of investigating specific product purchasing relationships, rather than trying to establish a general pattern for a broad family of products. While there is a constant temptation to cut corners in the cost of market research and strategic segmentation efforts, by seeking a single segmentation

pattern that can be applied to an entire group or family of products, the findings of this study suggest that efforts in segmentation are more likely to be successful, when directed toward specific products rather than a general product line.

The Need for New Research Data Collection Methods

A final, and resultant, implication to marketing management is that the combined need for specific product purchase data, non-linear and multivariate statistical techniques, and the use of an expanded set of demographic variables, all point to the requirement of larger sample sizes for market research data inputs than have typically been collected for past segmentation studies. This apparent need for larger sample sizes, to develop a more accurate data base for the effective use of demographic segmentation as well as the desire for information that is reflective of current market conditions, both point to the need for new techniques in collecting and processing of market research data inputs. This need becomes even more pronounced when the rising costs of traditional research techniques, such as the use of in-home questionnaires, is also recognized.

Thus, just as the computer has become the principal method of analyzing large data sets, the computer may also become the principal method of data collection, with a resultant solution to current marketing research problems of obtaining the large, current data base that becomes necessary in the use of the suggested multivariate techniques, for the use of demographic variables as segmentation criteria. It is

suggested that the use of passive data collection methods, such as by the use of electronic computer-based cash registers, may provide such a data source, if consumer purchases can be linked to demographic characteristics of the purchaser via credit card, electronic funds transfer cards, check cashing identification cards, or even an in-store survey of consumer demographic data.

Technologically, there is nothing in the current state of computer development which would prevent such a system from being implemented at a projected moderate cost. Some computerized cash register systems are already being used to record product movement for inventory control purposes. It would seem to be a relatively modest task to add the additional dimension of recording individual consumer purchases, linked to the demographic characteristics of the purchaser, thus eliminating the usual research problems of interview cost, key punching and coding of questionnaires, and similar barriers to large, quick, and economical data bases for consumer purchasing research.

Suggestions for Future Research

Based upon the empirical findings, conclusions, and the derived implications of this study, this section of the study provides some suggestions for future marketing research involving the use of demographic variables as predictors of consumer purchasing behavior.

The first suggestion is that research be conducted relative to the purchase of other specific product categories, and for specific products, if possible. Much of the past research relating to the use

of demographic variables seems to have involved rather broad categories of measured response, such as total food, total frozen foods, automobile brand, or other similar categories that may not allow measurement of specific differences in purchase response between different demographic categories. In fact, many product categories or product lines are strategically marketed to appeal to a broad range of consumer tastes, via substantial variety of specific products, brands, prices, features, etc. Thus, failure of demographic variables to disclose substantial differences between demographic purchases within a relatively broad category should not be perceived as a failure of the demographic variables, but rather, an expected response to current marketing practice.

The findings of this study showed substantial difference in the relationships of the tested demographic variables to each of the twelve specific frozen food categories of this study. Further research within the frozen food industry seems to be suggested, for purchases within other frozen food categories, such as frozen meats, frozen desserts, ice cream, and other categories not surveyed in this study. Moreover, even the categories of this study, although much more specific than simply a measurement of total frozen foods, were still relatively broad in the number of products, and the inclusive variety of product prices, sizes, functions, and expected consumer appeal. Greater accuracy for prediction of purchases would seem to demand more specific measurement of what the consumer actually does buy.

Moreover, as research efforts seek to delineate the purchases of more specific products, it must be expected that larger samples must be used to properly use multivariate techniques. If a product-purchase category is so defined that 60 percent or more of the population buys it, specific definition of a market segment seems less likely. Similarly, if a product does appeal to a limited segment within the population, as in the case of cooked poultry in this study, a relatively large data sample is required to effectively define the segment. For example, only 68 families, out of 718 families in the entire survey, bought at least one package of cooked chicken during a month's reported purchases. It seems obvious that 68 respondents can give only a limited statistical ability to determine what characteristics about this group are significantly different from non-buyers of this product category.

It must also be recognized that this study can only give a sample of the relationships that might be derived from the demographic characteristics of the consumer, since only a limited number of characteristics were actually examined in this study. Thus, additional demographic variables are suggested for inclusion in future research, such as geographic region, religion, ethnic background, age of children, stage in the family life cycle, the number of children in the household within certain age brackets, or the medical characteristics and needs of the consumer.

It is suggested that increasing use of computer technology to record specific product movement may allow an increased ability to acquire data for specific product purchases, for large numbers of

consumer respondents. Thus, electronic cash registers now can list specific items on the register receipt, as well as maintaining constantly up-to-date data on product movement. To the degree that consumer demographic characteristics can be surveyed at the point of sale, via identification cards, or electronic funds transfer cards, access to fast, accurate, and economical market research data is gradually becoming a reality, with an intriguing potential for future marketing research in the area of consumer demographics.

Finally, the finding of relatively non-linear relationships for several of the demographic variables, suggests that the linearity of relationships should at least be tested in future research, rather than making the convenient, but probably incorrect, assumption that linear relationships are present.

Thus, it is suggested that non-linear statistical methods should be applied to the research of demographic variables, a process which has been hindered by the lack of non-linear computer programs, combined with the need for larger sample sizes that are typically needed for non-linear multivariate methods of statistical analysis, two limitations that prohibited the use of a non-linear discriminant analysis in this study.

However, non-linear techniques are becoming more available, such as the non-linear discriminant analysis which can now be obtained via the Institute for Social Research at the University of Michigan.⁸ This program, titled Multivariate Nominal Scale Analysis, is designed to handle research problems where the independent variables may be

measured at any level of measurement, including the nominal level. Thus, non-linear demographic categories can be measured without recoding, restructuring, or making the assumption of linearity, thereby avoiding the predictive loss that often follows such methods. Although this program does need a substantially larger sample size to realistically analyze strongly segmented product purchases, this particular program, or other similar computer programs for multivariate analysis, may provide substantial potential for future marketing research.

CHAPTER V--FOOTNOTES

¹Johan Arndt, Market Segmentation: Theoretical and Empirical Dimensions (Bergen, Norway: Universitetsforlaget, 1974), pp. 24-25.

²Dik Warren Twedt, "How Important to Marketing Strategy Is the Heavy User," Journal of Marketing 28 (January 1964): 71-72.

³Terry Mathew Weisenberger, "Generalized Market Segments: A Study Using Selected Convenience Goods in Vigo County, Indiana" (Ph.D. dissertation, Michigan State University, 1977), pp. 123-124.

⁴Henry Assael and Hugh Cannon, "Do Demographics Help in Media Selection," Journal of Advertising Research 19 (December 1979): 7-8.

⁵Robert Ferber, "How Not To Do Research--An Editorial," Journal of Marketing Research 5 (February 1968): 104.

⁶Ibid.

⁷Yoram Wind, "Issues and Advances in Segmentation Research," Journal of Marketing Research 5 (February 1968): 104.

⁸Frank M. Andrews and Robert C. Messenger, Multivariate Nominal Scale Analysis (Ann Arbor: Survey Research Center, The University of Michigan, 1973).

APPENDIX A

RELEVANT SECTIONS OF DATA BASE QUESTIONNAIRE

FROM 1976 AKRON BEACON JOURNAL SURVEY

APPENDIX A

RELEVANT SECTIONS OF DATA BASE QUESTIONNAIRE
FROM 1976 AKRON BEACON JOURNAL SURVEY

Bardley & Haslacher, Inc.
MARKETING
RESEARCH
CONSULTANTS
B&H/114/76

CONSUMER PROFILE ANALYSIS
Akron, Ohio
1976

(1)	1
(2)	1
(3-6)	_____
(7)	1

ZONE: _____

TELEPHONE PREFIX: _____

COUNTY WHERE INTERVIEW COMPLETED:

1 - Summit

2 - Medina

3 - Portage

MONTH OF INTERVIEW:

0 - January

1 - February

2 - March

3 - April

4 - May

5 - June

6 - July

7 - August

8 - September

9 - October

X - November

Y - December

"Hello, I'm interviewing on a market research survey. I would like to speak to the person who is the homemaker, that is, the one who buys most of the food and other household products for this home."

	Date	Time	Day of Week							Remarks
			M	T	W	TH	F	ST	SN	
1										
2										
3										
4										Replacement for "not at home on 3rd call"
5										Replacement for refusal

Respondent's Name

Respondent's Address

City

INTERVIEWER CERTIFICATION:

I hereby certify that this interview was actually made at the address shown, that it is a true record of the information given me, and that the cost of this interview may be deducted from my pay if it is found to be improperly or inaccurately completed.

Signature of Interviewer

Date

Verified by:

Date

65. "How much money do you estimate all members of this family spent last week on groceries, including home delivered groceries?"

0 - Under \$15.00

1 - \$15.00 - \$24.99

2 - \$25.00 - \$29.99

3 - \$30.00 - \$34.99

4 - \$35.00 - \$39.99

5 - \$40.00 - \$44.99

6 - \$45.00 - \$49.99

7 - \$50.00 - \$54.99

8 - \$55.00 - \$59.99

9 - \$60.00 - \$69.99

X - \$70.00 & over

Y - Don't Know

69. "Thinking back over the last 30 days, about how many packages have you bought of (Record in appropriate column, below)

	None	1 to 5	6 to 10	11 to 15	16 to 20	21 to 25	26 to 30	31 to 35	36 to 40	41 to 45	46 or More	D.K.
a. Frozen breakfast baked goods & breakfast pastries including frozen pancake/waffle batter & donuts	0	1	2	3	4	5	6	7	8	9	X	Y
b. Frozen dessert baked goods & pastries	0	1	2	3	4	5	6	7	8	9	X	Y
c. Frozen fish, shrimp, or other seafood	0	1	2	3	4	5	6	7	8	9	X	Y
d. Uncooked frozen poultry, whole or in parts	0	1	2	3	4	5	6	7	8	9	X	Y
e. Cooked ('heat & serve') frozen poultry	0	1	2	3	4	5	6	7	8	9	X	Y
f. Frozen potatoes	0	1	2	3	4	5	6	7	8	9	X	Y
g. Frozen vegetables	0	1	2	3	4	5	6	7	8	9	X	Y
h. Frozen concentrated fruit juices	0	1	2	3	4	5	6	7	8	9	X	Y
i. Frozen fruit or berries	0	1	2	3	4	5	6	7	8	9	X	Y
j. Frozen pizza	0	1	2	3	4	5	6	7	8	9	X	Y
k. Frozen complete dinners	0	1	2	3	4	5	6	7	8	9	X	Y
l. Frozen main courses, including macaroni & cheese, chop suey, & meat or chicken pies, not including poultry	0	1	2	3	4	5	6	7	8	9	X	Y

68a. "Do you have a freezer in which to store frozen foods that is a separate unit, not part of the refrigerator?"

Yes

0 - No

79. (INTERVIEWER: Observe Race of Respondent)

1 - White

2 - Black

3 - Latin-American

4 - Other

80. AGE OF HEAD OF HOUSEHOLD

1 - Less than 18

5 - (45 - 49)

9 - (65 or older)

2 - (18 - 24)

6 - (50 - 54)

Y - Don't Know/

3 - (25 - 34)

7 - (55 - 61)

Refused

4 - (35 - 44)

8 - (62 - 64)

81a. SPECIFIC OCCUPATION OF HEAD OF HOUSEHOLD

(Industry)

(Specific Job)

81b. SEX OF HEAD OF HOUSEHOLD

1 - Male

2 - Female

81c. SEX OF HOMEMAKER RESPONDENT

1 - Male

2 - Female

82. (Interviewer: Hand Income Card to respondent) "Will you please select the number which represents your total household income before taxes last year. Please include income for all household members, including dividends, rentals, etc."

0 - Under \$2,500

4 - \$8,000 - \$8,999

8 - \$15,000 - \$17,999

1 - \$2,500 - \$4,999

5 - \$9,000 - \$9,999

9 - \$18,000 - \$19,999

2 - \$5,000 - \$6,999

6 - \$10,000 - \$11,999

X - \$20,000 or more

3 - \$7,000 - \$7,999

7 - \$12,000 - \$14,999

Y - Don't Know/Refused

83. "What was the last grade of school completed by the head of the household?"

1 - Grammar School (grades 1 thru 6)

5 - College, incomplete

2 - Grammar School (7th or 8th grades)

6 - College, graduate

3 - High School, incomplete (9th - 11th grades)

7 - Some post graduate

4 - High School, complete

Y - Don't Know/Refused

84. "Do you own this home or rent it?"

☒ - Rent

☐ - Own (*Skip to Q.86*)

(If "Rent", ask:)

85. "Which of these groups includes the monthly rental you pay?" (*Hand list to respondent*)

1 - Under \$40

5 - \$100 - \$149

9 - \$300 and over

2 - \$40 - \$59

6 - \$150 - \$199

Y - Don't Know/Refused

3 - \$60 - \$79

7 - \$200 - \$249

4 - \$80 - \$99

8 - \$250 - \$299

(Ask of all:)

86. "How long have you lived in this home?"

1 - Less than one year

3 - Five to ten years

2 - At least a year, but
less than five years

4 - Ten years or more

Y - Don't Know

87. "Do you plan to move during the next three years?"

1 - Yes

2 - No (*Skip to Q.90*)

3 - Undecided (*Skip to Q.90*)

88. "Do you plan to stay in the Akron area?"

1 - Yes

2 - No

3 - Undecided

89. "Do you plan to rent, buy or build?"

1 - Rent

2 - Buy

3 - Build

4 - Undecided

90. Household is in:

1 - Single dwelling unit structure

3 - Three or four unit structure

2 - Duplex structure

4 - Structure containing 5 or
more units

91. "When did the head of the household first move to the Akron area?"

1 - Less than one year

4 - Ten - twenty years

2 - At least a year, but
less than five years

5 - Twenty years or more

Y - Don't Know

3 - Five - ten years

92. "How many persons are there in this household?"

1 - One
2 - Two
3 - Three
4 - Four

5 - Five
6 - Six
7 - Seven
8 - Eight

9 - Nine
X - Ten or more

93. "How many members of this household are now employed?"

0 - None
1 - One

2 - Two
3 - Three

4 - Four or more
Y - Don't Know/Refused

94. "Is there a telephone in this household?" *(If "Yes", record telephone number)*

1 - Yes _____

2 - No

"THAT IS THE END OF THE INTERVIEW. THANK YOU."

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