

AN ANALYSIS OF MERCHANT WHOLESALER
CONSUMER GOOD COMMODITY LINE
DISTRIBUTION CHANNELS

Thesis for the Degree of Ph. D.
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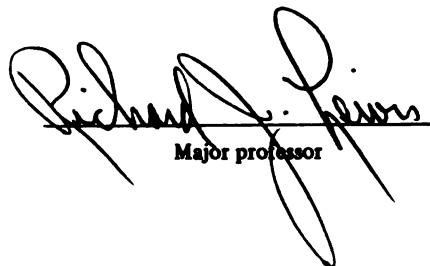
AN ANALYSIS OF MERCHANT WHOLESALER
CONSUMER GOOD COMMODITY LINE
DISTRIBUTION CHANNELS

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ABSTRACT

AN ANALYSIS OF MERCHANT WHOLESALER CONSUMER GOOD COMMODITY LINE DISTRIBUTION CHANNELS

By

Frederick George Bean

Statement of Purpose

There were two purposes for this study. The first was to identify economic and distribution channel factors that are associated with certain characteristics of the merchant wholesaling sector of consumer good commodity line distribution channels. With knowledge of these factors, the individual merchant wholesaler might be better able to adjust his activities and services to meet the present and future needs of his suppliers and customers. The second purpose of this study was to analyze the application of techniques proposed to provide more efficient estimates of regression coefficients. The analysis of these techniques may aid in the identification of situations where they should or should not be applied.

Procedure

Four consumer good commodity line distribution channels were selected for analysis. These were the all commodity or aggregate channel and the drug, liquor, and lumber commodity line channels. The period 1948 to 1967 was studied using United States Bureau of Census data. The characteristics of the merchant wholesaling sector (dependent variables) selected were: sales per capita, establishments per capita, and sales per establishment. The economic and distribution channel factors (independent variables) selected were: personal income per capita, mean nonagricultural employment as a percentage of total employment, population per square mile; all commodity retailers sales per capita, establishments per capita, sales per establishment; all commodity manufacturers value added per capita, establishments per capita, value added per establishment; all commodity merchant wholesalers sales per capita, establishments per capita, sales per establishment; commodity line retailers sales per capita, establishments per capita, sales per establishment; commodity line manufacturers value added per capita, establishments per capita, and value added per establishment.

To provide the most efficient estimates of the regression coefficients computational techniques employing multiple sets of data were used. The results computed by

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Van Tassel¹ using the Efficient Estimator Fortran Program (EFFEST) were compared with the estimates in this study calculated using the Zellner-Aitken (ZA) and least-squares (LS) techniques.

Findings

In each channel, significant associations were found between combinations of merchant wholesaling sector characteristics and the economic and channel factors studied. These combinations varied from channel to channel. For example, there was a significant association between per capita drug merchant wholesaling sales and the independent variable, per capita all commodity merchant wholesaling sales. The association between the per capita liquor merchant wholesaling sales and the same independent variable, on the other hand, was only marginally significant. The association between the per capita lumber merchant wholesaling sales and the same independent variable was not significant. These differences in the significance of factors from channel to channel reflect the varied character of merchant wholesaling channels in the United States. Additionally, shifts of regression coefficients between the dependent and independent variables were found. Although not all were statistically significant over the period of the study shifts were found in every channel. These findings

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reveal the need for the merchant wholesalers in every channel to analyze their unique, dynamic situation.

The regression coefficients by Van Tassel using EFFEST and those calculated in this study using ZA and LS were compared. It was concluded that the conditions necessary for applying EFFEST and ZA were not met. In addition, the regression coefficients calculated using these estimators resulted in biased estimates. Since the least-squares does not have these shortcomings, it was employed in this study.

¹Charles E. Van Tassel, An Analysis of Factors Influencing Retail Sales (East Lansing: Bureau of Business and Economic Research, Michigan State University, 1966).

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CHAPTER I

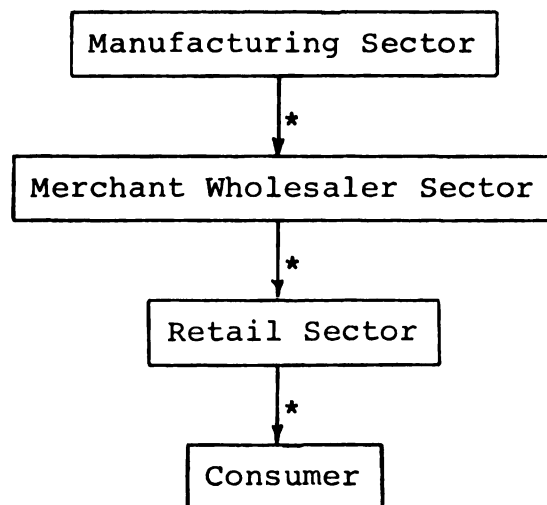
INTRODUCTION

Statement of Purpose

There were two basic purposes for this study. The first was to identify those economic and distribution channel factors that are associated with certain characteristics of the merchant wholesaler sector of consumer good commodity line distribution channels. The second purpose was to analyze the application of techniques proposed to improve the estimates of regression coefficients using multiple sets of data. The economic factors selected for study were: personal income per capita, mean nonagricultural employment as a percentage of total employment, and population per square mile. The distribution channel factors selected were: all commodity retailers sales per capita, establishments per capita, sales per establishment; all commodity manufacturers value added per capita, establishments per capita, value added per establishment; all commodity merchant wholesalers sales per capita, establishments per capita, sales per establishment; commodity line retailers sales per capita, establishments per capita, sales per establishment; commodity line

manufacturers value added per capita, establishments per capita, and value added per establishment.

Merchant wholesalers are wholesalers that take title to the goods they sell to other wholesalers, retailers, manufacturers, and various institutions. A simplified view of the merchant wholesaler distribution channel for a consumer good commodity line would have four basic sectors. They are the manufacturing, wholesale, retail, and consumer sectors. The basic relationships of a simplified consumer good commodity line distribution channel sectors are shown in Figure 1.1. It is this type of channel that was the basis for the study.



*The arrows indicate the flow of ownership.

Figure 1.1. The Relationship of the Merchant Wholesaler Distribution Channel Sectors for a Consumer Good Commodity Line

The individual merchant wholesaler should be aided by the identification of those environmental factors associated with the characteristics of the merchant wholesale sector. With knowledge of these factors, the merchant wholesaler will then be better able to adjust his activities and services to meet the present and future needs of his suppliers and customers.

As noted earlier the second purpose of this study was to analyze the application of techniques proposed to improve the estimates of regression coefficients using multiple sets of data. The results obtained by Van Tassel (18:9) using the Efficient Estimator Fortran Program (EFFEST) were compared with the estimates in this study using the Zellner-Aikten (ZA) and least-squares (LS) techniques.

The analysis of these techniques should aid in the identification of situations where they should or should not be applied.

Terms and Definitions of Wholesaling

A difficulty encountered in the study of wholesaling is the lack of clear nomenclature in this area of business activity. This situation is described by Schultz (17:175):

No topic in Marketing is more booby-trapped with misunderstandings and misleading generalizations, for the advanced scholar as well as for the beginning student, than that of wholesaling. In part this is due to the grievous lack, until very recent years, of

comprehensive information on the organization and activities of the many varieties of wholesaling middlemen. Wholesaling has been, and still is, the Dark Continent of American Marketing study. In part this is due to confusion of business nomenclature in this field, in part to the conflicting bases of classification applied to such data as have been collected and published. Furthermore, the operations of wholesaling middlemen are characterized by extreme operational and organizational flexibility, so that most generalizations about them require complicating qualifications and may hold true only temporarily.

This section presents the terminology and definitions used throughout this study. Unless otherwise noted, these definitions are the contribution of Beckman, Engle, and Buzzell (11). Much of their effort is based on the work of Beckman who developed many definitions used in the Census of Business.

Wholesaling

Wholesaling includes all marketing transactions in which the purchaser is actuated solely by a profit or business motive in making the purchase and in which, if the goods are bought from a concern operating substantially as a retail establishment and such goods are not intended for resale, the quantity is materially in excess of that which might reasonably be purchased by an ultimate consumer.

Wholesale Transaction

Three possible criteria for delineating between a wholesale sale and retail sale exist. They are:

1. Status or motivation of the purchaser, i.e., the position of the customer and his purpose in making the purchase.
2. The quantity of goods involved in the transaction.
3. Method of operation of the concern.

From these possibilities the status or motivation of the purchaser was chosen as the most basic criterion. Therefore, the resulting definition of a wholesale transaction is that it is one in which the purchaser does not buy for his own private or personal use or that of his family and friends, but is actuated instead by a profit or business motive in making the purchase.

Wholesaling Middleman

A business unit whose major activity is wholesaling on either a merchant or agent basis (17:642).

Wholesaler

A business unit which buys and resells merchandise to retailers and other merchants and/or to industrial, institutional, and commercial users but one which, at the same time, does not sell in significant amounts to consumers. In the fields of basic materials, semi-finished goods and tools and machinery, merchants of this type are commonly known as distributors or supply houses (28:23).

Wholesale Establishment

The definition of this term is probably the most flexible of any in the field of wholesaling. It seems to be a function of who is attempting to define it and for what purpose. Beckman, Engle, and Buzzell spend an entire chapter (Chapter 3) providing the various definitions used. The definitions and their origins are as follows:

Judicial View.--The authors note that the courts have consistently used a functional basis in determining the character of an establishment. In 1941, in the case of Fleming vs. American Stores, Inc., the court held that an "establishment" must be a separate and distinct place of business. Generally the courts have held that the ownership of the establishment is irrelevant in determining its character; rather it is the functions which it performs that determine its status.

Census View.--The United States Bureau of the Census hold that to be classified for census purposes as a wholesale establishment, a business unit must have over 50 per cent of its dollar volume at wholesale.

Fair Labor Standard Act.--For purposes of administering the minimum wage laws (which do not apply to retail establishments), the law is so phrased that any establishment that has a "substantial" part of the total gross receipts in non-retail selling is considered to be a wholesale establishment and, hence, covered under the law.

At the present time, 25 per cent of total gross receipts is considered "substantial."

Robinson Patman Act.--For purposes of administering the legality of "functional discounts," any establishment classified as a wholesale establishment is legally allowed a "functional 'discount'" on the portion of the business that it conducts on a wholesale basis.

Types of Wholesale Establishments

The Office of Statistical Standards classifies five principal types of wholesale establishments. They are (9:222):

1. Merchant wholesalers--wholesalers who take title to the goods they sell, such as wholesale merchants or jobbers, industrial distributors, voluntary group wholesalers, exporters, importers, cash-and-carry wholesalers, drop shippers, wagon distributors, retail cooperative warehouses, terminal elevators, and cooperative buying associations;

2. sales branches and sales offices--(but not retail stores) maintained by manufacturing or mining enterprises apart from their plant or mines for the purpose of marketing their products;

3. agents, merchandise, or commodity brokers and commission merchants;

4. petroleum bulk stations; and

5. assemblers, buyers, and associations--engaged in the cooperative marketing of farm products.

Wholesaling Structure.--The wholesaling structure is defined as that complex of business establishments which is constantly functioning so as to move products of industry through the channels of trade from primary and other producers to the retail outlets or to industrial consumers. It includes all public and private agencies (with certain exceptions noted below) which contribute, as their major activity, to the physical flow of merchandise or to change in ownership up to the point where the goods reach the hands of retailers or industrial users. (It excludes railroads, trucks, and pipe lines plus the communications industry because these are highly differentiated, and their main activity is not exclusively confined to wholesaling functions.)

Operating Establishment

An operating establishment is an economic unit in a single physical location which produces only one or predominantly one good or service for which an industrial code is provided. If the location performs two or more activities for which separate Standard Industrial Classifications (SIC's) exist, an attempt is made by the Bureau of the Census to treat the location as two or more separate establishments. Each is assigned a SIC on the

basis of the product or product line that is its major activity.

The Background of the Problem

Although the current study is concentrated on the merchant wholesaling type of wholesale establishment, this background section begins with a consideration of all wholesaler types. It then narrows to a consideration of the various types of wholesalers and, especially, the merchant wholesaler.

A review of the literature of wholesaling indicates that very little effort has been made to study the wholesale sector compared to the manufacturing or retail sectors. A possible reason for the lack of literature in this area may be a prevalent belief that the wholesaling sector is very stable. However, a review of the Census data for the period 1948-1967 (1,2,3,4,5,6,7,8) seems to indicate that a considerable amount of change has taken place in the United States economy. Moreover, much of this change appears relevant to the wholesale sector and, especially, the merchant wholesaler.

The data in Table 1.1 show the level of sales, employment, and number of establishments in each of the three channel sectors. The manufacturing sector is the largest on the basis of the value of shipments or sales, number of employees, and payroll.

Table 1.1. Aggregated Data for the Manufacturing, Wholesaling, and Retailing Sectors of the United States Economy in 1967.

Channel Sector	Sales or Value of Shipments (000,000)	Establishments	Sales or Value of Shipments per Establishment (000)	Paid Employees (000)	Payroll (000,000)
Manufacturing ^a	\$557,398	305,680	\$1,824	18,492	\$123,481
Wholesaling ^b	459,476	311,464	1,475	3,519	23,922
Retailing ^c	310,214	1,763,324	176	9,381	36,175

^aSource: 1967 Census of Manufacturers

^bSource: 1967 Census of Business: Wholesale Trade

^cSource: 1967 Census of Business: Retail Trade

Considering only sales level, the second largest sector would be wholesaling. However, on the basis of payroll, the wholesaling sector is the smallest. And the comparison on the basis of payroll (Table 1.1) may be the most meaningful since this measurement may closely reflect the amount that the sectors are paid for their services. On this basis, the wholesale sector is less than one-fifth the size of the manufacturing sector and two-thirds of the retail sector.

The Literature

Considering the relative size of the sectors, the wholesale sector has received a relatively small amount of attention in the form of substantial publications. This limited attention is reflected by the data in Table 1.2. Less than 5 per cent of the publications directed toward the three channel sectors considered wholesaling as a major topic.

Table 1.2. Number of Publications Listed in the Cumulative Book Index for the Topics of Production, Wholesaling, and Retailing for the Period January 1959 to July 1969.

Topic	Number of Publications Listed	Topic Publications as a Percentage of Total
Production	167	40
Wholesaling	20	5
Retailing	231	55

Source: Cumulative Book Index (1959-1969) (New York: The H. W. Wilson Company).

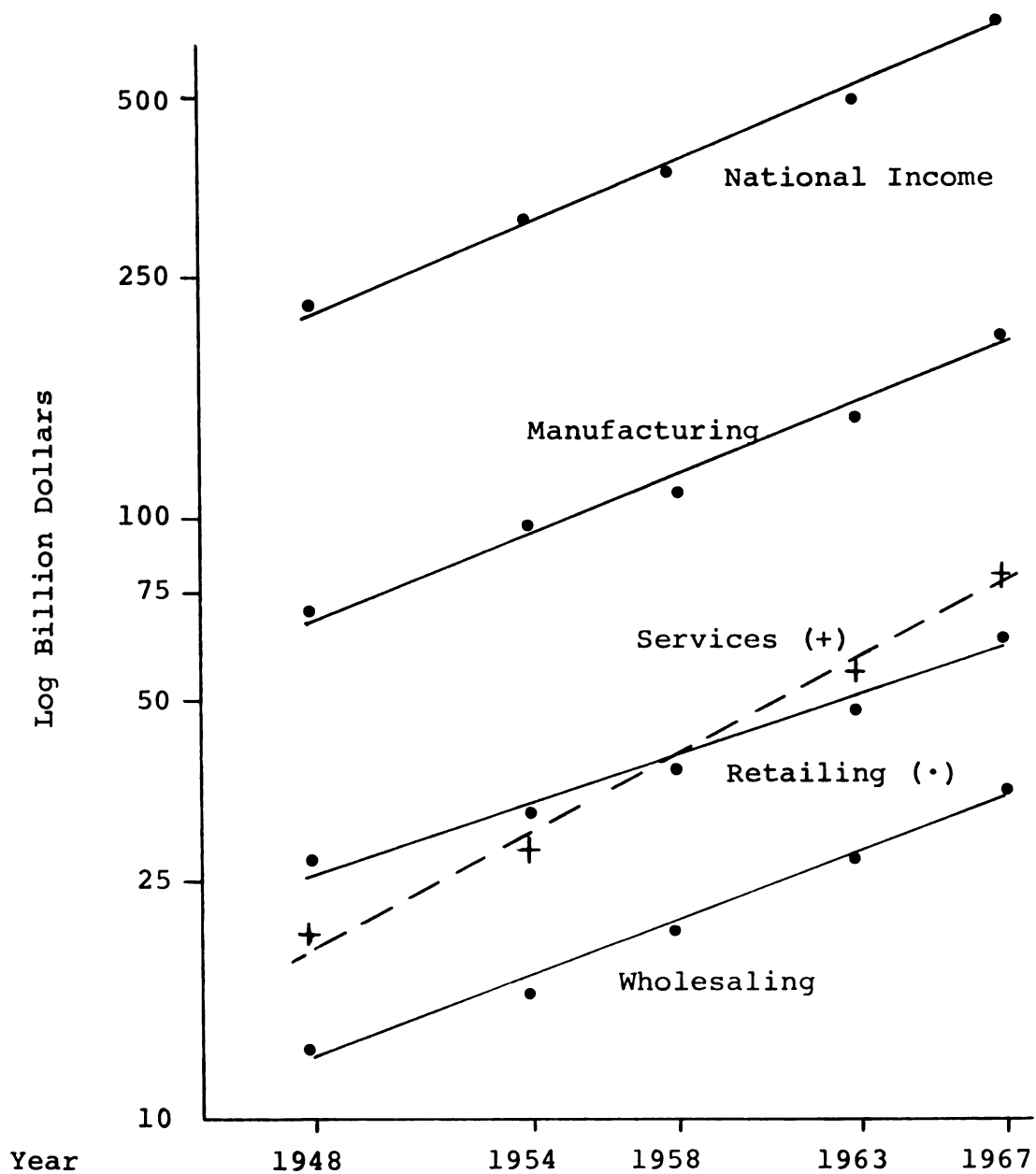
This lack of interest in the literature of management and education is noted by Lopota (21:130):

Although the wholesaling industry represents a major segment of the U.S. economy, it is little understood as an area, poorly defined, and considered by many to be dying or even dead. This paradox is reflected directly in the general literature of management, which contains little about wholesaling despite the fact that a large majority of our large companies have a stake in it. Graduate schools of business neglect wholesaling; witness the fact that the number of courses they offer which deal with it can be counted on the fingers of one hand. Business schools, university extensions, the American Management Association, and many other organizations very frequently sponsor seminars on manufacturing, for instance, and yet devote no attention to wholesaling, why? I suspect that for many people the answer to this question would be, "Well there's really nothing much to wholesaling these days--it's a declining business function." Nothing could be more mistaken.

The Changing Economic Environment

The growth rates for selected sectors of the United States economy are shown in Figure 1.2. Although the trend is upwards for all sectors, there are differences in the rate of increase.

Table 1.3 presents the percentage or share of National Income (N.I.) contributed by each selected sector in 1948 and 1967. In addition, the change in the percentage of National Income originating in each of the selected sectors through the period 1948-1967 is provided. There was a decrease in percentage of National Product contributed by each of the three channel sectors: manufacturing, wholesaling, and retailing. The greatest



Source: Survey of Current Business, August, 1965, pp. 44-45; July, 1970, p. 21.

Figure 1.2. The National Income and Amount of National Income Originating in Selected Sectors of the United States Economy for the Census Years 1948 to 1967.

Table 1.3. Level of National Income Originating in Selected Sectors of the United States Economy as Per cent of National Income (N.I.) in 1948 and 1967 and Per cent Change in Sector Share of N.I.

Sector	Per cent of 1948 N.I.	Per cent of 1967 N.I.	Per cent Change of Sector Share of N.I. 1948-1967
Manufacturing	30.6	29.9	- 2.3
Wholesaling	5.7	5.5	- 3.5
Retailing	12.0	9.5	-20.8
Services	8.9	12.0	+34.6

Source: Survey of Current Business, August, 1965, pp. 44-45; July, 1970, p. 21.

decrease was in the retailing sector where the relative share contributed to N.I. decreased 20.8 compared to decreases of 2.3 and 3.5 per cent for manufacturing and wholesaling respectively. During the same period the relative share contributed to N.I. by the service industries increased 34.6 per cent. This service group includes categories such as hotel, automotive, legal, and educational services. These shifts illustrate that changes were occurring in the economic environment during the period of the study.

Changes Among the Types of Wholesale Operations

On the basis of sales, the merchant wholesaler is the most important type of wholesale operation. It

accounted for 45 per cent of the 1967 sales of the whole-sale sector. The shares of the various types of wholesale operations are shown in Table 1.4. Between 1948 and 1967 significant changes took place in the distribution of sales among the five types of wholesale operations analyzed by the Bureau of the Census. It can be seen from Table 1.4 that the merchant wholesalers' and manufacturers' sales branches and offices increased their percentages of total whole sale sales at the expense of the other three wholesale types.

During the period 1948 to 1967, the merchant wholesalers' sector grew from 129,117 to 212,993 establishments (Table 1.5) an increase of 65 per cent. This growth increased the merchant wholesalers' share of wholesale establishments to 68.4 per cent. Notable during these nineteen years was the fact that merchant wholesalers experienced both a combination of slight relative growth of total sales and a rapid growth in establishments compared to other types of wholesalers. Such a combination of trends has led to a slower growth rate for the merchant wholesaler on the basis of sales per establishment than the other types of wholesalers (Table 1.6). This difference is especially significant with respect to the manufacturer's sales comparison of these trends with the other wholesaler types was not possible because of the lack of data provided in the Census of Business on a commodity

Table 1.4. Sales and Percentage Total Sales of Wholesalers by Type of Operation in 1948 and 1967.

Type of Operation	Sales (000,000)		Sales as Per cent of Total Wholesale Sales ^a	
	1948	1967	1948	1967
Merchant wholesaler	\$76,533	\$206,035	42.4	44.9
Manufacturer's sales branches, sales offices	50,800	157,097	28.1	34.3
Petroleum bulk stations, terminals	10,483	24,822	5.8	5.4
Merchandise agents, brokers	32,840	61,347	18.2	13.3
Assemblers of farm products	9,920	10,156	5.5	2.2

^aMay not total 100 per cent due to rounding.

Source: 1948, 1967 Census of Business: Wholesale Trade.

Table 1.5. Establishments and Percentage of Total Wholesale Establishments by Type of Operation in 1948 and 1967, and Per cent Increase (Decrease) in Number of Establishments by Type of Operation from 1948 to 1967.

Type of Operation	Establishments		Establishments as Per cent of Total Wholesale Establishments ^a		Per cent Increase (Decrease) in Type of Operation Establishments 1948-1967
	1948	1967	1948	1967	
Merchant wholesaler	129,117	212,993	59.7	68.4	65.0
Manufacturer's sales branches, sales offices	23,706	30,367	11.0	9.8	28.0
Petroleum bulk stations, terminals	28,351	30,229	13.1	9.7	6.8
Merchandise agents, brokers	18,138	26,462	8.4	8.5	46.0
Assemblers of farm products	16,787	11,101	7.8	3.6	(33.8)
Total	216,099	311,464			43.8

*May not total 100 per cent due to rounding.

Source: 1948, 1967 Census of Business: Wholesale Trade.

Table 1.6. Sales per Establishment and Percentage Increase by Type of Wholesale Operation Between 1948 and 1967.

Type of Operation	Sales per Establishment		Per cent Increase Sales per Establishment from 1948 to 1967
	1948	1967	
Merchant wholesaler	\$ 593,000	\$ 967,000	63
Manufacturer's sales branches, sales offices	2,143,000	5,120,000	139
Petroleum bulk stations, terminals	370,000	820,000	122
Merchandise agents, brokers	1,810,000	2,320,000	28
Assemblers of farm products	591,000	915,000	55
Total, all types	835,000	1,475,000	77

Source: 1948, 1967 Census of Business: Wholesale Trade.

line basis. But a study analyzing the difference between types of wholesalers on an all commodity basis is currently under way at the University of California (22:91).

The last comparison of the merchant wholesaler with the other types of wholesalers is made on the basis of class-of-customer (Table 1.7). The percentage of sales of the merchant wholesalers to retailers dropped from 46.8 to 40.8 per cent during the period 1948 to 1963. This "loss" of sales has been offset in part by an increase in level of sales to industrial and consumer users. These changes are also reflected in the change in the level of each sector's activities relative to G.N.P. presented in Table 1.3.

The absolute and relative changes of the merchant wholesalers compared to other types of wholesalers and sectors of the economy are substantial. These changes include wholesale market share of the various types of wholesalers, number of establishments, sales per establishment of the wholesaler types, and class-of-customers of wholesaler types.

The Selection of the Merchant Wholesaler for Study

This study concentrated on the merchant wholesaler type of distribution channel for a consumer good commodity line. There are three major reasons for this choice. First, this is the largest wholesaler type on

Table 1.7. Percentage Distribution of Sales by Types of Wholesaler for Wholesale Establishments Reporting Class-of-Customer Information for 1948 and 1963.

Type of Wholesaler	Percentage ^a Distribution of Sales to:							
	Industrial, Commercial, etc. Users		Consumers		Retailers		Wholesale Organization	
	1948	1963	1948	1963	1948	1963	1948	1963
Merchant wholesalers	31.8	37.6	1.6	1.2	46.8	40.8	13.7	14.5
Manufacturer's sales branches, offices	42.7	44.1	0.4	0.4	31.3	32.4	23.0	19.2
Merchandise agents, brokers	41.8	44.5	0.4	1.0	16.1	18.6	36.5	31.6
Assemblers of farm products	32.6	49.3	5.3	7.6	9.4	13.2	51.8	27.8
							0.9	2.0

^aMay not total 100 per cent due to rounding.

Source: 1948, 1963 Census of Business: Wholesale Trade.

the basis of total dollar sales and number of establishments. It therefore represents the majority of wholesale activity. Second, because of its independence, it is a type of wholesale operation with the ability to shift its efforts from one commodity line to another. Third, the merchant wholesale type of wholesaler has been given the most complete analysis by the Census of Business. The Census of Business often provides data on only two wholesaler categories. Those are total wholesale trade establishments and merchant wholesalers. Such limitation precludes the study of the other types of wholesale establishments because the necessary detailed data are not available.

Selection of Data Sources

As stated earlier, a purpose of this study was to analyze the association between the characteristics of the merchant wholesaling sector and the characteristics of the other channel sectors and the environment. Because it was also relevant to study the associations over a period of time so as to note changes occurring in channel structure, existing secondary data sources were required. The selected basic sources which provided the necessary data, were the Census of Business, Census of Manufacturing, and U.S. Census of Population.

Variable Selection

Characteristics (Dependent Variables) Selected to Analyze the Merchant Wholesaling Sector

The characteristics (or the dependent variables) selected to describe the merchant wholesaler sector were total dollar sales, establishments, and sales per establishment. The dollar sales figure was probably the best single indicator of level of the activity in each of the sectors. The establishment figure was used because it has been changing considerably in the merchant wholesale sector (129,117 in 1948 and 212,993 in 1967). And, in order to provide consideration of the "average" merchant wholesaler, the sales per establishment figures were included.

Selection of Independent Variables

The independent variables were selected from two sources. First, the literature of marketing proposes a number of associations between the members of the distribution channel; that is, the association between the wholesaling sector and the manufacturing and retailing sectors. Second, other variables, economic and demographic in nature, were considered for their possible association with the wholesaling sector.

The relationship between the retail sector and wholesale sector has long been considered one of the

principles of marketing. Presenting some of these principles in the marketing literature Bartels (10:62) states:

Some (principles) have been taken verbatim from the writings; others have not been accredited to particular writers because the generalizations are so common in marketing it would be unjust to attribute a statement of them to any one person.

One of the principles in this latter category as outlined by Bartels was the following: "As changes occur in the retail structure, changes will also occur in the wholesale system" (10:64). In the light of this principle, it is interesting to note that a trend in decentralization of manufacturing and retailing activity in the United States has occurred. In the retail sector, Tallman and Blomstrom (25:130) assert:

. . . retail outlets represents a catching-up of retail institutions with the vast changes that have taken place in consumer living habits, location, and buying power since World War II. These changes have generated a major revolution in the kinds of quantities of goods purchased by consumers, and in the types and location of shopping which is convenient and attractive to them.

And with respect to the manufacturing sector, Miller (23:156) notes:

There seems to be present today a general agreement on the wisdom of the decentralization of industry. . . . A majority of the branch factories newly established by existing manufacturing concerns have been located away from their central areas in less concentrated industrial sectors of the country.

Taking the above facts into consideration, the important question then becomes something like the following: when

shifting of activity occurred in the manufacturing and retailing sectors of the channel, did the merchant wholesalers shift locations to meet them?

These shifts in the manufacturing and retailing sectors present a problem to the wholesaler, whose majority of sales are made to retailers. Does the wholesaler maintain his location near the centers of high population concentrations or move toward his retail customers who are decentralizing? If the wholesaler does follow the movement of the retailers, his sales should more closely follow the patterns of retailers and the population distribution.

An argument has been presented, that the wholesalers should not follow these shifts. Miller contends that (23:156):

It is an open question however, whether the wholesaling industry will or should follow this decentralization of industrial employment and retail business. . . . There is good reason to believe that this general movement may not have much effect on the present structure of wholesale locations. Wholesaling is primarily a function suitable for large and medium-sized cities . . .

To determine if wholesale activity has shifted with movements in population density, the relationship between the per capita merchant wholesale sales and population density was studied. The relationship between per capita merchant wholesale sales and per capita retail sales was also examined. Both relationships were studied for the period 1948-1967.

The decentralization of industrial employment was noted previously. If such a shift takes place in a commodity line, does the merchant wholesaler shift the location of his activity? Possible changes in merchant wholesale sales, establishments, and sales per establishment may have been associated with the value added, establishments, and value added per establishment of the manufacturing sector.

Because the merchant wholesalers depend upon retailers for the majority of their sales, the association of the wholesaling sector with the sales, establishments, and sales per establishment characteristics of the retailing sector were analyzed.

Three economic or demographic variables were included to analyze their association with the dependent variables. The first, personal income, was selected because it would seem to be a measurement of consumers' potential for economic activity. Ideally, a measurement such as disposable personal income should be used in a study of the channels for consumer goods. Unfortunately, these data are not available on the necessary geographic basis. Nevertheless, the inclusion of the independent variable, personal income, may indicate if there is an association between certain characteristics of the merchant wholesaling sectors of the channels studied and the amount of income available to the population of a geographic unit.

The second economic variable selected was mean nonagricultural employment as a percentage of total employment. This variable was included to provide a measurement of the association between the characteristics of the merchant wholesaling sectors studied and a variable that might reflect the level of economic development. The finding of significant associations may indicate relationships between the level of merchant wholesaling activity and one measure of general economic development.

The third variable selected, population density, is a demographic measurement. Tallman and Blomstrom (25) have suggested that retailers have followed or adapted to changes in consumer locations. Because this change has been occurring in the retailing sector, it may have been necessary for the merchant wholesaling sector to adjust. They may have had to move their activities to provide the services required by the retailing sector. The independent variable, population per square mile, has been selected to provide a test of the association between the characteristics of the merchant wholesaling sector and consumer location.

Two basic questions about the independent variables selected for analysis in this section seem reasonable. First, do the selected characteristics have significant association with the characteristics of the merchant wholesaling channel sector? Second, do these

associations shift over time? In Chapter VIII the results of the study will be used in a consideration of these questions.

Problem Statement

As stated earlier, one purpose of this study was to analyze the association of selected independent characteristics of the merchant wholesaler's environment with selected characteristics of the merchant wholesaler. This study was also conducted to determine if these associations shifted over a period of time. The independent characteristics data available from Census sources were compared to the values of the merchant wholesalers' total sales, establishments, and sales/establishment by geographic division. These comparisons were made for the Census years 1948, 1954, 1958, 1963, and 1967.

General Hypotheses

1. The selected characteristics of the merchant wholesalers' sector of a distribution channel for a given commodity line are associated with characteristics describing the other sectors of the commodity line distribution channel, the all commodity distribution channel, and the economic environment.

2. The relationship between the selected characteristics of the merchant wholesalers' sector of the distribution channel and characteristics describing the other sectors of the distribution channel and economy will remain constant over a period of time.

Limitations

The limitations of the research are:

1. The geographical areas selected were larger than may have been desired. This was because the smaller geographic units had less variation within the individual areas and more among them. However, when smaller geographic areas, such as states or standard metropolitan statistical areas, were considered, the data available were inadequate. Because of the small numbers of establishments in many categories, especially manufacturing, the United States Bureau of Census does not reveal sales or value added figures. To avoid disclosure limitations, then, geographic divisions were used in the analysis.
2. The product (or commodity) line sales were not broken down by type of retailer and wholesaler in the 1954 and 1958 Census. This did not allow

a comparison of the merchant wholesalers with other forms of wholesalers.

3. The value of the dollar was changing from period to period during the study. The statistics used in the analysis were not adjusted for this change because adequate commodity line price indexes do not exist.
4. The product lines selected were limited to those lines where the necessary data detail was available for the three major sectors of the channel.
5. The commodity lines selected were limited to those where the commodity line sales were significant to all channel members. That is, one-half or more of their sales were of the commodity line. This limited the study to three commodity lines: drugs, liquor, and lumber.
6. The macro approach used may not describe the position of the individual merchant wholesaler within the commodity line merchant wholesaler channel. Rather, the approach describes the mean averages which may not represent the situations of individual group members.
7. The first postwar Census of Business, including data on retailing and wholesaling activity, was

conducted in 1948. The first postwar Census of Manufacturers was conducted in 1947. For this census period it was necessary to use data that was not gathered in the same census period.

Possible Contributions of Study

1. This study may provide aid to the individual wholesaler constructing his plans for the future. Although the approach does not indicate trends for the individual wholesaler, it does indicate trends that affect his operation. If the trend is toward large and fewer merchant wholesalers in a product line, the individual merchant wholesaler may realize his choice involves growing, changing product lines or leaving the wholesale trade.
2. This study may help in the selection of the proper methodology in future analyses that use data from different time periods. It will compare the results obtained using least-squares regression analysis with the results obtained when using efficient coefficient estimators. And this comparison may provide insights into the meaning of the results obtained when using the different methods.

CHAPTER II

RESEARCH METHODOLOGY

Measurement Units of Characteristics Used Selected for Study

The characteristics selected for study are presented in Chapter I. Those selected are normally found in the form of totals for the geographic division. In the United States there is a wide variation of population from geographic division to geographic division. The Bureau of Census estimated that in 1967 the populations of the Mountain and East North Central geographic divisions, the smallest and largest, were 7,828,000 and 39,189,000, respectively.

There is a relatively high association of economic activity and population in the United States. To reduce some of the association between variables that are correlated with population, many of the selected characteristics were used on a per capita basis. This procedure was employed for personal income, sales, and establishment totals. The variables selected for analysis are shown in Figure 2.1.

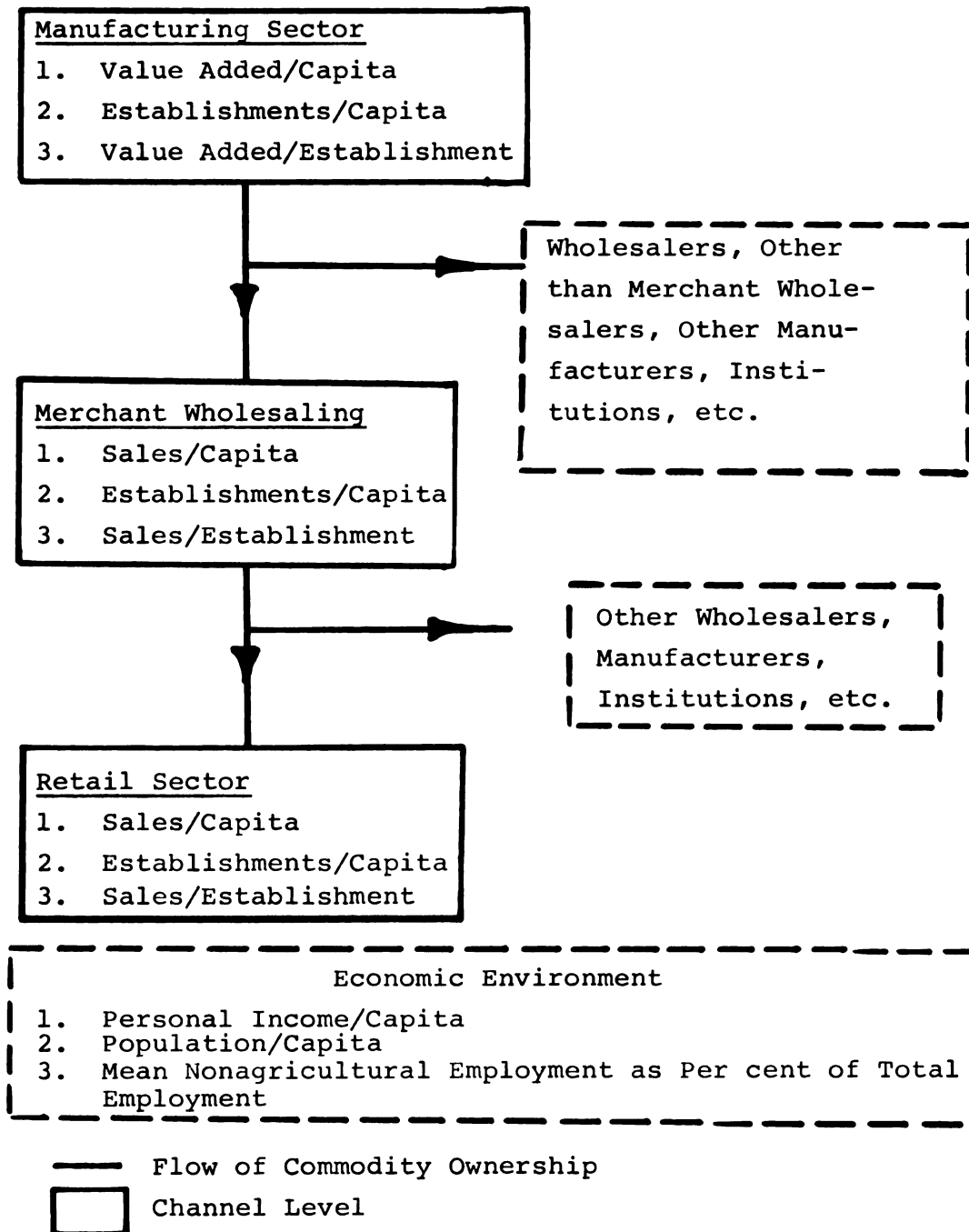


Figure 2.1. The Merchant Wholesaler Type of Consumer Good Commodity Line Distribution Channel and Characteristics Selected for Study.

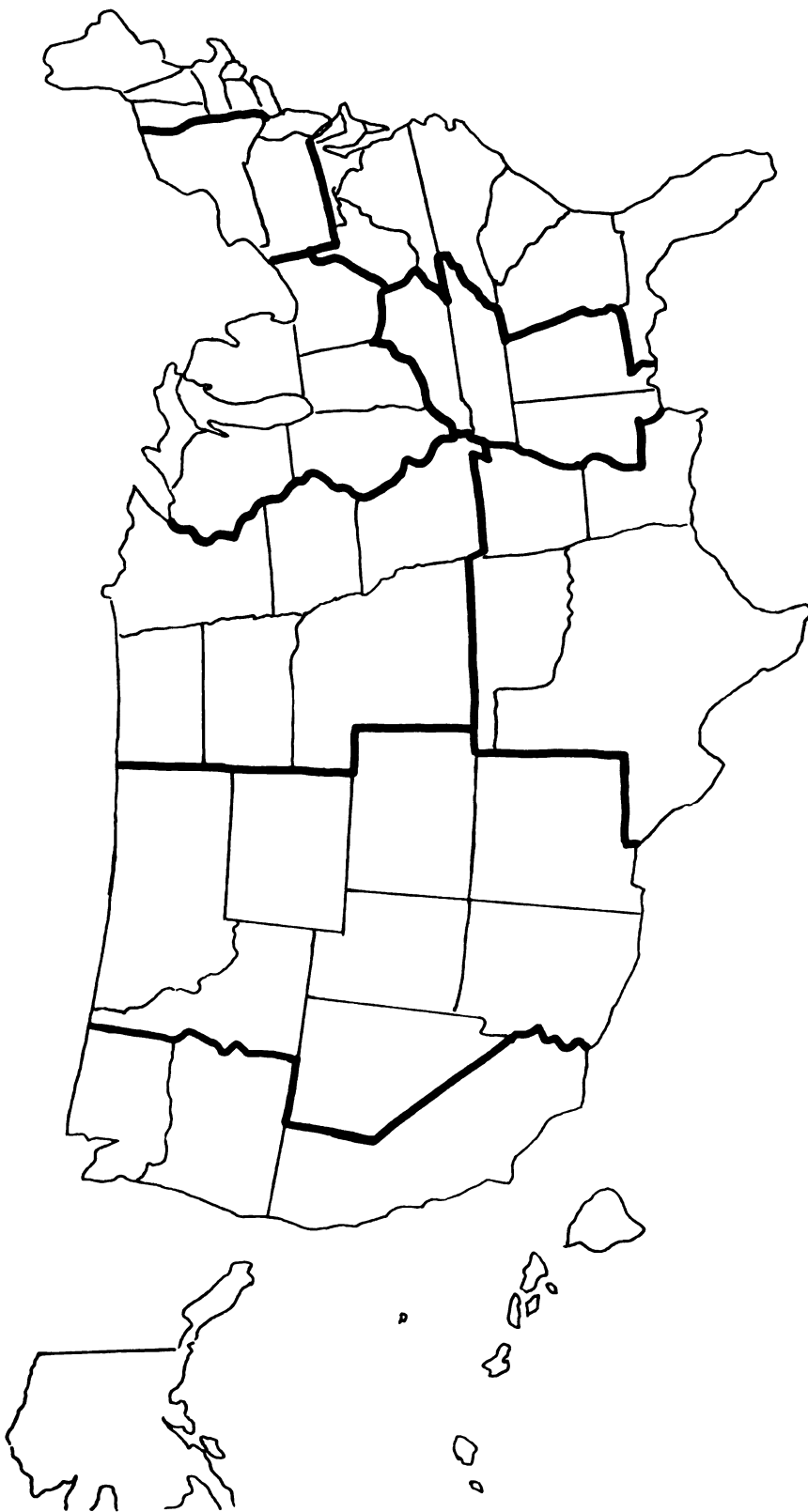
Geographic Control Units

The geographic control unit used in this study is the geographic division. The United States is divided into nine geographic divisions shown in Figure 2.2.

Other geographic units considered for this study were states and standard metropolitan areas (SMA's). These control units, because of their smaller size, may have been preferable to the geographic divisions, but with important exceptions. These exceptions concerned the amount of useful data able to be obtained on a geographic unit basis. First, the census "withheld to avoid disclosure" rule applied to the sales figure of the merchant wholesale for thirty out of fifty-one states (and the District of Columbia) for the wine, distilled spirits (SIC 5095 part) kind of business for 1963 (3:1963, Vol. V, 1-75). There were twenty "deletions" in the following merchant wholesalers kind of business: drugs, drugs proprietaries, druggists' sundries (SIC 5095 part). Second, the small number of manufacturing establishments in many states made the disclosure problem severe in the manufacturing sector of the commodity lines selected.

Selection of Merchant Wholesaler Channels

Two types of merchant wholesaler channels were selected for analysis in this study. The first type is the all commodity merchant wholesale channel. This channel is comprised of the total activity of each channel



Source: U.S. Department of Commerce, Bureau of the Census.

Figure 2.2. Geographic Divisions of the United States.

sector. The all commodity manufacturing sector is comprised of all manufacturing value added and establishments in the Census of Business. The all commodity merchant wholesaler sector is comprised of all merchant wholesaler sales and establishments, and the all commodity retail sector, of all retail sales and establishments. The all commodity channel is not a true channel in the sense that all goods of a particular type flow through it. However, it does represent the level of economic activity maintained by the all commodity channel sectors. The study of the all commodity channel also allowed the establishment of a base line to compare the relationships of individual consumer good commodity line channels.

The second type, the commodity line channels, were selected on the basis of the national market as summarized in the 1963 Census of Manufacturers (1) and Census of Business (2, 3). This census year was selected because it provided a breakdown on the national sales (or shipments) of manufacturers, wholesalers, and retailers by commodity line. This breakdown provision was made on a type of business basis.

As noted in Chapter I, to be selected for this study, the commodity line must have been a significant portion of the business for the establishments at each level or the distribution channel. This was one-half of the sales or shipments. In addition, to provide relationships between each level of the channel, a significant

portion of the manufacturers' sales were to wholesalers and a significant portion of the merchant wholesalers' sales were to retailers. This was one-half of the sales, with the exception of the lumber merchant wholesaling establishments. Only 44.6 per cent of their sales were to retailers.

Three commodity line channels met these requirements. They are delineated in terms of the merchant wholesaler kind of business classifications (9):

1. Drugs, drug proprietaries, druggist sundries (SIC 5022)
2. Wines, distilled spirits (SIC 5095 part)
3. Lumber, millwork (SIC 5098 part)

These commodity line channels are referred to as Drug, Liquor, and Lumber, respectively.

Multiple Regression

The measurements of association between the independent and dependent variables were determined by use of linear multiple regression or least squares. This procedure finds that linear regression equation which best fits the data. It "yields those estimates of the parameters which minimize for that form of regression equation the sum of squares of the deviation of the observations from the regression line, i.e., from the value of the observation which it would have if it had coincided with the regression line" (13:86).

This method estimates an equation of the form:

$$Y = a + b_1X_1 + b_2X_2$$

where:

Y = dependent variable

a = constant

b_1 = regression coefficient 1

b_2 = regression coefficient 2

X_1 = independent variable 1

X_2 = dependent variable 2.

Preliminary plots of some data used in this study indicate non-normal distributions exist. This fact demanded a transformation to fulfill the requirements for the use of linear multiple regression. Van Tassel in his study of the retail sector used logarithmic transformation. He found that (13:10):

The changes in the measurements of the extent of correlation between dependent and independent variables were judged to be substantial enough to warrant the use of logarithms in the analysis, with the exception of one kind of retail business establishment, "Lumber, Building Materials, Hardware, Farm Equipment Dealers." The relationship in this case appears to be best represented by arithmetic analysis.

To provide outputs comparable to Van Tassel, logarithmic transformations were used in this study. The form of the regression equation using logarithmic transformations would be:

$$\log Y = a + b_1 \log X_1 + b_2 \log X_2$$

Thus, the values of the a and b terms differ from those found with the non-transformed data inputs.

Zellner-Aitken Estimators

Van Tassel used the Fortran program EFFEST to improve upon the "line of best fit" obtained by least-squares regression (13:8). To explain this procedure Van Tassel quotes Zellner (27:348-349):

It is only under special conditions . . . that classical least-squares applied equation-by-equation yields efficient coefficient estimators. For conditions generally encountered, (there is) an estimation procedure which yields coefficient estimators at least asymptotically more efficient than single-equations least-squares estimators. In this procedure regression coefficients in all equations are estimated simultaneously by applying Aitken's generalized least-squares to the whole system of equations. To construct such Aitken estimators, we employ estimates of the disturbance terms' variances and covariances based on the residuals derived from an equation-by-equation application of least-squares.

Briefly, the purpose of the method is to use data from other time periods to estimate their regression coefficients. To be consistent with Van Tassel's notation, we have two time periods represented by the equations:

$$Y_{it_1} = a_{t_1} + b_{t_1} X_{it_1} + U_{it_1}$$

and

$$Y_{it_2} = a_{t_2} + b_{t_2} X_{it_2} + U_{it_2}$$

where

Y_{it_1}, Y_{it_2} = dependent variables

a_{t_1}, a_{t_2} = constant terms

b_{t_1}, b_{t_2} = regression coefficient

X_{it_1}, X_{it_2} = independent variables

U_{it_1}, U_{it_2} = residual terms

i = observation number

t_1 = first time period

t_2 = second time period.

First the single equation least-square analysis for each time period is estimated. The implicit assumption is that residuals for each observation are equal to zero or:

$$E \left(\frac{U_{i_1 t_1}}{T_{i_2 t_1}} \right) = 0$$

Then the regression equation for both equations are solved simultaneously assuming that:

$$E \left(\frac{U_{i_1 t_1}}{U_{i_2 t_1}} \right) \neq 0$$

Since neither value is equal to zero, it is assumed that the values have some relationship to one another. Therefore, the experiences of the two time periods are not independent, and the regression coefficient for the two periods are determined simultaneously.

Two points should be made about EFFEST at this time. First, although the values of the regression coefficients are allowed to change from their values calculated using the least-squares technique, the centroid $(\bar{Y}_{it}, \bar{X}_{it})$ for each time period is held constant. Second, the Zellner-Aitken estimators are calculated using an iterative process, each iteration asymptotically approaching the "best fit." However, because of the cost of computer time and the small increments of improvement, not more than one iteration is performed.

The ZA program developed by the Michigan State University Agricultural Experiment Station (30) is based on the same assumptions as the EFFEST program. However, the ZA program is a more powerful one than the EFFEST program, and has succeeded EFFEST in the Station's files because it provides a more efficient estimate. That is, its first estimate is closer to the "best fit" than the first estimate of the EFFEST program.¹

¹Discussion with Marylyn Donaldson, Michigan State University Agricultural Experiment Station, March, 1971.

An examination of Zellner (27) reveals that the EFFEST and ZA methods may not be appropriate in the Van Tassel study. Zellner states: "This gain in efficiency can be quite large if 'independent' variables in different equations are not highly correlated . . . " (27:348). Because all of the independent variables selected by Van Tassel are of the same economic variables measured at different times, they would tend to be correlated.

Additionally, the applications suggested by Zellner (27:349) involve a system of dependent variables such as " . . . a single cross-sectional budget study regressions for several commodities are to be determined." In his study, Van Tassel has applied the method to a situation where the dependent variables are measurements of the same variable at different times. This does not appear to be a type of application suggested by Zellner.

To determine if the application of the method by Van Tassel was correct, the following was done. In Chapter III the results obtained using least-squares and the ZA program are compared to the results obtained in Van Tassel's study using least-squares and the EFFEST program. The ZA run uses data from the Census of Business for the Retail sector on a geographic division basis. This was the same data source used by Van Tassel on a state basis.

Statistics Derived

The following statistics will be calculated for each selected product line for each of the five Census years:

Coefficient of determination (r^2_{yx}) which is the proportion of the variance in the dependent variable that was associated with the independent variables.

Degree of association is the relative amount of error reduced in the estimate of one variable because of knowledge about another (12).

$$A_{y.x} = \frac{\bar{\sigma}_y - \bar{\sigma}_{y.x}}{\bar{\sigma}_y}$$

$A_{y.x}$ = degree of association of dependent variable y with independent variable x.

$\bar{\sigma}_y$ = standard deviation of variable y about its mean \bar{y} .

$\bar{\sigma}_{y.x}$ = standard deviation of variable y around conditional distribution of y.

"Coefficient of regression which indicates the nature of the change in the dependent variable in response to a change in the independent variable" (18:11).

Standard error of the estimate measures the extent of the deviation between the computed coefficient of regression and the actual observations.

Cross-section elasticities of the independent variable with respect to the dependent variables can be determined in two ways. If the data are not transformed, the formula for the cross-section elasticity is:

$$e = b \times \frac{D_m}{I_m} \quad (18:12)$$

e = cross section elasticity

b = coefficient of regression

D_m = mean value dependent variable

I_m = mean value independent variable

This formula determines the cross-section elasticity for only the point on the regression line where D_m and I_m are the mean values of the dependent and independent variables. Unless the regression line passes through the origin, each point on the line will have a different value of cross-section elasticity.

If the data is logarithmically transformed, the regression coefficients are the cross-sectional elasticities of the association. Since the data in this study were logarithmically transformed, it should be noted that the regression coefficients calculated are also the cross-sectional elasticities.

The Hypotheses Tested

Regression Coefficients

The first group of hypotheses tested were those related to the significance of the relationships between the dependent and independent variables for the relationships hypothesized in Chapter I--for example, the relationship between the dependent variable per capita drug merchant wholesalers' sales and the independent variable per capita personal income. The hypotheses for each set of relationships are:

$$H_0: B = 0$$

$$H_1: B \neq 0$$

where B is the regression coefficient.

Change in Regression Coefficients

The second group of hypotheses to be tested were those related to the significant changes that have occurred in the relationship of the dependent and independent variables during the period of the study (1948-1967). The hypotheses used for each set of relationships are:

$$H_0: B_{1948} = B_{1967}$$

$$H_1: B_{1948} \neq B_{1967}$$

or

$$H_0: B_{1948} - B_{1967} = 0$$

$$H_1: B_{1948} - B_{1967} \neq 0$$

Significance of Findings in This Study

Regression Coefficient (B)

The test for the significance of the regression coefficient can be made using the t test described in Chapter III. In the case of a single independent variable, significance of the regression coefficient can also be found by testing the correlation coefficient (r_{yx}). In this study, the correlation coefficient was so tested. This procedure provided an easier comparison of the findings where single and multiple variable correlation coefficients were determined. For example, there may be two independent variables that, individually, do not have a significant relationship with a common dependent variable. Yet the multiple correlation coefficient may be significant. The t test does not provide a way to examine this type of situation.

A level of correlation required for significance was selected on the basis of two requirements. First, it should, at a minimum, be statistically significant (.6666). Second, the independent variable must explain a reasonable amount of the variation in the dependent variable. The level selected for this study was a coefficient of association (A_{yx}) of 0.5. This is translated into a correlation

coefficient (r_{YX}) of .866. This means that the error in estimating the value of the dependent variable is reduced by a factor 0.5 if knowledge of the value of the independent variable is available.

To translate this .5 coefficient of association (A_{YX}) to coefficient of determination (r^2_{YX}) or coefficient of correlation (r_{YX}), the following relationships were used (12:512):

$$r^2_{YX} = 1 - (1 - A_{YX})^2$$

$$r^2_{YX} = 1 - (1 - .5)^2$$

$$r^2_{YX} = 1 - (.5)^2$$

$$r^2_{YX} = 1 - .25$$

$$r^2_{YX} = .75$$

$$r^2_{YX} = .866$$

In this study significant values of r_{XY} and r^2_{XY} are .866 and .760 respectively.

The selection of an arbitrary value of correlation seems to be a contradiction of Elkblad's advice, "We think it is best not to have any arbitrary boundaries for a minimum degree of useful correlation" (12:518). However, such boundaries were selected for three reasons. First,

it was desired to find those associations that are useful indicators of merchant wholesaler activity. To achieve this purpose, there should be a "significant," not just a statistically significant, level of association. That is, the association should explain a substantial portion of the variance of the independent variable about its mean. This results in a conservative use of the term significant, compared to the .05 level of statistical significance. Second, different sample sizes were used with different methodologies and the use of a significant level of association allowed a more meaningful comparison of results. Third, the values selected exceeded the statistically significant boundary at the .05 level. This situation is explored in more depth in Chapter III.

The following classifications were used to evaluate the significance of the correlation coefficients. These standards were applied to only single independent variable relationships.

Significant.--At least one year in which the correlation coefficient (r_{YX}) was greater than $|.866|$ and, for all other years tested, was greater than $|.6666|$.

Marginally Significant.--The mean correlation coefficient for the five years tested was greater than $|.6666|$.

Nonsignificant Relationship.--The mean correlation coefficient for the five years tested was less than $|.666|$.

Multiple Correlation
Coefficients ($r_{YX_1X_2}$)

In addition to the single independent variable least-square analyses multiple regression analyses were run. This was done to determine if certain combinations of independent variables could provide significantly better estimates of the dependent variables than could the individual independent variables. The combinations of independent variables selected for testing were those found significant in Van Tassel's study along with others that appeared relevant to the merchant wholesaler's channel--for example, the relationship of the dependent variable per capita merchant wholesaler sales and the independent variables per capita manufacturing value added and per capita retail sales.

The combinations selected for this study are presented in Table 2.1. In Chapters IV through VII the results are reported for only those combinations of variables that provided significant improvement over the single independent variable. The criterion for selecting the significant multiple correlation coefficients were:

1. The multiple correlation coefficient was greater than $|.866|$ for at least one year. This is equivalent to a coefficient of association of at least 0.5.

Table 2.1. Combinations of Single Dependent and Multiple Independent Variables Studied for Association in Terms of Multiple Correlation Coefficients.

Dependent Variables	Independent Variables
*Per Capita MW Sales	Per Capita MF Value Added Per Capita RT Sales
*Per Capita MW Est.	Per Capita MF Est. Per Capita RT Est.
*Sales per MW Est.	Value Added per MF Est. Sales per RT Est.
Per Capita Comm. MW Sales	Per Capita All MF Value Added Per Capita All MW Sales Per Capita All RT Sales
Per Capita Comm. MW Est.	Per Capita All MF Est. Per Capita All MW Est. Per Capita All RT Est.
Sales per Comm. MW Est.	Value Added per All MF Est. Sales per All MW Est. Sales per All RT Est.
*Per Capita MW Sales	Per Capita Personal Income Nonagricultural Employment
Per Capita MW Est.	Per Capita Personal Income Nonagricultural Employment
Sales per Comm. MW Est.	Per Capita Personal Income Nonagricultural Employment
Per Capita Comm. MW Sales	Per Capita Personal Income Population per Square Mile
Per Capita Comm. MW Est.	Per Capita Personal Income Population per Square Mile
Sales per Comm. MW Est.	Per Capita Personal Income Population per Square Mile

Table 2.1. (Continued)

Dependent Variables	Independent Variables
Per Capita Comm. MW Sales	Per Capita All MW Sales Per Capita Personal Income
Per Capita Comm. MW Est.	Per Capita All MW Est. Per Capita Personal Income
Sales per. Comm. MW Est.	Sales per All MW Est. Per Capita Personal Income

*These combinations were studied for both the all commodity and commodity line channels.

Key: All = All Commodity lines factor; Comm. = Commodity Line; Est. = Establishment; MW = Merchant Wholesaler; MF = Manufacturing; RT = Retailing.

2. The mean correlation coefficient must have averaged at least $|.7943|$ or $|.8744|$. These are the statistically significant levels of r , when there are two or three independent variables, respectively.
3. The multiple correlation coefficient must be at least 0.10 higher than the highest of the single independent variable correlation coefficients.

Changes in Regression Coefficients (1948-1967)

To test the changes that may have occurred in the regression coefficient, it was necessary to use a t test. Since the significance of the difference was being tested, the test was of the form:

$$t_{(B_{1948} - B_{1967})} = 0$$

$$t_{(B_{1948} - B_{1967})} \neq 0$$

where:

B_{1948} = regression coefficient in 1948

B_{1967} = regression coefficient in 1967

$\bar{\sigma}_{B_{1948}}$ = standard error of B_{1948}

$\bar{\sigma}_{B_{1967}}$ = standard error of B_{1967}

$$\bar{\sigma}_{B_{1948-1967}} = \sqrt{\bar{\sigma}_{B_{1948}}^2 + \bar{\sigma}_{B_{1967}}^2}$$

$$t_{(B_{1948} - B_{1967})} = \frac{B_{1948} - B_{1967}}{\bar{\sigma}_{B_{1948-1967}}}$$

$$\text{d.f.} = \text{d.f.}_{\bar{\sigma}_{B_{1948}}} + \text{d.f.}_{\bar{\sigma}_{B_{1967}}}$$

$$= \text{d.f.} = 7 + 7$$

$$\text{d.f.} = 14$$

Graphically the test can be represented by Figure 2.3.

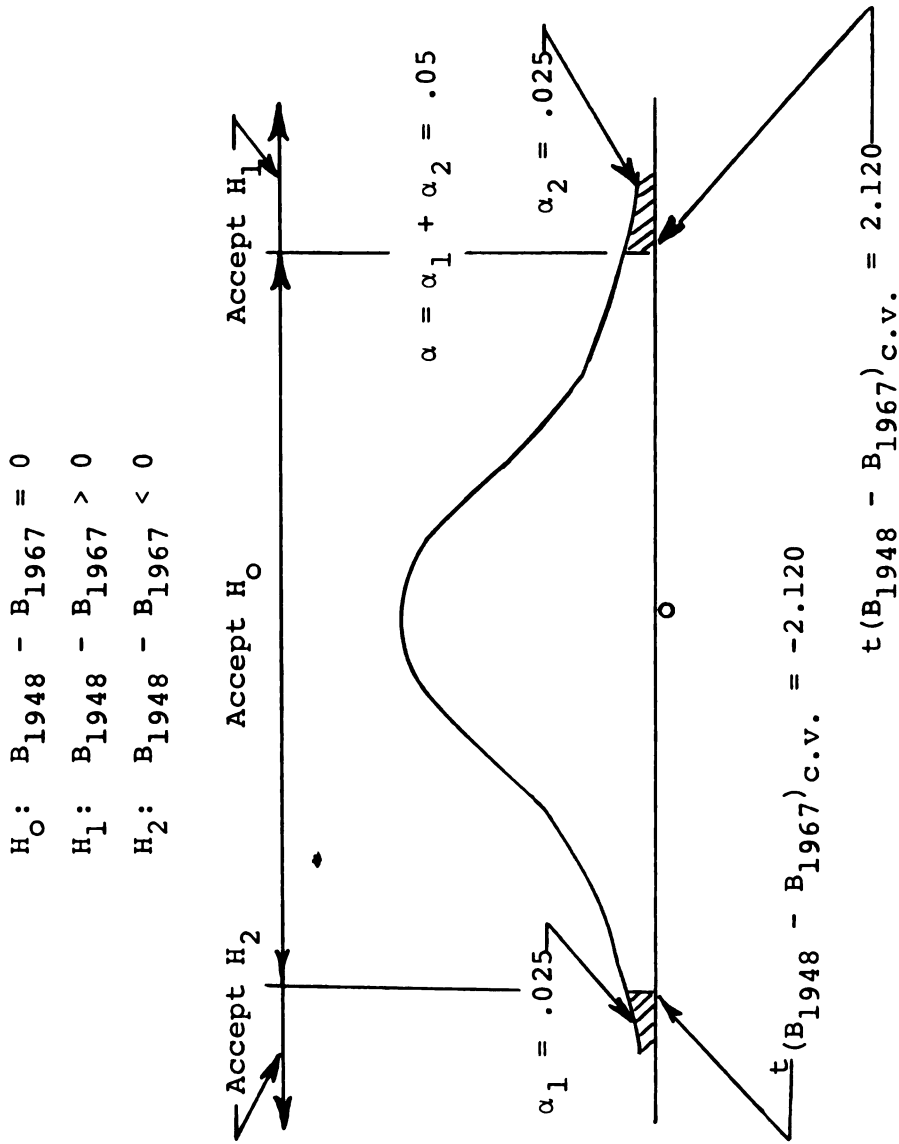


Figure 2.3. Test for Statistical Significance of the Change in the Regression Coefficient for the Period 1948 to 1967.

CHAPTER III

THE COMPARISON OF THE METHODOLOGY OF THIS STUDY AND THE VAN TASSEL RETAIL STUDY

Introduction

The purpose of this chapter is to explore the methodology (ZA) used in this study and the methodology (EFFEST) used by Van Tassel in An Analysis of Factors Influencing Retail Sales. For purposes of comparison, a part of this study is a modified replication of Van Tassel's. This permits a more accurate appraisal of the similarities and differences between the methodologies in the two studies. Then, using the output obtained from this study, a decision concerning the appropriateness of the methodologies can be made.

The Data Used

The basic data source used for both studies was the United States Census of Business. The reports of 1948, 1954, 1958, and 1963 were used in Van Tassel's study. The reports of 1948, 1954, 1958, 1963, and 1967 were used in this study.

The geographic units used in Van Tassel's study were states, while those in this study were geographical divisions. Because Van Tassel was using data from only the retail sector of the distribution channel, he was able to use the smaller geographic unit, the state. But when the merchant wholesaler sector and manufacturing sector were included, much of the detail desired was not provided on a state basis. This was because the disclosure rules prevent the Bureau of the Census from providing sales data when only a few establishments are found in a geographic unit. Hence, it was necessary for this study to move to the next larger geographic unit, the geographic division.

Computational Techniques

In both this study and Van Tassel's, the first stage of the process was a linear regression analysis using least-squares. The next stage in both studies was an attempt to provide regression coefficients that were more efficient estimators. Van Tassel used the EFFEST program while this study used the ZA program. The ZA technique is a more recently developed program and has succeeded the EFFEST program.

Results of the Van Tassel Study and This Study for the Drug Retail Sector

To replicate the Van Tassel study, a common set of dependent and independent variables were studied. The

dependent variable selected was drug retail establishment sales per capita. The drug retail establishment sector of the channel was the same as the Drug Stores and Proprietary Stores used in the Van Tassel study. The independent variables which were selected to duplicate the Van Tassel study were personal income per capita and mean per cent nonagricultural employment.

The following statistics were calculated by Van Tassel using the EFFEST program ro by this study using least-squares and the ZA program:

Van Tassel (EFFEST):

B_1 = regression coefficient of independent variable "per capita personal income."

B_2 = regression coefficient of independent variable "mean per cent nonagricultural employment."

$\bar{\sigma}_{B_1}$ = standard error of B_1 .

$\bar{\sigma}_{B_2}$ = standard error of B_2 .

t_{B_1} = "t" value of B_1 or $(B_1/\bar{\sigma}_{B_1})$.

t_{B_2} = "t" value of B_2 or $(B_2/\bar{\sigma}_{B_2})$.

In addition to the above, the following were found by this study using Least-Squares (LS) and (ZA):

A_0 = "Y - Axis" intercept of regression equation.

$\bar{\sigma}_{A_0}$ = standard error of A_0 .

$$t_{A_0} = \text{"t" value of } A_0, (A_0/\bar{\sigma}_{A_0}).$$

The results of the computation are shown in Table 3.1.

The Results of Comparing ZA to
EFFEST Estimates

Regression Coefficients
(B₁ and B₂)

The three methods of calculating the coefficients of regression discussed in the previous sections were used. These methods are least-squares, EFFEST, and ZA. Calculations were made for the 1948, 1954, 1958, 1963 (and 1967). The coefficients of regression calculated were the per capita personal income and mean nonagricultural employment as a per cent of total employment. The dependent variable in the comparison was per capita drug retailing establishments sales. The values obtained are plotted in Figures 3.1 and 3.2. Figure 3.1 shows the relationship between the independent variable, personal income per capita, and dependent variable, drug retail sales per capita. In both the case of the EFFEST and the ZA estimators, the coefficients calculated were less than the coefficients calculated using the least-squares technique.

Figure 3.2 shows the relationship between the independent variable mean per cent nonagricultural employment and independent variable drug retail sales per capita.

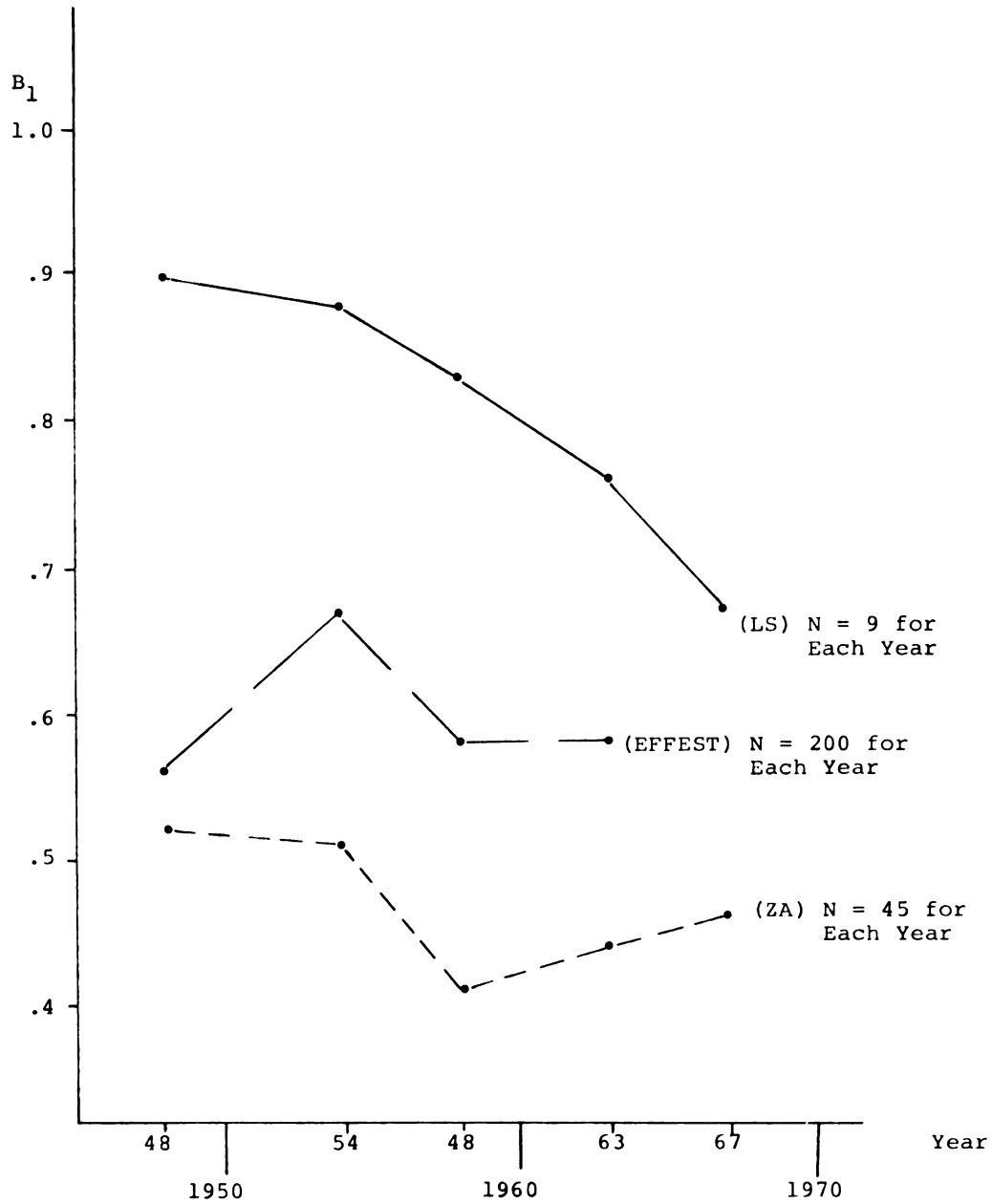
Table 3.1. The Values of the "Y-Axis" Intercept, Regression Coefficients, Standard Errors of the Estimates, and "t" Value Estimates for the Drug Store Retail Sales per Capita Using the EFFEST Program, Least-Squares, and the ZA Program for the Years 1948, 1954, 1958, 1963 (and 1967).

Year	A_0		B_1			B_2		
	LS	ZA	EFFEST	LS	ZA	EFFEST	LS	ZA
1948	1.33	1.86	.56	.89	.52	.31	-.36	-.03
1954	1.72	2.08	.66	.88	.51	-.10	-.55	-.11
1958	2.84	2.65	.58	.83	.41	-.05	-1.02	-.22
1963	2.72	2.45	.58	.76	.44	-.27	-.84	-.14
1967	3.67	2.84	a	.67	.46	a	-1.15	-.36

Year	$\bar{\sigma}_{A_0}$		$\bar{\sigma}_{B_1}$			$\bar{\sigma}_{B_2}$		
	LS	ZA	EFFEST	LS	ZA	EFFEST	LS	ZA
1948	.78	.52	.11	.48	.23	.21	.56	.32
1954	.85	.67	.10	.58	.28	.25	.90	.45
1958	.85	.66	.09	.40	.21	.28	.80	.41
1963	1.24	.95	.11	.48	.27	.35	1.07	.62
1967	2.09	1.59	a	.56	.36	a	1.61	1.05

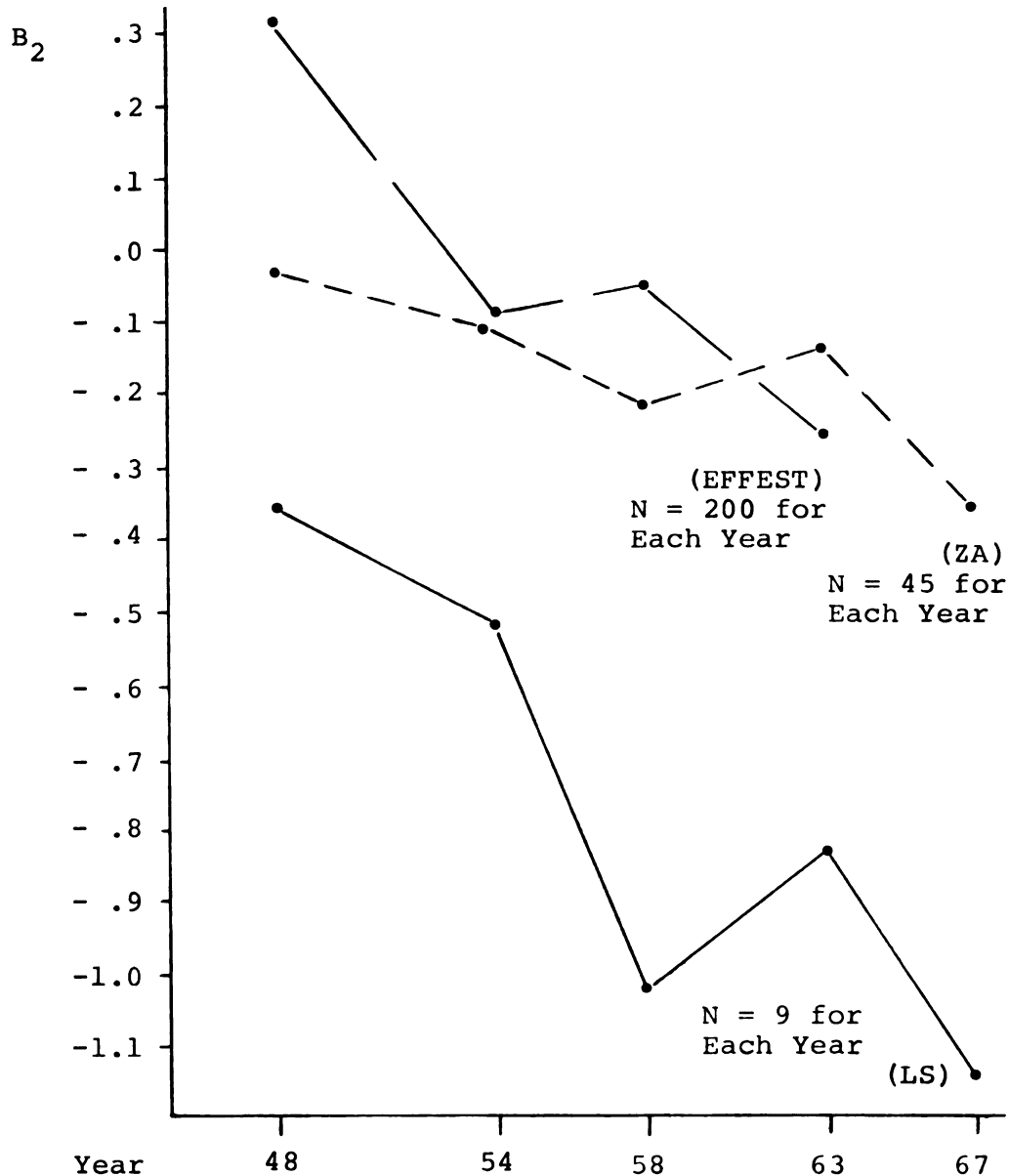
Year	t_{A_0}		t_{B_1}			t_{B_2}		
	LS	ZA	EFFEST	LS	ZA	EFFEST	LS	ZA
1948	1.71	3.60	5.63	1.87	2.30	1.41	-.65	-.09
1954	2.04	3.10	6.47	1.51	1.84	-.38	-.62	-.24
1958	3.34	4.02	6.29	2.07	2.01	-.18	-1.28	-.53
1963	2.20	2.58	5.09	1.60	1.62	-.77	-.79	-.23
1967	1.75	1.79	a	1.19	1.27	a	-.71	-.35

^aThe Van Tassel Study was concluded before the 1967 Census was conducted. EFFEST values are from the Van Tassel study.



Note: N is the sample size used to calculate B_1 .

Figure 3.1. The Regression Coefficients (B_1) Between the Independent Variable Personal Income per Capita and the Dependent Variable Drug Retail Establishments' Sales per Capita Using the Least-Squares (LS) Technique and EFFEST and Zellner-Aitken (ZA) Estimators for the Census Years 1948, 1954, 1958, 1963 (and 1967). Sample Size (N) for Each Year.



Note: N is the sample size used to calculate B_2 .

Figure 3.2. The Regression Coefficient (B_2) Between the Independent Variable Mean² Per cent Nonagricultural Employment as Per cent of Total Employment and the Dependent Variable Drug Retail Establishments' Sales per Capita Using the Least-Squares (LS) Technique and EFFEST and Zellner-Aitken (ZA) Estimators for the Census Years 1948, 1954, 1958, 1963 (and 1967). Sample Size (N) for Each Year.

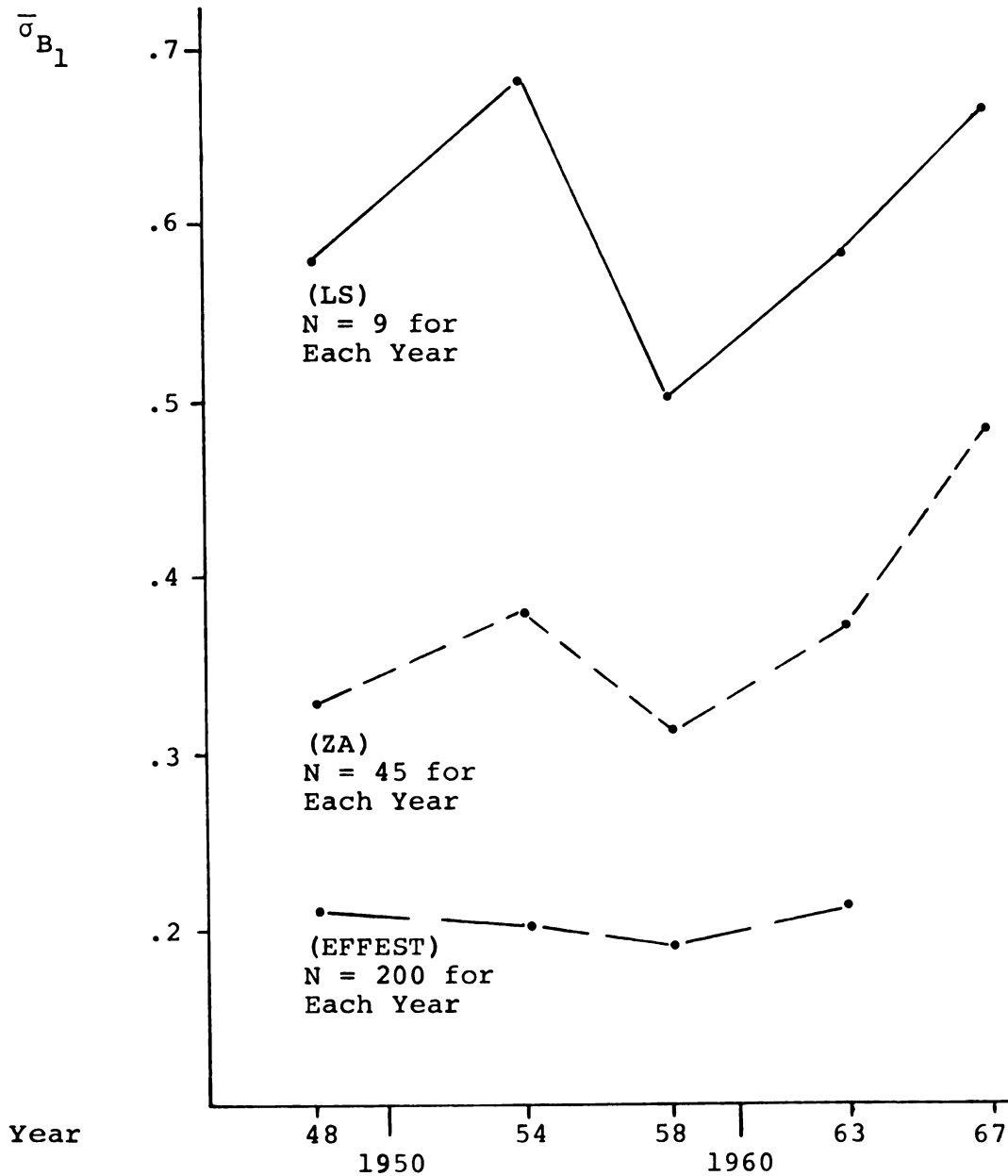
For this regression coefficient, the values calculated using the EFFEST and ZA estimators were greater than the values calculated using the LS estimators. Also for this coefficient, the values calculated for EFFEST and ZA are quite close.

Although it could not be tested statistically, it appeared that the values of the regression coefficient calculated using the EFFEST and ZA methods were related. Three factors that may have contributed to the differences that did exist were identified. First, the ZA and EFFEST methods were not exactly identical. As discussed earlier, the computer programs used differ. Second, the geographical units used for the techniques differ. States were used for the EFFEST program and geographic divisions for the ZA program. Third, the ZA estimates were calculated including 1967 census data; and since the observations from each time period affect all the other periods, when using the ZA and EFFEST estimators, some variations were expected. However, in spite of differences, both the estimating techniques (EFFEST and ZA) have a common origin, the LS analysis. And because both estimates were found to have a similar relationship with this similar origin, their relationship to each other seemed meaningful.

Standard Error of the Regression
Coefficients (σ_{B_1} and σ_{B_2})

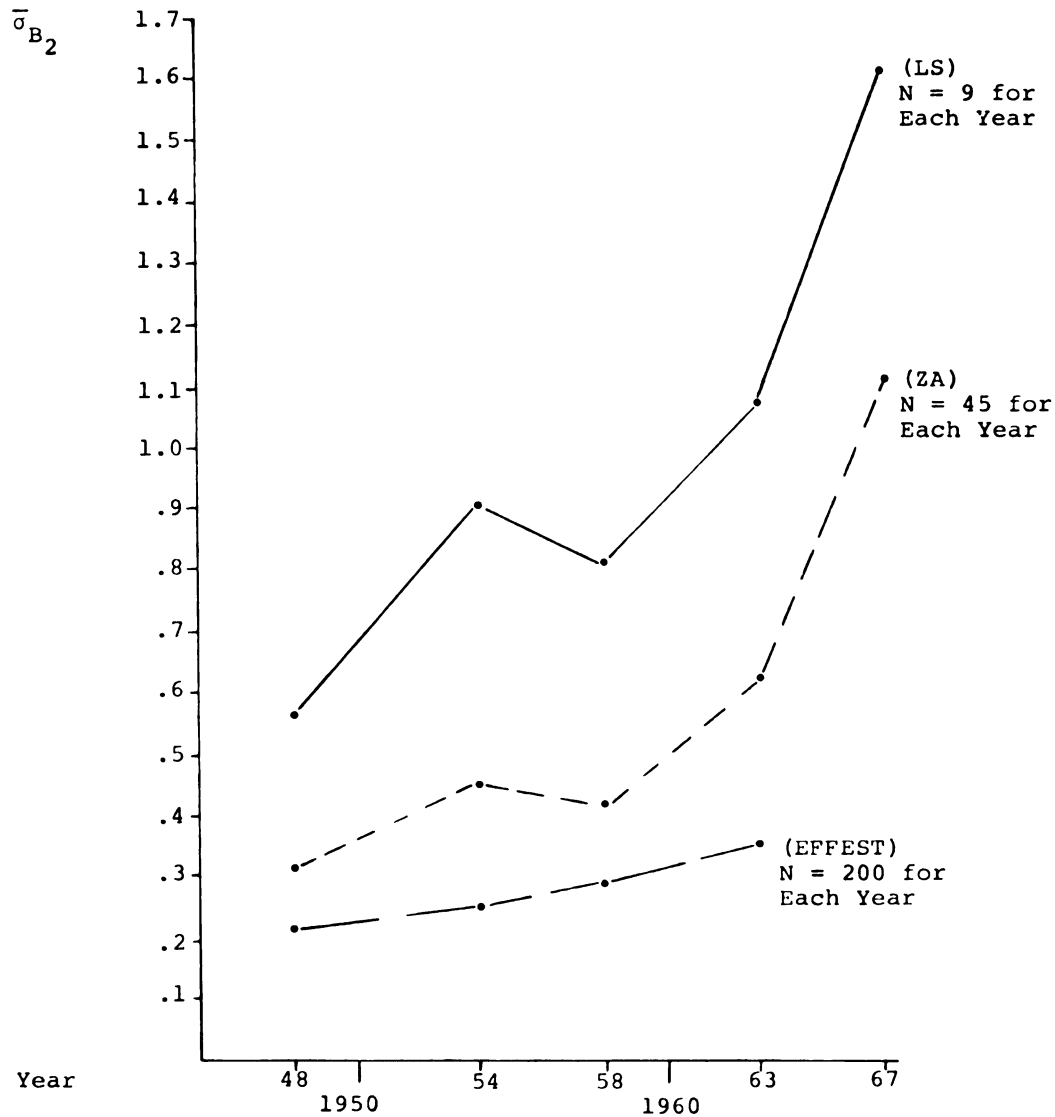
The standard error of the regression coefficient was the estimate of sampling error that was calculated for each of the three techniques: least-squares, EFFEST, and Zellner-Aitken estimators. The values of these estimates are plotted in Figure 3.3 and Figure 3.4. The standard errors of the regression coefficients of drug retail establishments' sales per capita and person income per capita (σ_{B_1}) are shown in Figure 3.3. The standard errors of the regression coefficients of retail drug establishments' sales per capita and mean per cent nonagricultural employment (σ_{B_2}) are illustrated in Figure 3.4.

In both cases, the size of the standard error estimates varied with the estimator used. The largest estimates were found using the least-squares technique, the second largest, using the ZA estimator, and the smallest, using the EFFEST estimator. This difference in estimates was expected considering the size of the sample used in each of the calculations. For the calculation using LS, the sample size was 9, for ZA, it was 45, and for EFFEST, it was 200. It was necessary to compare the estimates on the basis of standard deviation of the regression coefficient. This comparison was done by multiplying the standard errors by the square root of their respective degrees of freedom. These results are presented in Table 3.2.



Note: N is the sample size used to calculate $\bar{\sigma}_{B_1}$.

Figure 3.3. The Standard Error of the Estimate of the Regression Coefficient ($\bar{\sigma}_{B_1}$) Between the Independent Variable Personal Income per Capita and Dependent Variable Drug Retail Establishments' Sales per Capita Using the Least-Squares (LS) Technique and EFFEST and Zellner-Aitken (ZA) Estimators for the Census Years 1948, 1954, 1958, 1963 (and 1967). Sample Size (N) for Each Year.



Note: N is the sample size used to calculate $\bar{\sigma}_{B_2}$.

Figure 3.4. The Standard Error of the Estimate of the Regression Coefficient ($\bar{\sigma}_{B_2}$) Between the Independent Variable Mean Per Cent Nonagricultural Employment and Dependent Variable Drug Retail Establishments' Sales per Capita Using the Least-Squares (LS) Technique and EFFEST and Zellner-Aiken (ZA) Estimators for the Census Years 1948, 1954, 1958, 1963 (and 1967). Sample Size (N) for Each Year.

Table 3.2. Estimate of the Standard Deviation of the Regression Coefficients Using the Estimated Values of the Standard Errors of the Regression Coefficients Calculated Using the LS Method and EFFEST and ZA Estimators for the Drug Retail Establishments' Sales per Capita for the Census Years 1948, 1954, 1958, 1963 (and 1967).

Year	σ_A		σ_{B_1}			σ_{B_2}		
	LS	ZA	EFFEST	LS	ZA	EFFEST	LS	ZA
1948	1.91	3.03	1.52	1.08	1.31	2.90	1.37	1.87
1954	2.08	3.91	1.38	1.42	1.63	3.46	2.20	2.62
1958	2.08	3.85	1.24	.98	1.22	3.87	1.96	2.39
1963	3.04	5.54	1.52	1.08	1.57	4.84	2.62	3.62
1964	5.12	9.27	a	1.37	2.10	a	3.94	6.12

^aThe Van Tassel study was concluded before the 1967 Census was conducted.

Note: Degrees of freedom are equal to $(n - k)s - 1$

n = sample size

k = number of independent variables

s = number of samples

For LS, d.f. = 6;

ZA, d.f. = 34;

EFFEST, d.f. = 191.

With minor exception, the standard deviation estimates using the ZA and EFFEST estimators are larger than those using the LS techniques. This was as expected because the ZA and EFFEST techniques use the observations from all census periods in the calculation of the regression coefficients for each individual period. And a wider dispersion of values was found for the combined census years than for any one census year. These dispersions, or ranges, are presented in Table 3.3. For example, the independent variable, drug retail establishments' sales per capita, had ranges from \$16 to \$26 for the individual census years, while the range for the entire period, 1948-1967, was \$51. Therefore, the EFFEST and ZA methods, which used data from all time periods, had a larger variance than the least-square method using one time period.

When a significant difference in range of values for the individual year and the entire period was found, care in the application of techniques such as EFFEST and ZA had to be exercised. The problems encountered in this situation are presented in a later section of this chapter.

$$\underline{\text{"t" Values, } A/\bar{\sigma}_{A_1}, B_1/\bar{\sigma}_{B_1}, B_2/\bar{\sigma}_{B_2}}$$

Because of the difference in sample size, a comparison of the "t" values was not made. These "t" values were used by Van Tassel to determine the significance of his findings (18:12-13). An evaluation of this part of his procedure is made in a later section of this chapter.

Table 3.3. Range of Values for the Dependent and Independent Variables for the Individual Census Years and Total Census Period 1948-1967.

Census Years Period	Dependent Variable		Independent Variables			
	Drug Retail Establishments per Capita Sales		Per Capita Personal Income		Mean Per cent Nonagricultural Employment	
	Min.	Max.	Min.	Max.	Min.	Max.
1948	\$18.20	\$34.60	\$860	\$1660	54.5	94.6
1954	22.40	41.00	1120	2150	63.5	95.3
1958	29.50	49.20	1340	2450	73.3	96.1
1963	34.90	57.10	1660	2870	77.5	97.2
1967	43.80	69.50	2240	3600	83.4	98.0
Total period (1948- 1967)	18.20	69.50	860	3600	54.5	98.0

Conclusion on Comparison of EFFEST and ZA

Considering the limitations on the comparison, it was concluded that the EFFEST and ZA estimators do provide about the same result. As pointed out earlier, it was not possible to arrive at a conclusion concerning whether ZA is a more powerful estimator than EFFEST.

An Analysis of the Effects of the Estimators on the Regression Coefficients

The LS technique and ZA estimator give values of the regression coefficient that differ considerably. This section compares the differences to determine which was the correct value for consideration in this study. First, we looked at the drug retail establishments' sales per capita and two independent variables. When there are two independent variables, the correct graphical presentation of the regression equation is three-dimensional. Thus, a transition from numerical to graphical methods was made to provide a visual presentation of what occurs. Because of the difficulty in depicting the three-dimensional case, additional cases with only one independent variable were studied graphically.

The Three-Dimensional Case

If the regression equations for Van Tassel's drug retail establishments' sales per capita case were plotted, the results would be pictorially confusing. If

geometrically correct, this representation would require the plotting of ten planes (two for each of the five census years). To reduce some of the potential confusion caused by such complex geometric plotting, Figure 3.5 was drawn with only three pairs of equations represented. In addition, the relative position of the planes and their slopes were shifted to provide a clearer representation.

Each of the equations is skewed to the left. This resulted in the left end of the 1967 ZA plane shifting downward and the left end of the 1948 plane shifting upward. (The centroids of the ZA planes remain constant.) But these shifted planes do not appear to provide the best description of the relationship for their respective years. The bias tended to pull the regression equations together in the direction of the skewness (to the left). This can be observed in the graphic presentation found in Figure 3.5.

Three Cases of Efficient Estimators

In order to overcome the graphical difficulty of presenting three-dimension cases, a study of two-dimensional cases was made. These cases have only one independent and one dependent variable. The first case presents what might have been expected of the ZA estimators. Because an actual example of this type was not found in the study of the channels examined, the variables used for illustration were artificial. Even though it was

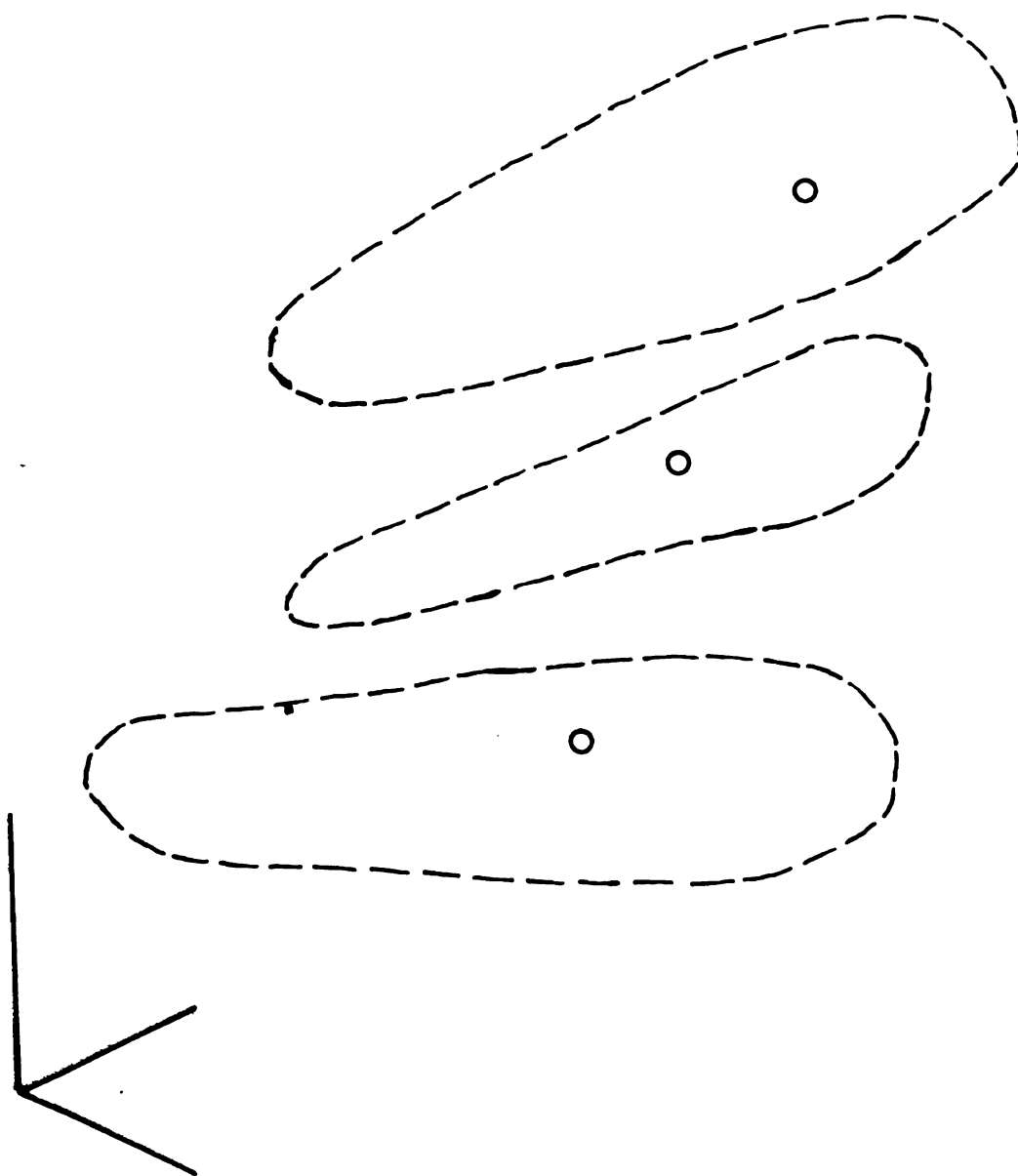
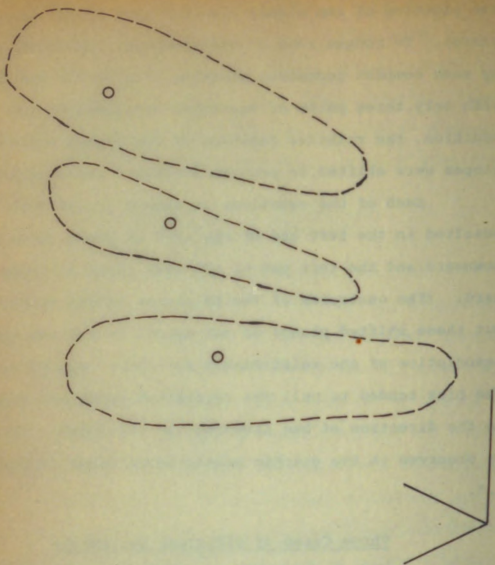


Figure 3.5. (Overlay)--Regression Equations Calculated
Using ZA Estimators ---

Figure 3.2. (Overlay)--Regression Equations Calculated
Using 2A Estimators



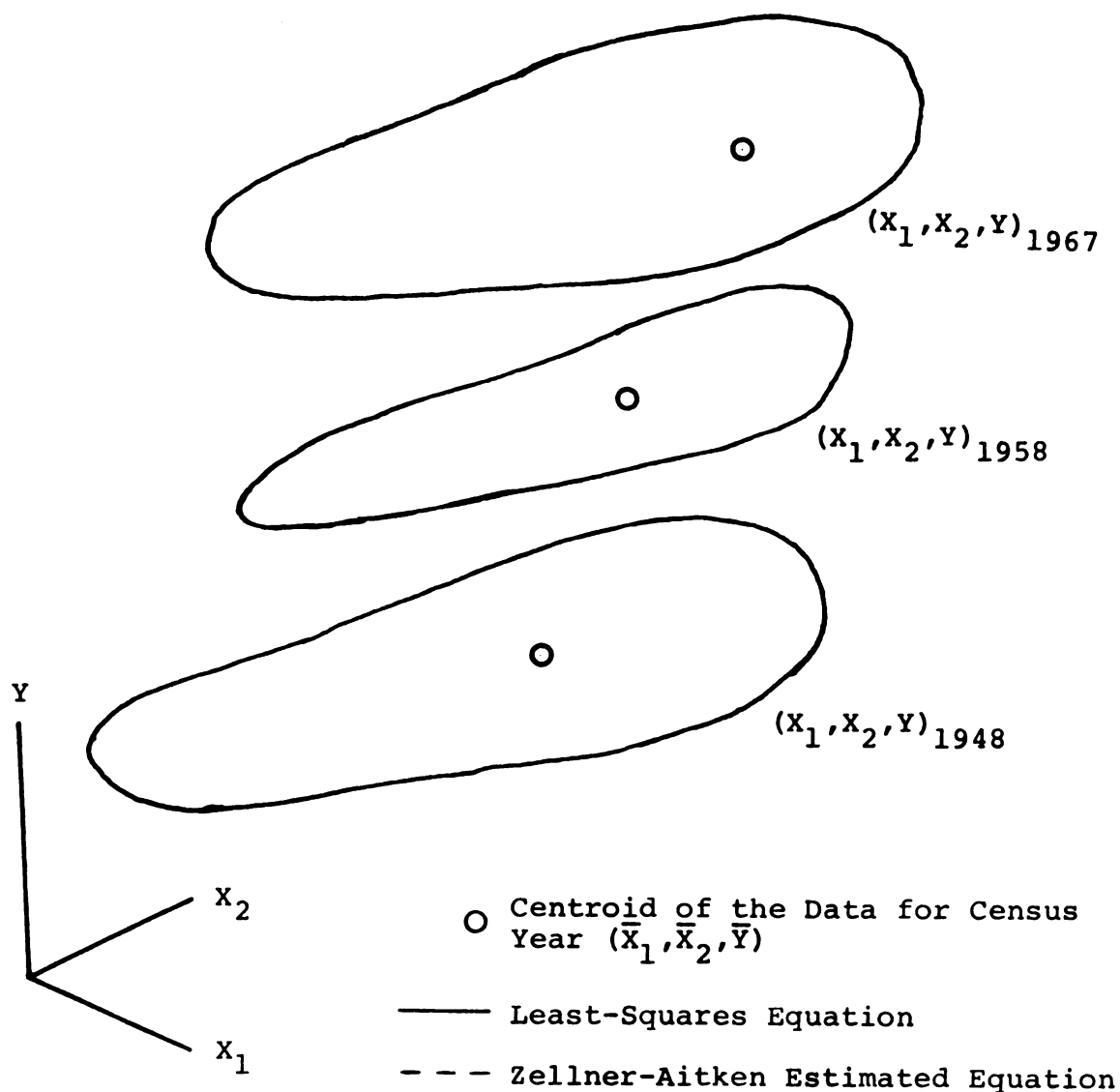


Figure 3.5. A Non-Scale Representation of the Regression Equations for the Drug Retailing Establishments' Sales per Capita for the Census Years 1948, 1958, and 1967. The Least-Squares (LS) and Zellner-Aitken (ZA) Estimators Were Used for Each Year.

not actually observed in the study, this case was included to provide a representation of the ZA method for the three conditions discussed. It reflects the advantage of the larger sample size employed when the estimators are used. If the small individual samples (years) from a common population were used in the estimate of the regression coefficient, it should have provided a better estimate of the population regression coefficient than the use of only one sample. In the second case the independent and dependent variables selected were all commodity per capita retail sales and per capita retail drug establishments' sales, respectively, while the independent and dependent variables in the third case were nonagricultural employment and drug merchant wholesaler per capita sales, respectively.

The length of the regression lines was determined by the range of values of the independent variable for individual census years.

Case 1. In this case the regression coefficients for each set of data (time-period) were approximately the same. With this situation, it would appear that a more efficient estimator for each set of data would be found using all sets of data simultaneously. This case is shown in Figure 3.6.

Each solid line represents the least-square (LS) regression equation for one set of data. The "o's"

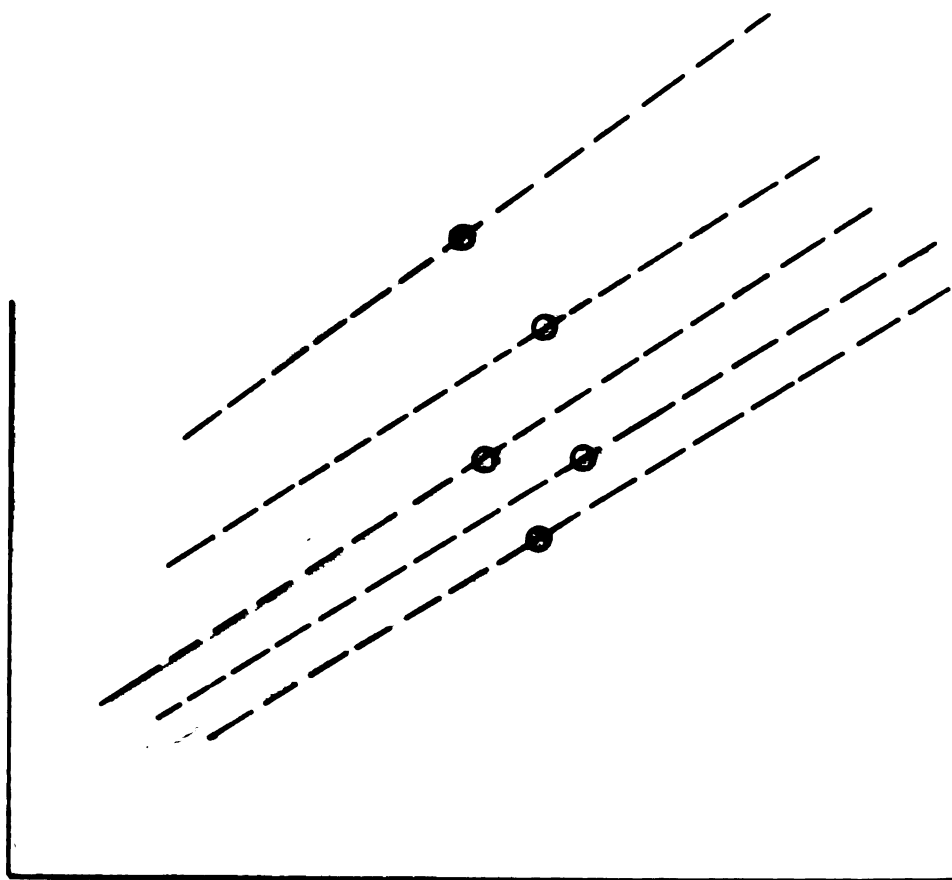
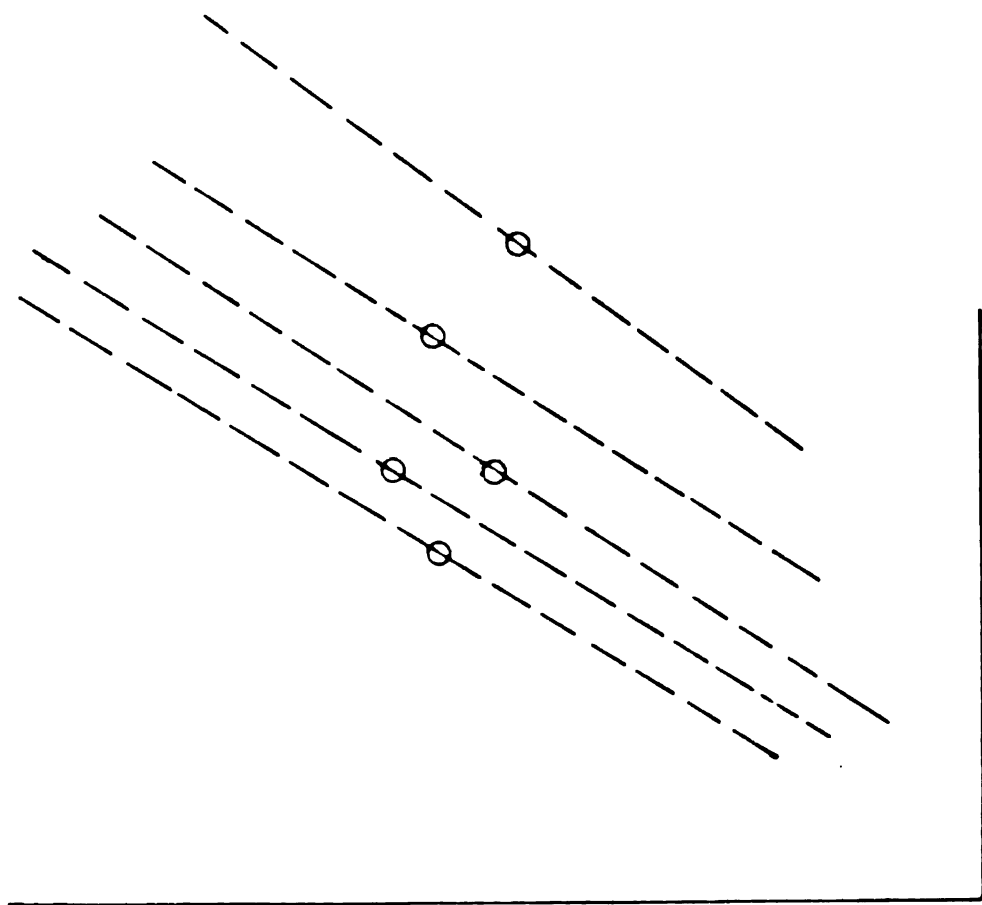


Figure 3.6. (Overlay)--Regression Equations Estimated
Using ZA Estimators ---

Figure 3.6. (Overlay)--Regression Equations Estimated
Using 2A Estimators - - -



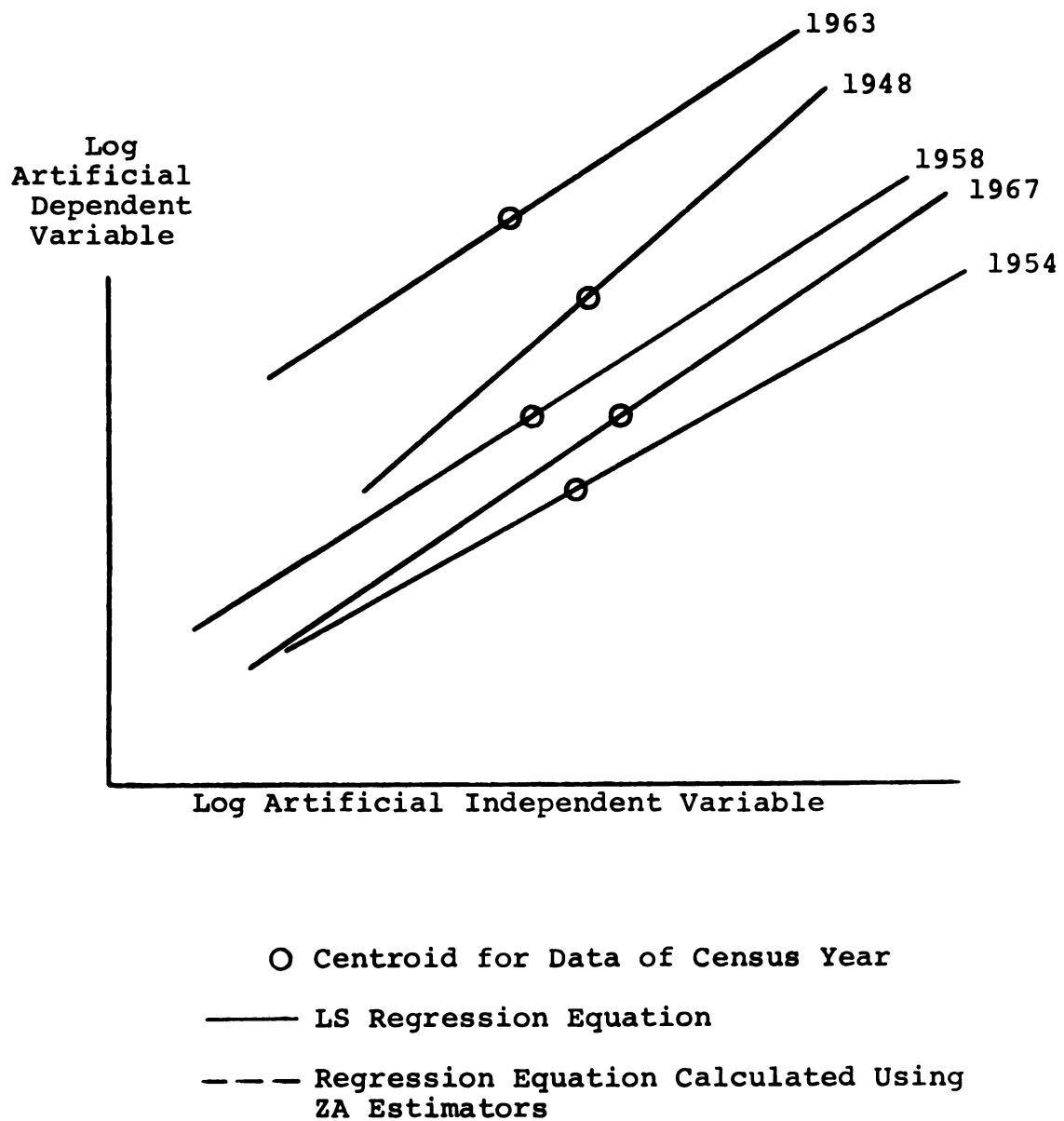


Figure 3.6. Case 1. Artificial Data to Show How the ZA Estimator Might Improve the Estimates of the Regression Coefficients for the Individual Census Periods (1948-1967).

represent the centroids of the individual sets of data, and each dashed line, the regression equation for a set of data after the application of the ZA routine.

Case 2. In this case the least-squares equations were nearly parallel. This relationship is shown by Figure 3.7. The equations calculated using the ZA estimators are approximately parallel to each other, but not to the equations estimated by LS. Because the ZA equations were closer to the horizontal than the LS estimator, one reasonable explanation did exist. The ZA estimate was made using the data for all time periods. Because of this, a greater range of variables (Table 3.3) were used in the calculations of each ZA, compared to those employed for LS. These increased ranges, then, reduced the value of the estimators or slopes in this case. This is reflected by the lower coefficients of correlations (r^2) as revealed in Table 3.4. Unless special circumstances exist, such as in Case 3, the ZA estimates tend to parallel the horizontal axis, rather than the slope of the individual equations calculated by LS.

Case 3. In this case another type of undesired result was found while using both LS and ZA estimators. The pair of equations calculated by LS and ZA for each of the first three census periods were very similar (Figure 3.8). However, the two methods provided very different equations for 1963 and 1967. In this case, unlike Case 2,

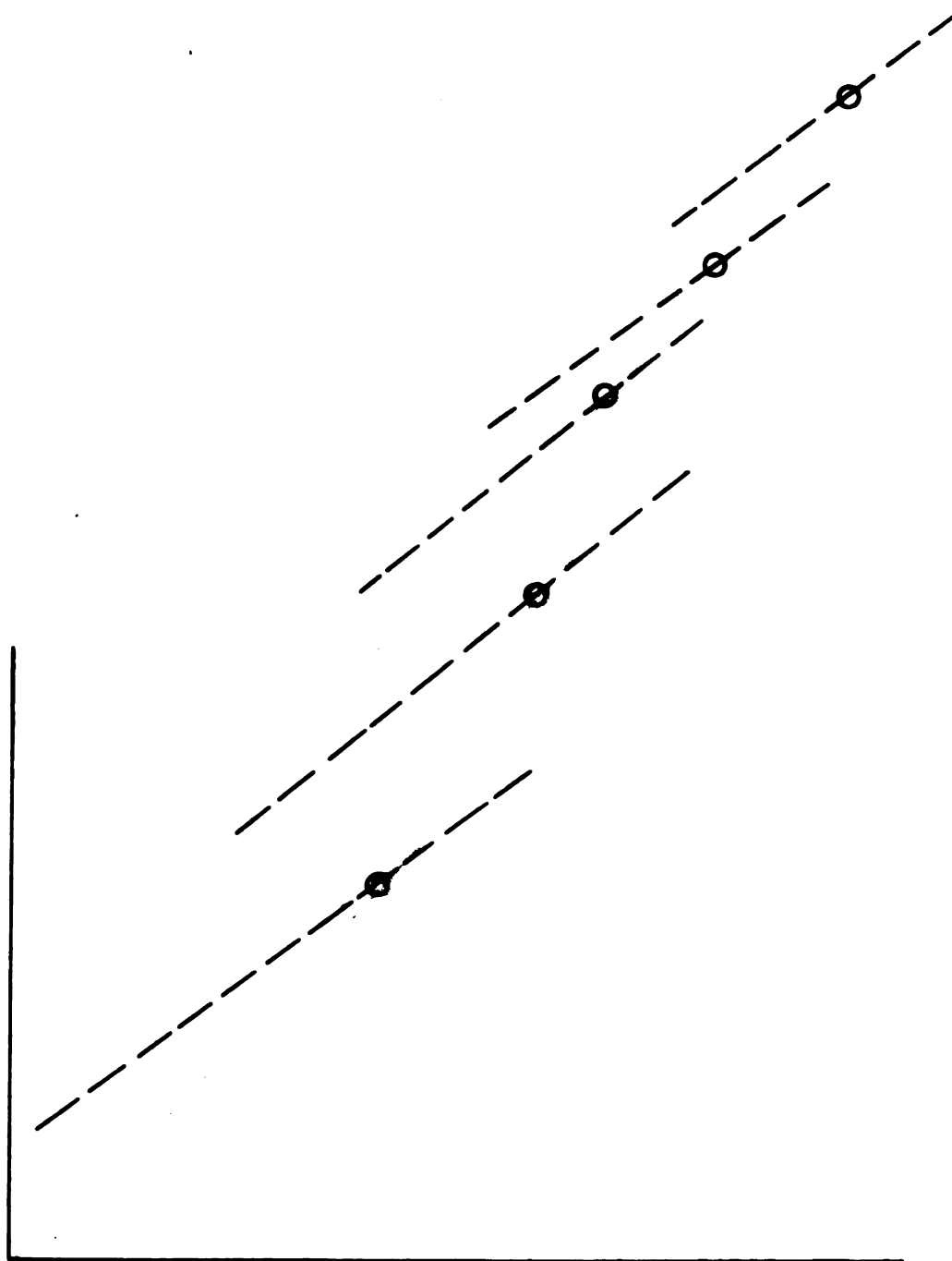
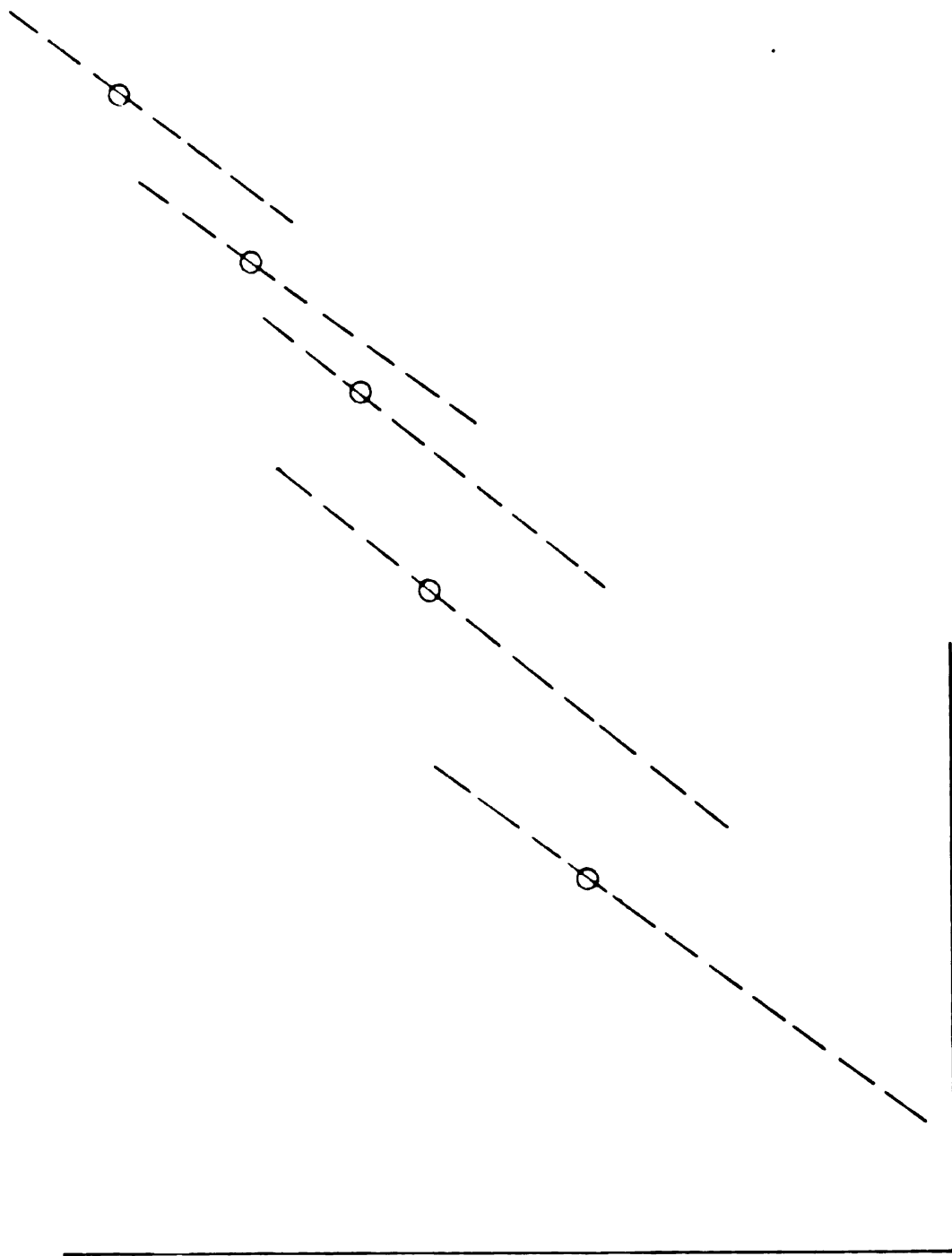


Figure 3.7. (Overlay)--Regression Equations Calculated
Using ZA Estimators - - - - -

Figure 3.7. (Overlay)--Regression Equations Calculated
Using 2A Estimators . . .



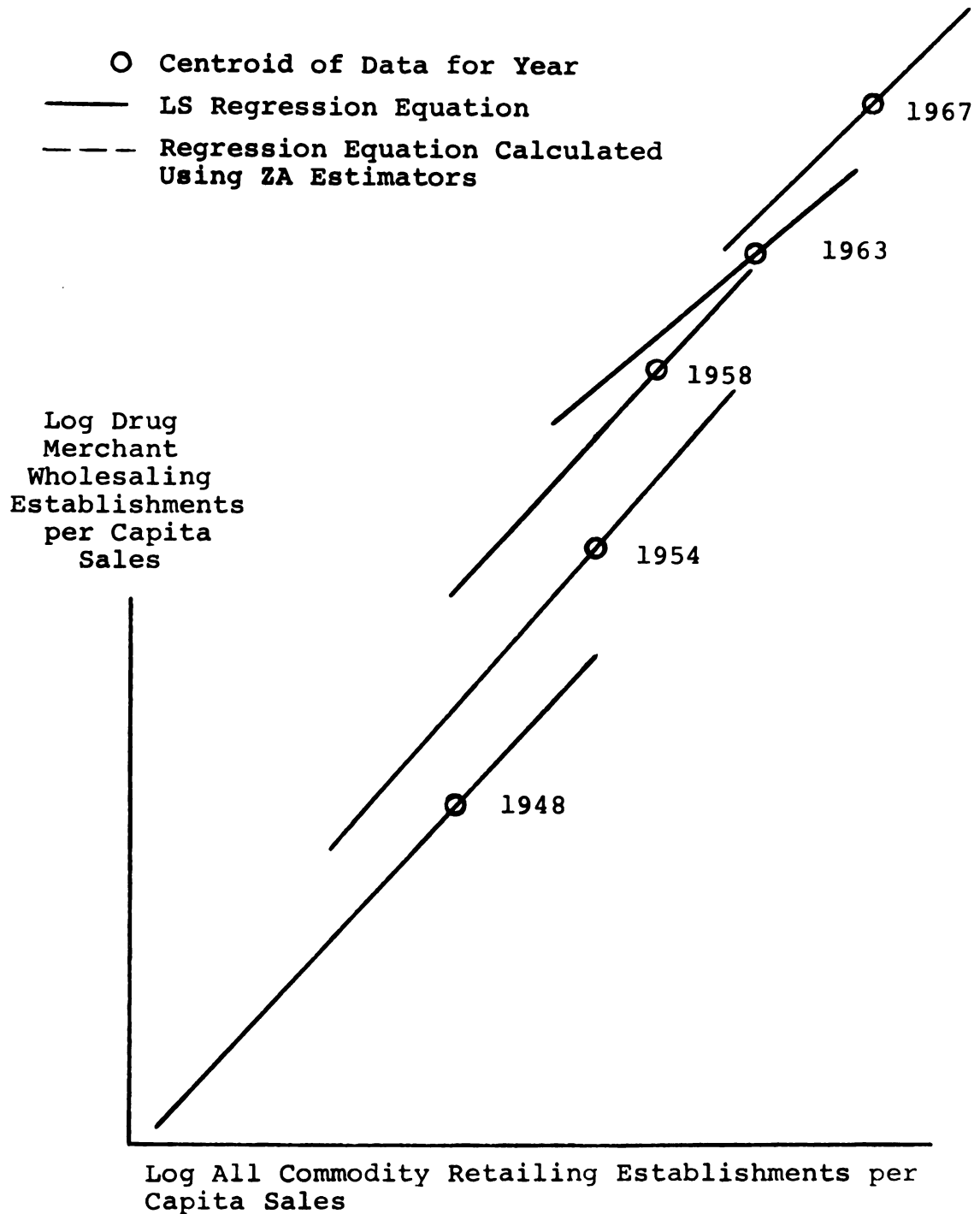
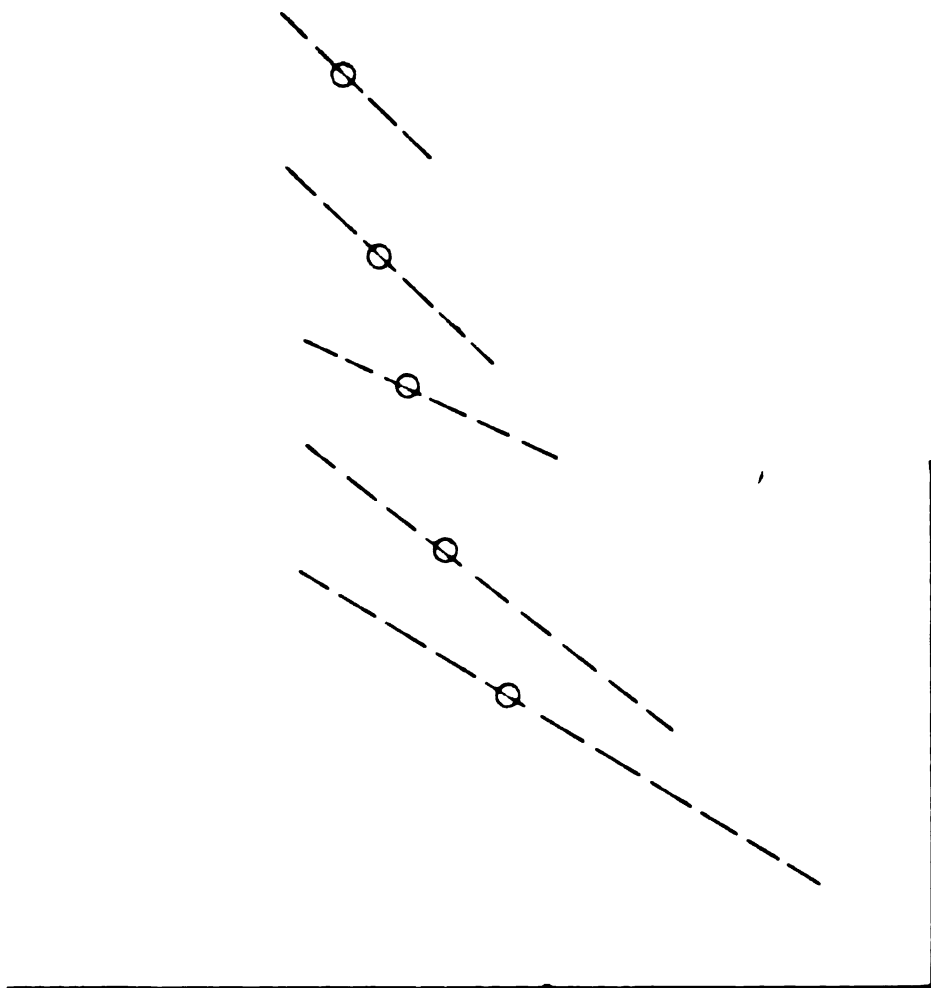


Figure 3.7. Case 2. Regression Equations for the Relationships Between the Independent Variable, All Commodity Retail per Capita Sales, and Dependent Variable, Drug Merchant Wholesaling per Capita Sales, Using LS and ZA Estimators for the Individual Census Periods (1948-1967).

Figure 3.8. (Overlay)--Regression Equation Calculated
Using 2A Estimators. - - -



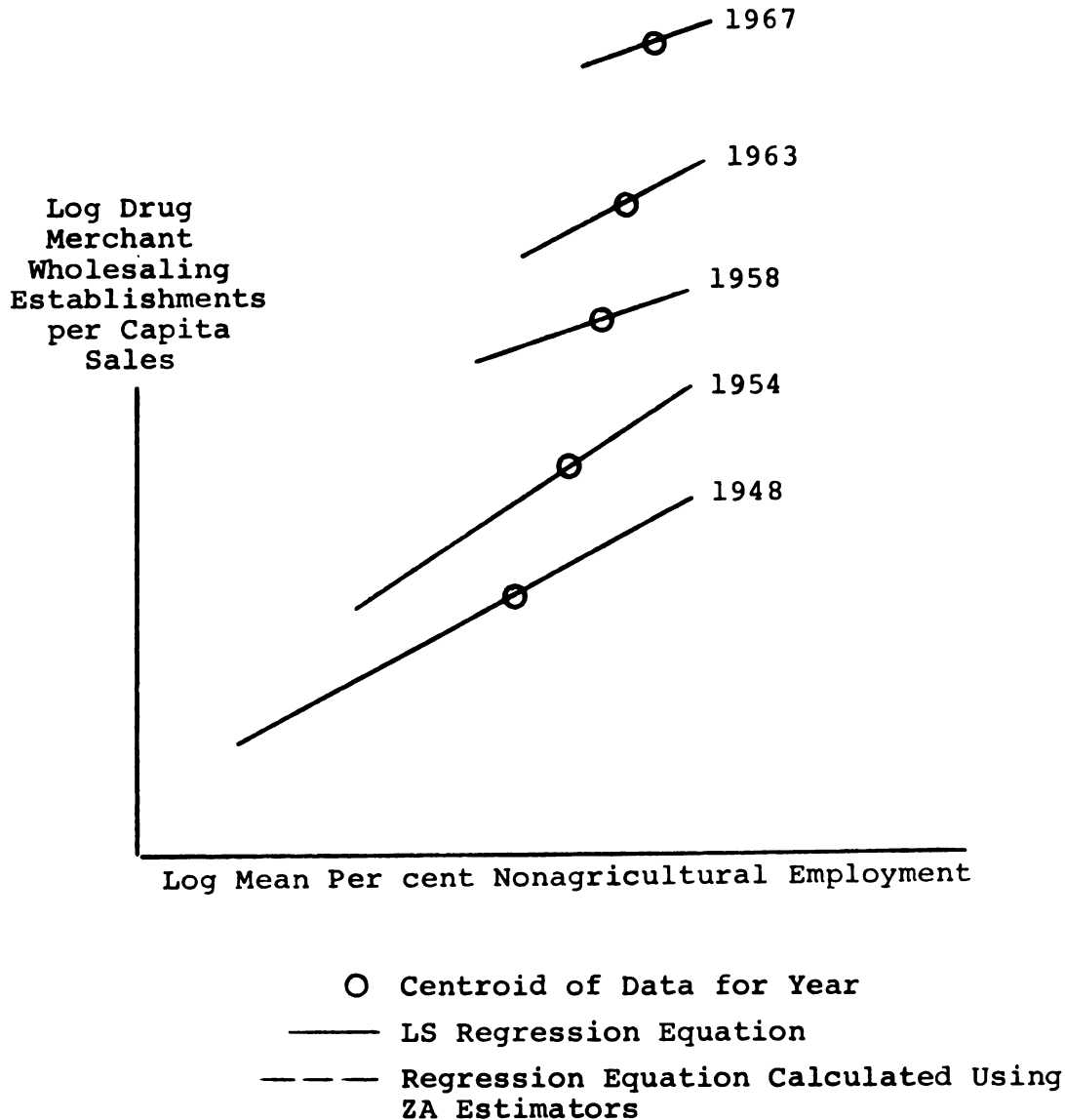


Figure 3.8. Case 3. Regression Equations of the Relationships Between the Independent Variable, Mean Per cent Nonagricultural Employment and Dependent Variable, Drug Merchant Wholesaling Establishments per Capita Sales, Using LS and ZA Estimators for the Individual Census Years (1948-1967).

Table 3.4. The Coefficient of Correlation (r) Between the Independent Variable All Commodity per Capita Retail Sales and Dependent Variable Drug Merchant Wholesaler per Capita Sales for Least-Squares (LS) and Zellner-Aitken for the Census Years 1948, 1954, 1958, 1963, and 1967.

Year	Coefficient of Correlation (r)	
	LS	ZA
1948	.65	.61
1954	.55	.50
1958	.49	.46
1963	.32	.31
1967	.30	.28

the ZA equations have a much steeper slope (B_1) than the LS equations. The difference between the equations for each of these years was basically a result of the skewness of the data. Recalling that the centroid of the equations for the ZA and LS must be the same for each year, one notes the slope of the 1963 and 1967 ZA estimates shifting toward the left end of the 1948 and 1954 data ranges. Although this would make a better estimate for the entire period of the study, it did not improve the estimate of the individual census periods.

Many varieties of 2 and 3 were found in a review of the computer output. However, none of the types described by Case 1 was found. Considering the limitations of Zellner included in the review of EFFEST and ZA in

Chapter II, it was concluded that the use of either EFFEST or ZA would be inappropriate. First, because the conditions stated by Zellner were not met and second because the actual application of EFFEST and ZA reviewed in this chapter obtained incorrect estimates with the two methodologies.

Therefore, the analyses for Chapters IV, V, VI, and VII were made using only the results of the least-squares calculations.

Testing the Significance of the Findings

Van Tassel used a t test to determine if the correlation between the dependent and independent variables occurred by chance. The hypotheses being tested were of the form:

$$H_0: B = 0$$

$$H_1: B \neq 0$$

B = the regression coefficient.

To perform this test the "t" values were used.

$$t = \frac{B}{\bar{\sigma}_B}$$

$\bar{\sigma}_B$ = standard error of B.

For his study Van Tassel (18) selected a critical value of t at the .05 level of significance. He calculated the degrees of freedom to be 46, and used a one-tail

test with a critical value of 1.67. Unfortunately, several errors of a technical or omission-type nature were committed by Van Tassel on these points.

First, the degrees of freedom for the ZA estimators as used by Van Tassel was 191 (see Table 3.2), not 46 as calculated by Van Tassel. Because he assumed a large sample size and used a \underline{t} value, this procedural irregularity did not lead to an error in the selection of a critical value for testing.

Second, the one-tail test was incorrectly used by Van Tassel. If properly employed, the one-tail test would determine those regression coefficients that were statistically greater than 0. Or the test could also determine if the value of \underline{t} was large enough in the negative direction to be statistically significant. The test hypothesized by Van Tassel (18:13) is shown in Figure 3.9. He should have accepted H_1 only when \underline{t} was greater than 1.67. Yet, he accepted relationships as highly significant when their \underline{t} values were negative. In these negative cases he stated that the relationships between dependent and independent variables were inverse. However, to test in both directions a two-tail test with $\underline{t}_{c.v.} = 1.96$ was appropriate (Figure 3.10).

Third, Van Tassel used the estimated standard error of the regression coefficient ($\bar{\sigma}_B$) that was calculated using the EFFEST program. Ruble has stated that

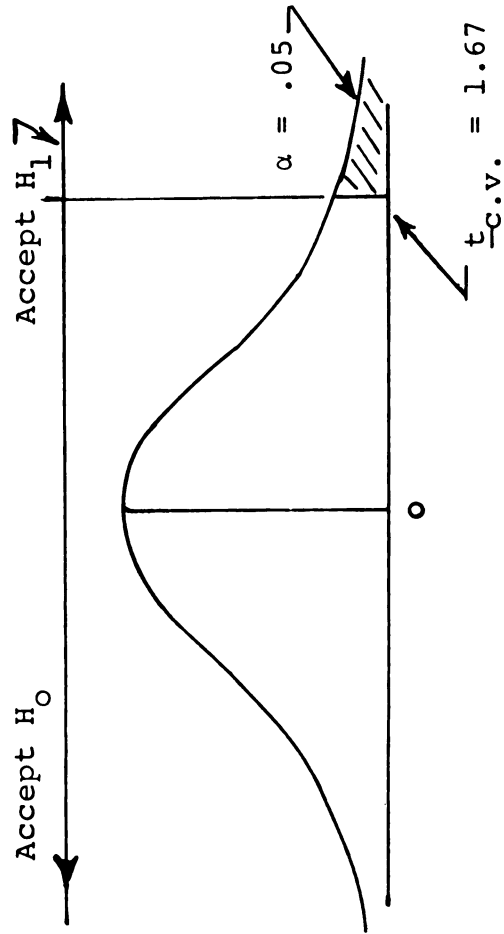


Figure 3.9. One-Tail Test as Hypothesized by Van Tassel for the Hypotheses of the Form: $H_0: B \leq 0$

$$H_1: B > 0$$

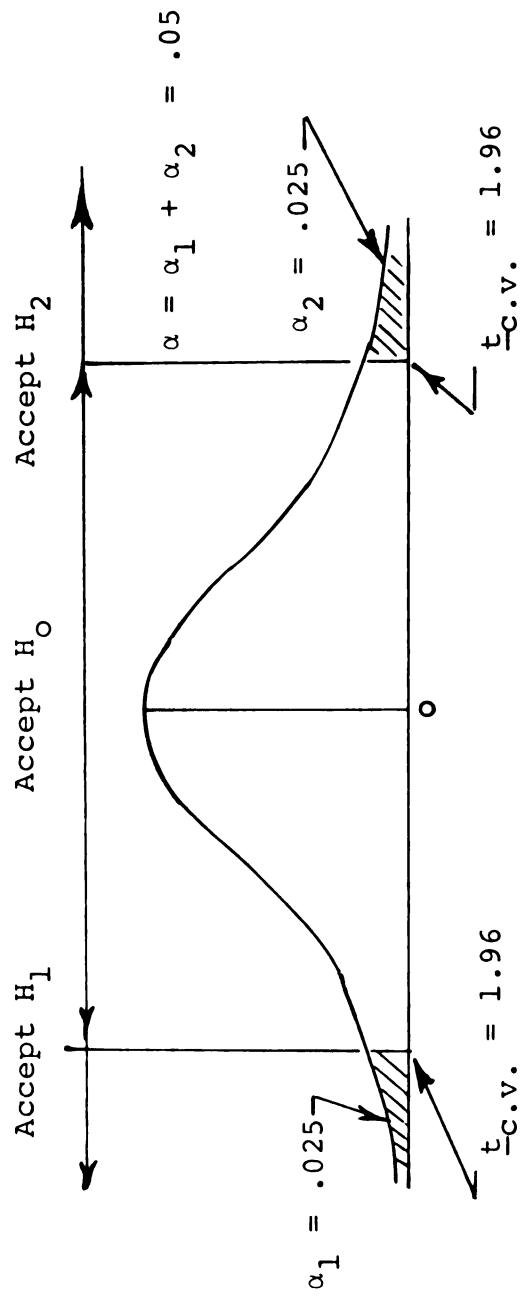


Figure 3.10. Two-Tail Test That Van Tassel Should Have Used of the Form:

$$H_0: B = 0$$

$$H_1: B < 0$$

$$H_2: B > 0$$

uncertainty about the meaning of these terms remain
(16:125):

The square roots of the diagonal elements of the estimated coefficient variance-covariance matrix (i.e., the square roots of the estimated coefficient variances) are often used as approximate coefficient standard errors and the ratios of the coefficients to the square roots of the estimated coefficient variance are often used as approximate coefficient t-ratios; however, very little information is available on how well these computed values serve as approximate standard errors and approximate t-ratios.

Unfortunately, however, Ruble does not provide a substitute for these values at this time.

The statistical significance of the relationship between the dependent and independent variable(s) can be based on the t-ratio or the correlation coefficient. At a given level of significance both methods would reject or accept the same relationship. The critical values are calculated using the following formulation (14).

$$R_{c.f.}^2 = (1 - R_{c.v.}^2) \frac{(F_{k, (n-k-1)} \cdot k)}{(n-k-1)}$$

where:

$R_{c.v.}^2$ = critical value of the correlation coefficient

F = "F" value for degrees of freedom k and (n-k-1)

k = number of independent variables per establishment

n = number of observations.

The critical values of the single (or multiple) coefficients of determination for this and the Van Tassel studies are presented in Table 3.5. A coefficient of determination .0193 would have been statistically significant in the Van Tassel study. However, on a practical basis the independent variable explained very little about the distribution of the dependent variable.

Conclusion

Based on the findings presented in this chapter, three methodological differences exist between Van Tassel's and this study. They are:

1. The efficient estimators (EFFEST and ZA) were not used in the remaining chapters of this study.
2. To test the significance of the relationships, the correlation coefficients, not the t-ratios, were tested in this study.
3. Conservative significance levels (as explained in Chapter II) were used to establish the critical values for this study.

Table 3.5. Critical Values of Single and Multiple Coefficients of Determination (r^2) and Coefficients of Correlation (r) at the .05 Level of Significance for Selected Sample Sizes and Numbers of Independent Variables.

Sample Size	Coefficient of Determination			Coefficient of Correlation			Application
	Independent Variables			Independent Variables			
	1	2	3	1	2	3	
9	.4444	.3610	.7645	.6666	.7943	.8744	This Study LS
45	.0863	.1327	.1716	.2938	.3643	.4142	This Study ZA
200	.0193	.0300	.0382	.1389	.1732	.1955	Van Tassel's EFFEST

CHAPTER IV

FINDINGS: THE ALL COMMODITY MERCHANT WHOLESALE CHANNEL

The all commodity merchant wholesaler channel represents the sum of the characteristics (dollar sales and establishments) of the individual merchant wholesaler channels. This all commodity channel provided a base line to compare the individual commodity line distribution channels that were examined in this study.

Merchant Wholesaler Characteristics Studied

The characteristics of the merchant wholesaler sector selected for study were the total dollar sales, total establishments, and mean dollar sales per establishment. The levels of these characteristics for the all commodity channel are presented in Table 4.1 for the census years 1948 to 1967.

The index numbers indicate the relative level of the individual characteristic with respect to the base year, 1948, a convenient reference base for this study. The use of index numbers provided a method of comparing

Table 4.1. Characteristics (and Index Numbers) of the All Commodity Merchant Wholesaler Sector of the United States Economy for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Total Merchant Wholesaler Sales 000,000 (Index Number)	Total Merchant Wholesaler Establishments (Index Number)	Mean Merchant Wholesaler Sales per Establishment (Index Number)
1948	\$ 76,533 (1.00)	129,117 (1.00)	\$593,000 (1.00)
1954	101,436 (1.33)	165,698 (1.27)	612,000 (1.03)
1958	122,060 (1.60)	190,492 (1.47)	641,000 (1.08)
1963	157,392 (2.06)	208,997 (1.62)	753,000 (1.27)
1967	206,035 (2.69)	212,993 (1.65)	967,000 (1.63)

the relative changes that took place between characteristics, channel sectors, and channels.

It can be seen (from Table 4.1) that the merchant wholesaler activity grew during the study period (1948-1967). Compared to the manufacturing and retailing sector, the most notable growth occurred in the number of merchant wholesaler establishments. This sector grew 65 per cent during the period, compared to 29 and 0 per cent for the manufacturing and retailing sectors, respectively.

Characteristics of the Other Channel Sectors

Manufacturing and retailing were the other two sectors of the all commodity merchant wholesaler channel

studied. The characteristics of these sectors selected for study are presented in Tables 4.2 and 4.3.

Table 4.2. Selected Characteristics (and Index Numbers) of the All Commodity Manufacturing Sector of the United States Economy for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Total Manufacturing Value Added 000,000 (Index Number)	Total Manufacturing Establishments (Index Number)	Mean Manufacturing Value Added per Establishment (Index Number)
1948	\$ 74,290 (1.00)	240,807 (1.00)	\$309,000 (1.00)
1954	117,032 (1.58)	286,814 (1.19)	408,000 (1.32)
1958	141,541 (1.90)	303,387 (1.26)	467,000 (1.51)
1963	192,103 (2.58)	311,921 (1.29)	616,000 (1.99)
1967	262,358 (3.54)	311,754 (1.29)	665,000 (2.15)

The levels of total value added or sales rose during the period 1948-1967. However, the index numbers indicate that the manufacturers' value added was growing faster than the retailers' sales level (3.54 to 2.39).

The total manufacturing establishments rose 29 per cent during the period, while the number of retail establishments remained stable. But the all commodity value added or sales per establishment of the two sectors grew at nearly the same rate during the period of the study.

Table 4.3. Selected Characteristics (and Index Numbers) of the All Commodity Retail Sector of the United States Economy for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Total Retail Sales 000,000 (Index Number)	Total Retail Establishments (Index Number)	Mean Retail Sales per Establishment (Index Number)
1948	\$130,521 (1.00)	1,796,540 (1.00)	\$ 76,000 (1.00)
1954	170,568 (1.31)	1,727,967 (1.00)	99,000 (1.30)
1958	200,365 (1.54)	1,794,744 (1.02)	112,000 (1.47)
1963	244,202 (1.89)	1,707,391 (0.96)	143,000 (1.88)
1967	310,214 (2.39)	1,763,324 (1.00)	176,000 (2.32)

Selected Economic Characteristics

The economic characteristics selected for study are presented in Table 4.4. These are mean per capita personal income, mean population per square mile, and mean per cent nonagricultural employment.

The trend during the 1948-1967 period is not surprising. It included increasing personal income per capita and population density. The level of mean per cent non-agricultural also rose during this time.

Mean Per Capita Sales or Value Added and Establishments

To offset the differences in the levels of activity because of population variations between the geographic divisions, the analyses for most variables were conducted

Table 4.4. Aggregate Selected Economic Characteristics
(and Index Numbers) of the United States
Economy for the Years 1948, 1954, 1958, 1963,
and 1967.

Year	Mean per Capita Personal Income		Mean Population per Square Mile		Mean Nonagricultural Employment as Per cent Total Employment	
	(Index Number)		(Index Number)		(Index Number)	
1948	\$1435	(1.00)	49.0	(1.00)	80.0	(1.00)
1954	1770	(1.23)	54.2	(1.11)	84.7	(1.06)
1958	2057	(1.43)	58.5	(1.19)	86.9	(1.09)
1963	2449	(1.71)	63.4	(1.29)	89.6	(1.12)
1967	3159	(2.20)	66.4	(1.35)	93.1	(1.16)

on a per capita or per 1,000,000 population basis. Tables 4.5 and 4.6 present the sales or value added and establishments on this basis. The comments concerning the total sales and establishment levels, then, apply to per capita values. Obviously, magnitudes of the positive growth rates were reduced because of the population growth during the study period.

Results of the All Commodity Channel Study

Regression Coefficients (B)

As was stated earlier (in Chapter II), the significance of the association between the dependent and independent variables was determined by analysis of the

Table 4.5. Per Capita Sales or Value Added (and Index Numbers) for Manufacturing, Merchant Wholesaling, and Retailing Establishments for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Mean per Capita Value Added by Manufacturing Establishments (Index Number)		Mean per Capita Sales by Merchant Wholesaling Establishments (Index Number)		Mean per Capita Sales by Retailing Establishments (Index Number)	
1948	\$ 509	(1.00)	\$ 524	(1.00)	\$ 894	(1.00)
1954	726	(1.43)	629	(1.20)	1058	(1.18)
1958	813	(1.60)	701	(1.34)	1151	(1.29)
1963	1018	(2.00)	834	(1.59)	1294	(1.45)
1967	1326	(2.60)	1041	(1.99)	1568	(1.75)

Table 4.6. Manufacturing, Merchant Wholesaling, and Retailing Establishments (and Index Numbers) for the Years 1948, 1954, 1958, 1963, and 1967, per 1,000,000 Population.

Year	Mean Manufacturing Establishments per 1,000,000 Population (Index Number)		Mean Merchant Wholesaling Establishments per 1,000,000 Population (Index Number)		Mean Retailing Establishments per 1,000,000 Population (Index Number)	
1948	1649	(1.00)	884	(1.00)	12,116	(1.00)
1954	1779	(1.08)	1028	(1.16)	10,720	(0.88)
1958	1742	(1.06)	1094	(1.24)	10,358	(0.85)
1963	1653	(1.00)	1108	(1.25)	9,050	(0.75)
1967	1576	(0.96)	1076	(1.22)	8,912	(0.74)

correlation coefficients. This was done for two reasons. First, practical significance, not statistical significance, was used as a basis of analysis. Second, the findings in terms of correlation coefficients could more easily compare to the findings in the multiple correlation analysis.

Per Capita All Commodity Merchant Wholesaler Sales.--The simple correlation coefficients between the dependent variable per capita merchant wholesaler sales and the selected independent variables studied are presented in Table 4.7.

The relationships between the dependent variable, per capita all commodity merchant wholesaler sales, and the two independent variables, mean per capita all commodity manufacturing value added, and mean per capita retail sales, were not significant. However, their correlation coefficients were of the same magnitude during the period studied (1948-1967).

There was only one independent variable that had even a marginally significant association with per capita all commodity merchant wholesaler sales. It was per capita personal income. This correlation coefficient was slowly declining during the period. Neither of the other two independent variables selected, however, was significantly related to the dependent variable.

Table 4.7. Correlation Coefficients (r) Between Mean per Capita All Commodity Merchant Wholesaler Sales and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Mean per Capita All Commodity Manufacturing Value Added	Mean per Capita All Commodity Retailing Sales	Mean per Capita Personal Income*	Population per Square Mile	Mean Nonagricultural Employment as Per cent of Total Employment
1948	.6005	.6536	.7978	.4725	.6507
1954	.6146	.6101	.7349	.4813	.6057
1958	.5374	.6300	.7428	.4278	.5580
1963	.4679	.5356	.6888	.4444	.4868
1967	.5564	.5355	.6947	.5146	.3993

*Marginally significant.

Per Capita All Commodity Merchant Wholesaler

Establishments.--The simple correlation coefficients between the dependent variable, per capita merchant wholesaler establishments, and the selected independent variables studied are presented in Table 4.8.

A significant association exists between the dependent variable and the independent variable, mean per capita personal income. Marginally significant relationships exist between the dependent variable and the independent variables, mean per capita manufacturing establishments and mean per cent nonagricultural employment.

All three of the correlation coefficients decreased during the period of the study. Moreover, there is a notable similarity among the three independent variables associated with per capita merchant wholesale establishment. They are all measures of economic development. Thus, it would appear that the degree of association between per capita wholesaling establishments and the three independent variables become weaker as the level of economic development increases. Perhaps this reflects no more than the economics of scale or a trend toward larger scale establishments with increasing levels of economic development.

Mean Sales per All Commodity Merchant Wholesaler

Establishment.--The single correlation coefficients between the dependent variable, mean sales per all commodity

Table 4.8. Correlation Coefficients (r) Between Mean per Capita All Commodity Merchant Wholesaling Establishments and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Mean per Capita All Commodity Manufacturing Establishments*	Mean per Capita All Commodity Retailing Establishments	Mean per Capita Personal Income**	Population per Square Mile	Mean Nonagricultural Employment as Per cent of Total Employment*
1948	.8599	.8080	.8873	.4090	.8583
1954	.7931	.7887	.8606	.3868	.8483
1958	.7212	.6651	.8399	.3288	.7206
1963	.7057	.2865	.7520	.3378	.7136
1967	.5995	.3113	.6661	.2943	.5774

*Marginally significant.

**Significant.

merchant wholesaler establishment, and the selected independent variables are presented in Table 4.9.

None of the correlation coefficients was significant for the period of the study.

Multiple Correlation Coefficients

A selected group of multiple (linear) regression analyses were conducted. The combination of independent variables selected were presented in Chapter II. The purpose of the analyses was to find those combinations of independent variables that provided significantly better association with the dependent variables than did a single independent variable.

In the all commodity channel only one combination of independent variables provided a significantly higher correlation coefficient than did the single correlation coefficients. The combination of per capita manufacturing establishments and per capita retail establishments had significantly higher correlation coefficients with per capita merchant wholesaler establishment than did either of the individual independent variables. These findings are shown in Table 4.10.

Although not significant, by the definition outlined in Chapter II, an additional relationship is presented in Table 4.10. The combination of per capita manufacturer value added and per capita retail sales had a noticeably higher correlation coefficient with per

Table 4.9. Correlation Coefficients (r) Between Mean Sales per Merchant Wholesaling Establishment and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Mean Value Added per Manufacturing Establishment	Mean Sales per Retail Establishment	Mean per Capita personal Income	Population per Square Mile	Mean Nonagricultural Employment as per cent of Total Employment
1948	.1973	-.2240	-.2021	.1577	-.4855
1954	.4843	-.2560	-.0789	.2863	-.3308
1958	.4461	.0077	.1991	.3845	-.0066
1963	.2753	.0688	.3064	.3985	-.0317
1967	.6058	.2718	.4498	.5369	.0594

Table 4.10. Multiple Independent Variable Combinations that Provide Correlation Coefficients Significantly Superior to Each of the Independent Variables Considered Separately for the All Commodity Channel for the Years 1948, 1954, 1958, 1963, and 1967.

Combination of Dependent (Y) and Independent Vari- ables (X_1, X_2) Studied	Year	Multiple and Single Correlation Coefficients		
		Multiple	Single	
		$r_{YX_1X_2}$	r_{YX_1}	r_{YX_2}
Per Capita All MW Est (Y)	1948	.9561	.8599	.8080
Per Capita All MF Est (X_1)	1954	.9132	.7931	.7887
	1958	.8585	.7212	.6651
Per Capita All RT Est (X_2)	1963	.7430	.7057	.2865
	1967	.8225	.5995	.3113
Per Capita All MW Sales (Y)	1948	.7700	.6005	.6536
Per Capita All MF Value Added (X_1)	1954	.7302	.6146	.6101
	1958	.7235	.5374	.6300
Per Capita All RT Sales (X_2)	1963	.6152	.4679	.5356
	1967	.6676	.5564	.5355

capita merchant wholesaler establishments than either of them separately.

Both of the findings in Table 4.10 indicate that the all commodity merchant wholesaler characteristics, per capita sales and establishments, were associated with the corresponding characteristics of both the manufacturing and retailing sectors of the channel.

Changes in the Regression Coefficient

As stated in Chapter I, the second hypothesis concerned changes over time of the relationships between the independent and dependent variables studied. In this section the regression coefficients and the coefficients' standard errors of the all commodity channel relationships are presented. These values were determined for each Census of Business year during the period 1948 through 1967. Also calculated with the t values for the differences between the regression coefficients for the years 1958 and 1967. These t values provided a method to determine if the regression coefficient (B) had changed significantly during the study period. The critical t value was 2.120, with 14 degrees of freedom at the .05 level of significance.

Per Capita All Commodity Merchant Wholesaler Sales.--The regression coefficients and the coefficients' standard errors between the dependent variable per capita

merchant wholesaler sales and the selected independent variables are presented in Table 4.11. None of the coefficients changed significantly during the period of the study. The low t values indicate the low level of change that took place. The greatest change occurred in the case of mean per cent nonagricultural employment. This change may be attributed, in part at least, to the narrowing range of values for this independent variable. An example of this narrowing was observed in Figure 3.8.

Per Capita Merchant Wholesaler Establishments.--

In Table 4.12 the regression coefficients and coefficients' standard errors are presented for the dependent variable, per capita merchant wholesaler establishments, and selected independent variables.

One statistically significant change in regression coefficient took place. This was between the dependent variable and per capita retail establishments. Although not statistically significant, other changes in regression coefficients were noted. The regression coefficients of independent variables, per capita manufacturing establishments, per capita personal income, and population per square mile, decreased during the study period. This would tend to indicate that the dependent variable was varying less with changes in the level of the independent variables toward the end of the study period. The lower levels of regression coefficients (or slopes of the linear

Table 4.11. Estimated Regression Coefficients (B) and Standard Error of Coefficients (σ_B) Between Mean per Capita All Commodity Merchant Wholesaler Sales and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967. t Value of 1948 to 1967 Shift in Regression Coefficient. (Critical Value of $t = 2.12$)

Year	Mean per Capita All Commodity Manufacturing Value Added		Mean per Capita All Commodity Retailing Sales		Mean per Capita Personal Income		Population per Square Mile		Mean Nonagricultural Employment as Per cent of Total Employment	
	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B
1948	.317	.159	.997	.436	1.065	.304	.122	.086	1.021	.450
1954	.336	.163	1.020	.501	.955	.333	.117	.080	1.211	.601
1958	.336	.199	1.198	.558	.933	.318	.098	.078	1.401	.787
1963	.293	.210	1.023	.610	.879	.350	.097	.074	1.387	.941
1967	.361	.204	1.180	.703	1.002	.392	.133	.071	1.655	1.437
	$t_{48-67} = +.17$		$t_{48-67} = +.22$		$t_{48-67} = -.14$		$t_{48-67} = -.08$		$t_{48-67} = +.66$	

Table 4.12. Estimated Regression Coefficients (B) and Standard Error of Coefficients (σ_B) Between Mean per Capita All Commodity Merchant Wholesaling Establishments and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967. t Value of 1948 to 1967 Shift in Regression Coefficient. (Critical Value of $t = 2.12$)

Year	Mean per Capita All Commodity Manufacturing Establishments		Mean per Capita All Commodity Retailing Establishments		Mean per Capita Personal Income		Population per Square Mile		Mean Nonagricultural Employment as Per cent of Total Employment	
	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B
1948	.710	.159	2.756	.760	1.178	.231	.105	.089	1.339	.303
1954	.548	.159	1.898	.559	1.003	.224	.084	.076	1.522	.359
1958	.458	.166	1.656	.703	.821	.201	.059	.064	1.408	.512
1963	.402	.152	.878	1.109	.677	.224	.052	.055	1.434	.532
1967	.359	.181	.565	.652	.604	.255	.041	.050	1.504	.804
	$t_{48-67} = -1.46$		$t_{48-67} = +2.20^*$		$t_{48-67} = -1.67$		$t_{48-67} = -.63$		$t_{48-67} = +.19$	

*Statistically significant.

regression equation) indicate the dependent variables were less responsive to changes in the independent variables.

Mean Sales per Merchant Wholesaler Establishment.--

The regression coefficients and coefficients' standard errors between the dependent variable, sales per merchant wholesaler establishment, and selected independent variables are shown in Table 4.13. None of the changes was statistically significant for the period of the study. However, four of the relationships underwent changes that deserve attention. The correlation coefficients of value added per manufacturing establishment, sales per retail establishment, per capita income, and population per square mile increased.

This latter finding appeared to be related to the changes noted for the previous dependent variables, per capita merchant wholesaler sales and establishments. While the per capita sales relationships remained stable, the number of establishment relationships decreased and the sales per establishment relationships increased. This suggested that while the merchant wholesaler establishments had become more uniformly distributed on a per capita basis, the variation in the scale of operations (sales per establishment) became greater.

Table 4.13.

Estimated Regression Coefficients (B) and Standard Error of Coefficients

(σ_B) Between Mean Sales per All Commodity Merchant Wholesaling Establishment and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967. t Value of 1948 to 1967 Shift in Regression Coefficient. (Critical Value of $t = 2.12$)

Year	Mean Value Added per Manufacturing Establishment		Mean Sales per Retailing Establishment		Mean per Capita Personal Income		Population per Square Mile		Mean Nonagricultural Employment as Per cent of Total Employment	
	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B
1948	.082	.154	-.200	.328	-.113	.206	.017	.040	-.318	.216
1954	.231	.157	-.337	.482	-.048	.230	.033	.041	-.310	.335
1958	.242	.184	.008	.382	.112	.208	.039	.039	-.007	.424
1963	.160	.211	.065	.357	.202	.238	.045	.039	-.047	.557
1967	.414	.205	.304	.407	.398	.299	.072	.043	.151	.960
	$t_{48-67}=+1.31$		$t_{48-67}=+.96$		$t_{48-67}=+1.41$		$t_{48-67}=+.94$		$t_{48-67}=+.48$	

CHAPTER V

FINDINGS: THE DRUG CHANNEL

In this chapter characteristics of the drug merchant wholesaler channel sector are compared to traits in selected drug manufacturing and retailing sectors' characteristics. In addition, the merchant wholesalers' characteristics are compared to selected economic characteristics.

Drug Commodity Line Merchant Wholesaler Characteristics

The characteristics of the drug merchant wholesaler sector selected for study were the total dollar sales, total establishments, and mean dollar sales per establishment. The levels of these characteristics are presented in Table 5.1 for the census years in the period 1948 to 1967.

The index numbers indicate the relative level of the individual characteristics with respect to the base year, 1948. The use of index numbers provided a method of comparing the relative changes that took place between characteristics, channel sectors, and channels.

All characteristics of the drug merchant wholesaler sector increased during the study period, 1948 to 1967.

Table 5.1. Selected Characteristics (and Index Numbers) of the Drug Merchant Wholesaler Sector of the Drug Distribution Channel for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Total Drug Merchant Wholesaler Sales 000,000 (Index Number)		Total Drug Merchant Wholesaler Establishments (Index Number)		Mean Drug Merchant Wholesaler Sales per Establishment (Index Number)	
1948	\$1370	(1.00)	2205	(1.00)	\$ 621,315	(1.00)
1954	2173	(1.58)	2801	(1.27)	775,794	(1.25)
1958	2826	(2.06)	3042	(1.38)	928,994	(1.50)
1963	3581	(2.62)	3321	(1.51)	1,078,289	(1.74)
1967	4749	(3.47)	3053	(1.38)	1,555,519	(2.50)

Comparing these findings to the all commodity channel on the basis of index numbers (Table 5.2), one notes several differences. First, the total sales level of the drug merchant wholesaler grew faster than the rate for all merchant wholesalers. Second, until the last census year, 1967, the number of drug merchant wholesalers establishments was proportional (on the basis of index number) to the number of merchant wholesaler establishments. Third, the sales per establishment of the drug merchant wholesalers increased much faster than the sales per establishments of the all commodity merchant wholesaler group.

Table 5.2. The Index Numbers of Selected Characteristics of the Manufacturing, Merchant Wholesaling, and Retailing Sectors of the All Commodity and Drug Merchant Wholesaler Distribution Channels for the Years 1948, 1954, 1963, and 1967.

Manufacturing						
Year	Total Value Added		Total Establishments		Value Added per Establishment	
	All Commodity	Drug	All Commodity	Drug	All Commodity	Drug
1948	1.00	1.00	1.00	1.00	1.00	1.00
1954	1.58	1.92	1.19	1.00	1.32	1.90
1958	1.90	3.10	1.26	0.96	1.51	3.22
1963	2.58	4.27	1.29	0.87	1.99	4.90
1967	3.54	6.14	1.29	0.75	2.15	8.10

Merchant Wholesaling Sector						
Year	Total Sales		Total Establishments		Sales per Establishment	
	All Commodity	Drug	All Commodity	Drug	All Commodity	Drug
1948	1.00	1.00	1.00	1.00	1.00	1.00
1954	1.33	1.58	1.27	1.27	1.03	1.25
1958	1.60	2.06	1.47	1.38	1.08	1.50
1963	2.06	2.62	1.62	1.51	1.27	1.74
1967	2.69	3.47	1.65	1.38	1.63	2.50

Retailing Sector						
Year	Total Sales		Total Establishments		Sales per Establishment	
	All Commodity	Drug	All Commodity	Drug	All Commodity	Drug
1948	1.00	1.00	1.00	1.00	1.00	1.00
1954	1.31	1.31	0.98	1.00	1.30	1.30
1958	1.54	1.69	1.02	0.91	1.47	1.81
1963	1.89	2.11	0.96	0.98	1.88	2.16
1967	2.39	2.72	1.00	0.96	2.32	2.83

Drug Commodity Line Manufacturing
Establishment Characteristics

The characteristics of the drug manufacturing sector are presented in Table 5.3. This sector reflected two major trends during the 1948-1967 period: a rapid growth in the amount of value added, and a concentration of activity into fewer manufacturing establishments. These trends compound into a very substantial increase in value added per establishment.

A comparison of the drug and all commodity manufacturing sectors' index numbers (in Table 5.2) indicates the magnitude of the above mentioned trends. The level of the drug manufacturing value added increased by 514 per cent compared to 254 per cent for the all commodity manufacturing sector. And while the number of all commodity manufacturing establishments was growing 29 per cent, the number of drug manufacturing establishments decreased by 25 per cent. But the greatest difference was in value added per establishment. While the all commodity manufacturing value added per capita increased only 115 per cent, the drug value added per capita increased 710 per cent.

Drug Commodity Line Retail Establish-
ments' Characteristics

The drug retail establishments' sales and sales per establishment grew about the same amount during the period of the study. The number of drug retail

Table 5.3. Selected Characteristics (and Index Numbers) of the Drug Manufacturing Sector of the Drug Distribution Channel for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Total Drug Manufacturing Establishments' Value Added 000,000 (Index Number)		Total Drug Manufacturing Establishments (Index Number)		Mean Drug Manufacturing Value Added per Establishment (Index Number)	
1948	\$ 607	(1.00)	1158	(1.00)	\$ 524,179	(1.00)
1954	1162	(1.92)	1163	(1.00)	999,140	(1.90)
1958	1882	(3.10)	1114	(0.96)	1,689,407	(3.22)
1963	2595	(4.27)	1011	(0.87)	2,566,765	(4.90)
1967	3721	(6.14)	875	(0.75)	4,252,571	(8.10)

establishments remained about constant during the period. These figures are shown in Table 5.4.

The levels of the selected characteristics for the drug and all commodity retail sectors are shown in Table 5.2. The levels of drug retail establishments' sales and sales per establishments grew slightly faster than the levels for the all commodity retail establishments. Thus, there are only slight differences between the index numbers of the drug and all commodity retail establishments.

Mean per Capita Drug Establishments' Sales
or Value Added and Establishments

To offset the differences in the total levels of activity among the various geographic divisions, the

Table 5.4. Selected Characteristics (and Index Numbers) of the Drug Retailing Sector of the Drug Distribution Channel for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Total Drug Retailing Establishments' Sales 000,000 (Index Number)	Total Drug Retailing Establishments (Index Number)	Mean Drug Retailing Sales per Establishment (Index Number)
1948	\$ 4,012 (1.00)	55,796 (1.00)	\$ 71,904 (1.00)
1954	5,250 (1.31)	56,009 (1.00)	93,734 (1.30)
1958	6,778 (1.69)	50,792 (0.91)	133,446 (1.81)
1963	8,487 (2.11)	54,732 (0.98)	155,064 (2.16)
1967	10,930 (2.72)	53,722 (0.96)	203,454 (2.83)

least-squares analysis of variables was conducted on a per capita basis. Tables 5.5 and 5.6 show the sales or value added and establishment on this basis. And the comments concerning the total sales and establishments' levels apply to the per capita values. Obviously, the magnitudes of the positive growth rates were reduced because of the population growth during the study period.

Results of the Drug Channel Study

Regression Coefficients (B)

As was stated earlier (in Chapter II), the significance of the association between the dependent and

Table 5.5. Per Capita Sales or Value Added (and Index Number) for Drug Manufacturing, Merchant Wholesaling, and Retailing Establishments for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Mean per Capita Value Added by Drug Manufacturing Establishments (Index Number)	Mean per Capita Sales by Drug Merchant Wholesaling Establishments (Index Number)	Mean per Capita Sales by Drug Retailing Establishments (Index Number)
1948	\$ 4.16 (1.00)	\$ 9.83 (1.00)	\$27.48 (1.00)
1954	7.22 (1.74)	13.50 (1.37)	32.61 (1.19)
1958	10.82 (2.60)	16.24 (1.65)	38.95 (1.42)
1963	13.73 (3.30)	18.95 (1.93)	44.90 (1.63)
1967	18.79 (4.52)	23.98 (2.44)	55.20 (2.01)

Table 5.6. Drug Manufacturing, Merchant Wholesaling, and Retailing Establishments (and Index Numbers) for the Years 1948, 1954, 1958, 1963, and 1967, per 1,000,000 Population.

Year	Mean Drug Manufacturing Establishments per 1,000,000 Population (Index Number)	Mean Drug Merchant Wholesaling Establishments per 1,000,000 Population (Index Number)	Mean Drug Retailing Establishments per 1,000,000 Population (Index Number)
1948	7.93 (1.00)	15.10 (1.00)	38.22 (1.00)
1954	7.22 (0.91)	17.40 (1.15)	34.79 (0.91)
1958	6.40 (0.81)	17.48 (1.16)	29.19 (0.76)
1963	5.35 (0.67)	17.57 (1.16)	28.96 (0.76)
1967	4.42 (0.56)	15.42 (1.02)	27.13 (0.71)

independent variables was determined by analysis of the correlation coefficients.

Per Capita Drug Merchant Wholesaler Sales.--The simple correlation coefficients between the dependent variable, per capita drug merchant wholesaler sales, and the selected independent variables are presented in Table 5.7.

Two significant associations and one marginally significant association were noted for the study period. First, the dependent variable was significantly associated with the independent variables, per capita all commodity merchant wholesaler sales and per capita personal income. The level of the first correlation coefficient was increasing, while the second was decreasing. Then, an additional correlation coefficient was marginally significant. This was the association between the dependent variable and the independent variable, per capita all commodity retail sales. All three of the above associations were between the dependent variable and variables that are indicators of general economic activity, that is, wholesale sales, personal income, and retail sales.

The only other independent variable that came close to a significant correlation coefficient was per cent nonagricultural employment. This was also related to the general economic indicators mentioned above.

Table 5.7. Correlation Coefficients (r) Between Mean per Capita Drug Merchant Wholesaling Establishment Sales and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Mean per Capita Drug Manufacturing Establishments Value Added	Mean per Capita Drug Retailing Establishments' Sales	Mean per Capita All Commodity Merchant Wholesaling Establishments' Sales**
1948	.3843	.5652	.8169
1954	.3934	.3953	.8757
1958	.1927	.3106	.9130
1963	.3817	.0690	.9128
1967	.4582	-.0952	.9107

Year	Mean per Capita Personal Income**	Population per Square Mile	Mean Nonagricultural Employment as Per cent of Total Employment
1948	.8879	.2546	.8080
1954	.8444	.3812	.7446
1958	.7547	.2843	.6017
1963	.7083	.4847	.5043
1967	.7282	.5347	.5285

Year	Mean per Capita All Commodity Manufacturing Establishments Value Added	Mean per Capita All Commodity Retailing Establishments' Sales*
1948	.4975	.8091
1954	.5847	.7395
1958	.3575	.6997
1963	.4440	.5640
1967	.4651	.5477

*Marginally significant.

**Significant.

Per Capita Drug Merchant Wholesaler Establishments.--The simple correlation coefficients between the dependent variable, mean per capita drug merchant wholesaler establishments, and the selected independent variables are presented in Table 5.8.

A significant association existed between the dependent variable and independent variable, per capita all commodity merchant wholesaler establishments. This finding tied in with a related result on a per capita sales basis reported in the previous section.

One marginally significant correlation coefficient was also found. This was between the dependent variable and the independent variable, per capita drug manufacturing establishments. It indicated association between the per capita number of establishments in the manufacturing and merchant wholesale sectors of the drug channel. But such a relationship did not exist with respect to the drug merchant wholesaling and retail sectors.

None of the other independent variables had a correlation coefficient that was significant.

Mean Sales per Drug Merchant Wholesaler Establishment.--The single correlation coefficients between the dependent variable, mean sales per drug merchant wholesaler establishment, and the selected independent variables are presented in Table 5.9.

Table 5.8. Correlation Coefficients (r) Between Mean per Capita Drug Merchant Wholesaling Establishments and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Mean per Capita Drug Manufacturing Establishments*	Mean per Capita Drug Retailing Establishments	Mean per Capita All Commodity Merchant Wholesaling Establishments**
1948	.6745	.4242	.9106
1954	.7531	.1471	.8732
1958	.6554	.0297	.8371
1963	.6548	-.0612	.7458
1967	.6151	-.0622	.7980

Year	Mean per Capita Personal Income	Population per Square Mile	Mean Nonagricultural Employment as Per cent of Total Employment
1948	.7484	.3425	.7042
1954	.6900	.5268	.6620
1958	.6178	.4358	.5178
1963	.4408	.4839	.4038
1967	.4573	.4622	.4070

Year	Mean per Capita All Commodity Manufacturing Establishments	Mean per Capita All Commodity Retailing Establishments
1948	.6571	.6890
1954	.6635	.5470
1958	.5535	.4356
1963	.5292	.0545
1967	.4830	.0971

*Marginally significant.

**Significant

Table 5.9. Correlation Coefficients (r) Between Mean Sales per Drug Merchant Wholesaler Establishment and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Mean Value Added per Drug Manufacturing Establishment	Mean Sales per Drug Retailing Establishment	Mean Sales per All Commodity Merchant Wholesaling Establishment
1948	.1645	.3701	-.2165
1954	-.0323	.7630	-.2317
1958	-.5118	.6059	-.6968
1963	-.1167	.3075	-.2405
1967	.1067	.2218	-.0079
Year	Mean per Capita Personal Income	Population per Square Mile	Mean Nonagricultural Employment as Per cent of Total Employment
1948	-.2393	-.3528	-.2693
1954	.4557	-.3004	.2760
1958	-.0164	-.6199	-.0883
1963	.3297	-.1423	.0531
1967	.3903	.0174	.1233
Year	Mean Value Added per All Commodity Manufacturing Establishment	Mean Sales per All Commodity Retailing Establishment	
1948	.1420	.0352	
1954	.1928	.7552	
1958	-.3484	.4433	
1963	-.0051	.4338	
1967	.1212	.4783	

None of the correlation coefficients was significant for the study period 1948-1967.

Multiple Correlation Coefficients

A selected group of multiple (linear) regression analyses were conducted. The combinations of independent variables selected were presented in Chapter II. The purpose of the analyses was to find those combinations of independent variables that provided significantly better association with the dependent variables than did single independent variables.

In the drug channel none of the combinations of independent variables provided significantly higher (multiple) correlation coefficients.

Changes in the Regression Coefficients

As stated in Chapter I, the second hypothesis concerned changes over time of the relationship between the independent and dependent variables studied. In this section, the regression coefficients and coefficients' standard errors of the drug channel relationships are analyzed.

Per Capita Drug Merchant Wholesaler Establishments' Sales.--The regression coefficients and the coefficients' standard errors between the dependent variable,

per capita drug merchant wholesaler sales, and the selected independent variables are presented in Table 5.10.

None of the t values was statistically significant. Only one exceeded $|1.00|$. The t value of the change in regression coefficient between the dependent variable and the independent variable, per capita drug retail establishments' sales, equaled -1.43 . This decrease in regression coefficient might have reflected the "scrambled merchandising" in the retail sector, that is, commodity lines being handled by more types of retail outlets. The figures in Table 5.2 support this belief. While the value added and sales of the drug manufacturing and retail sectors increased 514 and 247 per cent respectively, the sales of the retail sector increased only 172 per cent. The increased output of the manufacturing and wholesaling sectors had to be disposed of somewhere.

Per Capita Drug Merchant Wholesaler Establishments.--In Table 5.11 the regression coefficients and coefficients' standard errors are presented for the dependent variable, per capita drug merchant wholesaler establishments, and selected independent variables.

None of the changes in the regression coefficients was statistically significant. However, four of the regression coefficients indicated changes with t values that were close to or greater than 1.00. These regression

Table 5.10. Estimated Regression Coefficients (B) and Standard Error of Coefficients (σ_B) Between Mean per Capita Drug Merchant Wholesaling Establishment Sales and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967. t Value of 1948 to 1967 Shift in Regression Coefficient. (Critical Value of $t = 2.12$)

Year	Mean per Capita Drug Manufacturing Establishments Value Added		Mean per Capita Drug Retailing Establishments' Sales		Mean per Capita All Commodity Merchant Wholesaling Establishments' Sales		Mean per Capita Personal Income		Population per Square Mile		Mean Nonagricultural Employment as Per cent of Total Employment		Mean per Capita All Commodity Manufacturing Establishments Value Added		Mean per Capita All Commodity Retailing Establishments' Sales	
	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B
1948	.072	.065	.778	.429	.734	.196	1.064	.208	.059	.085	1.139	.314	.236	.156	1.108	.304
1954	.065	.057	.560	.492	.829	.173	1.039	.249	.087	.080	1.409	.478	.302	.159	1.171	.403
1958	.025	.047	.446	.516	.761	.128	.790	.259	.054	.069	1.259	.631	.186	.184	1.109	.428
1963	.046	.042	.083	.452	.740	.125	.733	.276	.086	.059	1.165	.754	.226	.172	.873	.483
1967	.062	.046	-.117	.463	.771	.132	.889	.316	.099	.059	1.854	1.126	.255	.184	1.022	.590
	$t_{48-67} = -.13$		$t_{48-67} = -1.43$		$t_{48-67} = +.16$		$t_{48-67} = -.46$		$t_{48-67} = +.39$		$t_{48-67} = +.61$		$t_{48-67} = +.08$		$t_{48-67} = -.13$	

Table 5.11. Estimated Regression Coefficients (B) and Standard Error of Coefficients (σ_B) Between Mean per Capita Drug Merchant Wholesaling Establishments and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967. t Value of 1948 to 1967 Shift in Regression Coefficients. (Critical Value of $t = 2.12$)

Year	Mean per Capita Drug Manufacturing Establishments		Mean per Capita Drug Retailing Establishments		Mean per Capita All Commodity Merchant Wholesaling Establishments		Mean per Capita Personal Income		Population per Square Mile		Mean Nonagricultural Employment as Per cent of Total Employment		Mean per Capita All Commodity Manufacturing Establishments		Mean per Capita All Commodity Retailing Establishments	
	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B
1948	.046	.190	1.001	.807	1.140	.196	1.244	.417	.110	.114	1.376	.524	.680	.295	2.943	1.170
1954	.317	.105	.265	.675	.880	.185	.811	.322	.115	.070	1.197	.512	.462	.197	1.327	.767
1958	.287	.125	.058	.736	1.104	.273	.797	.383	.103	.080	1.335	.834	.464	.264	1.431	1.118
1963	.305	.133	-.232	.722	1.005	.339	.535	.412	.101	.069	1.093	.936	.406	.246	.225	1.558
1967	.341	.151	-.127	.770	1.222	.349	.634	.466	.097	.071	1.623	1.377	.443	.304	.270	1.045
	$t_{48-67} = +1.10$		$t_{48-67} = -1.01$		$t_{48-67} = +.20$		$t_{48-67} = -.98$		$t_{48-67} = -.21$		$t_{48-67} = +.17$		$t_{48-67} = -.56$		$t_{48-67} = -.170$	

coefficients were of the dependent variable and the independent variables, per capita drug manufacturing establishments, per capita drug retail establishments, per capita personal income, and per capita all commodity retail establishments. Except for that associated with the per capita drug manufacturing establishments, the shifts seemed to be toward a distribution of drug merchant wholesalers' characteristics less related to other forms of economic activity. This simply meant that the regression coefficients were approaching zero.

Mean Sales per Drug Merchant Wholesaler Establishment.--The regression coefficients and coefficients' standard errors between the dependent variable, sales per drug merchant wholesaler establishment, and selected independent variables are shown in Table 5.12. None of the changes is statistically significant.

However, the t value for one association was greater than 1.00. The association between the dependent variable and the independent variable, per capita personal income, equaled 1.21. Yet because the regression coefficient varied so much from census to census, no meaning could be assigned to this finding.

Table 5.12. Estimated Regression Coefficients (B) and Standard Error of Coefficients ($\bar{\sigma}_B$) Between Mean Sales per Drug Merchant Wholesaling Establishment and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967. t Value of 1948 to 1967 Shift in Regression Coefficients. (Critical Value of $t = 2.12$)

	Mean Value Added per Drug Manu- facturing Establishment		Mean Sales per Drug Retailing Establishment		Mean Sales per All Commodity Merchant Whole- saling Establish- ment		Mean per Capita Personal Income		Population per Square Mile		Mean Nonagricul- tural Employment as per cent of Total Employment		Mean Value Added per All Commodity Manufacturing Establishment		Mean Sales per All Commodity Retailing Establishment	
	B	$\bar{\sigma}_B$	B	$\bar{\sigma}_B$	B	$\bar{\sigma}_B$	B	$\bar{\sigma}_B$	B	$\bar{\sigma}_B$	B	$\bar{\sigma}_B$	B	$\bar{\sigma}_B$	B	$\bar{\sigma}_B$
1948	.027	.060	.351	.333	-.291	.496	-.179	.275	-.051	.051	-.237	.320	.079	.209	.042	.452
1954	-.003	.034	.438	.140	-.190	.301	.228	.168	-.028	.034	.212	.280	.075	.145	.817	.268
1958	-.038	.024	.270	.134	-.538	.209	-.007	.164	-.049	.023	-.076	.326	-.146	.149	.346	.264
1963	-.011	.034	.158	.185	-.219	.334	.198	.214	-.015	.039	.071	.506	-.003	.200	.374	.294
1967	.010	.036	.102	.170	-.006	.278	.254	.227	.002	.037	.231	.703	.061	.189	.394	.274
	$t_{48-67} = -.24$		$t_{48-67} = -.67$		$t_{48-67} = +.50$		$t_{48-67} = +1.21$		$t_{48-67} = +.84$		$t_{48-67} = +.61$		$t_{48-67} = -.06$		$t_{48-67} = +.83$	

CHAPTER VI

FINDINGS: THE LIQUOR CHANNEL

In this chapter characteristics of the liquor merchant wholesaler channel sector were compared to selected characteristics of the liquor manufacturing and retail sectors. The merchant wholesalers' characteristics are also compared to selected economic characteristics.

Liquor Commodity Line Merchant Wholesaler Characteristics

The characteristics of the liquor merchant wholesaler sector selected for study were the total dollar sales, total establishments, and mean dollar sales per establishment. The levels of each are presented in Table 6.1 for the census years during the period 1948 to 1967.

The index numbers indicate the relative level of the individual characteristics with respect to the base year, 1948. Their use provided a method of comparing the relative changes that took place between characteristics, channel sectors, and channels.

The level of liquor merchant wholesale dollar sales grew 146 per cent during the study period. While

Table 6.1. Selected Characteristics (and Index Numbers) of the Liquor Merchant Wholesaler Sector of the Liquor Distribution Channel for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Total Liquor Merchant Wholesaler Sales 000,000 (Index Number)		Total Liquor Merchant Wholesaler Establishments (Index Number)		Mean Liquor Merchant Wholesaler Sales per Establishment (Index Number)	
1948	\$2518	(1.00)	1527	(1.00)	\$1,648,984	(1.00)
1954	3376	(1.34)	1518	(0.99)	2,223,978	(1.35)
1958	3799	(1.51)	1446	(0.95)	2,627,247	(1.59)
1963	4810	(1.91)	1470	(0.96)	3,272,108	(1.98)
1967	6119	(2.46)	1486	(0.97)	4,117,765	(2.50)

the number of establishments remained about constant, the sales per establishment grew 150 per cent during the period.

A comparison of the liquor and all commodity merchant wholesaling sector index numbers revealed a trend of relative concentration. The all commodity and liquor merchant wholesalers had approximately equal sales index numbers (Table 6.2). But, while the number of all commodity merchant wholesalers increased 65 per cent, the number of liquor merchant wholesalers decreased 3 per cent. Consequently, the sales per liquor merchant wholesaler increased 150 per cent compared to 63 per cent for the all commodity merchant wholesaler.

Table 6.2. The Index Numbers of Selected Characteristics of the Manufacturing, Merchant Wholesaling, and Retailing Sectors of the All Commodity and Liquor Merchant Wholesaler Distribution Channels for the Years 1948, 1954, 1958, 1963, and 1967.

Manufacturing						
Year	Total Value Added		Total Establishments		Value Added per Establishment	
	All Commodity	Liquor	All Commodity	Liquor	All Commodity	Liquor
1948	1.00	1.00	1.00	1.00	1.00	1.00
1954	1.58	0.78	1.19	0.61	1.32	1.27
1958	1.90	0.96	1.26	0.56	1.51	1.71
1963	2.58	1.30	1.29	0.51	1.99	2.54
1967	3.54	1.59	1.29	0.49	2.15	3.24

Merchant Wholesaling Sector						
Year	Total Sales		Total Establishments		Sales per Establishment	
	All Commodity	Liquor	All Commodity	Liquor	All Commodity	Liquor
1948	1.00	1.00	1.00	1.00	1.00	1.00
1954	1.33	1.34	1.27	0.99	1.03	1.35
1958	1.60	1.51	1.47	0.95	1.08	1.59
1963	2.06	1.91	1.62	0.96	1.27	1.98
1967	2.69	2.46	1.65	0.97	1.63	2.50

Retailing Sector						
Year	Total Sales		Total Establishments		Sales per Establishment	
	All Commodity	Liquor	All Commodity	Liquor	All Commodity	Liquor
1948	1.00	1.00	1.00	1.00	1.00	1.00
1954	1.31	1.23	0.98	0.94	1.30	1.32
1958	1.54	1.63	1.02	1.11	1.47	1.47
1963	1.89	2.01	0.96	1.20	1.88	1.68
1967	2.39	2.58	1.00	1.19	2.32	2.18

Liquor Commodity Line Manufacturing
Sector Characteristics

The characteristics of the liquor manufacturing sector are presented in Table 6.3. This was the only manufacturing sector studied that showed a drop in the level of manufacturing value added from the 1948 to the 1954 census. Between 1948 and 1954 the level of value added dropped 22 per cent compared to an increase of 58 per cent for all manufacturing. And in 1967, the level of value added was only 59 per cent above the 1948 level.

The number of liquor manufacturing establishments in 1967 were less than one-half the number in 1948. Because of the drop in number of establishments, the value added per establishment rose 224 per cent during the study period, compared to 115 per cent for all manufacturing establishments.

Liquor Commodity Line Retail Establish-
ments' Characteristics

The characteristics of the liquor retail sector are presented in Table 6.4. The level of sales increased throughout the study period. Although the number of establishments fluctuated during the period, the trend seemed to be slightly upward. In addition, the level of sales per retail establishment for this commodity line rose.

Comparison of the liquor retail sector with the all commodity retail sector revealed that both had about

Table 6.3. Selected Characteristics (and Index Numbers) of the Liquor Manufacturing Sector of the Liquor Distribution Channel for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Total Liquor Manufacturing Establishments Value Added 000,000 (Index Number)		Total Liquor Manufacturing Establishments (Index Number)		Mean Liquor Manufacturing Value Added per Establishment (Index Number)	
1948	\$586	(1.00)	644	(1.00)	\$ 909,937	(1.00)
1954	455	(0.78)	395	(0.61)	1,151,898	(1.27)
1958	560	(0.96)	361	(0.56)	1,551,246	(1.71)
1963	761	(1.30)	329	(0.51)	2,313,069	(2.54)
1967	934	(1.59)	317	(0.49)	2,946,372	(3.24)

Table 6.4. Selected Characteristics (and Index Numbers) of the Liquor Retailing Sector of the Liquor Distribution Channel for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Total Liquor Retailing Establishments' Sales 000,000 (Index Number)		Total Liquor Retailing Establishments (Index Number)		Mean Liquor Retailing Sales per Establishment (Index Number)	
1948	\$2580	(1.00)	33,422	(1.00)	\$ 77,194	(1.00)
1954	3171	(1.23)	31,240	(0.94)	101,504	(1.32)
1958	4202	(1.63)	37,068	(1.11)	113,359	(1.47)
1963	5191	(2.01)	40,188	(1.20)	129,167	(1.68)
1967	6662	(2.58)	39,619	(1.19)	168,151	(2.18)

the same rate of sales increase. The number of liquor retail establishments increased compared to the number of all commodity retail establishments. Therefore, the relative level of sales per establishment rose faster for the all commodity retail sector.

Mean per Capita Liquor Establishments'
Sales or Value Added and
Establishments

To offset the differences in the total levels of activity among the various geographic divisions, the least-squares analysis of the variables was conducted on a per capita basis. Tables 6.5 and 6.6 show the sales or value added and establishments arrived at through LS.

Results of the Liquor Channel Study

Regression Coefficients (B)

As was stated earlier (in Chapter II), the significance of the association between the dependent and independent variables was determined by analysis of the correlation coefficients.

Per Capita Liquor Merchant Wholesaler Sales.--The simple correlation coefficients between the dependent variable, per capita liquor merchant wholesaler sales, and the selected independent variables are presented in Table 6.7.

Table 6.5. Per Capita Sales or Value Added (and Index Number) for Liquor Manufacturing, Merchant Wholesaling, and Retailing Establishments for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Mean per Capita Value Added by Liquor Manufacturing Establishments (Index Number)		Mean per Capita Sales by Liquor Merchant Wholesaling Establishments (Index Number)		Mean per Capita Sales by Liquor Retailing Establishments (Index Number)	
1948	\$4.01	(1.00)	\$17.25	(1.00)	\$17.67	(1.00)
1954	2.83	(0.71)	20.97	(1.22)	19.70	(1.11)
1958	3.22	(0.80)	21.83	(1.27)	24.15	(1.37)
1963	4.03	(1.01)	25.45	(1.48)	27.47	(1.55)
1967	4.72	(1.18)	30.90	(1.79)	33.65	(1.91)

Table 6.6. Liquor Manufacturing, Merchant Wholesaling, and Retailing Establishments (and Index Numbers) for the Years 1948, 1954, 1958, 1963, and 1967, per 1,000,000 Population.

Year	Mean Liquor Manufacturing Establishments per 1,000,000 Population (Index Number)		Mean Liquor Merchant Wholesaling Establishments per 1,000,000 Population (Index Number)		Mean Liquor Retailing Establishments per 1,000,000 Population (Index Number)	
1948	4.41	(1.00)	10.46	(1.00)	228.92	(1.00)
1954	2.45	(0.56)	9.43	(0.90)	194.04	(0.85)
1958	2.08	(0.47)	8.31	(0.79)	213.03	(0.93)
1963	1.74	(0.39)	7.78	(0.74)	212.63	(0.93)
1967	1.60	(0.36)	7.51	(0.72)	200.10	(0.87)

Table 6.7. Correlation Coefficients (r) Between Mean per Capita Liquor Merchant Wholesaling Establishment Sales and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Mean per Capita Liquor Manufacturing Establishments Value Added	Mean per Capita Liquor Retailing Establishments' Sales*	Mean per Capita All Commodity Merchant Wholesaling Establishments' Sales*
1948	-.0048	.6208	.7398
1954	.0263	.7220	.7995
1958	.0866	.7402	.8746
1963	.0198	.8176	.7536
1967	-.0793	.7444	.6157

Year	Mean per Capita Personal Income**	Population per Square Mile	Mean Nonagricultural Employment as Per cent of Total Employment**
1948	.9018	.3941	.9119
1954	.9585	.5177	.9195
1958	.9478	.4666	.8011
1963	.9269	.4822	.8356
1967	.8988	.4584	.8231

Year	Mean per Capita All Commodity Manufacturing Establishments Value Added	Mean per Capita All Commodity Retailing Establishments' Sales*
1948	.6594	.8078
1954	.7545	.8265
1958	.6346	.8260
1963	.5344	.7996
1967	.4268	.7942

*Marginally significant.

**Significant.

Two significant associations were noted for the study period. The dependent variable exhibited a meaningful association with the independent variables, per capita personal income and per cent nonagricultural employment. And these correlations were positive, indicating a positive association between the variables involved.

Three marginally significant associations were also noted for the period. The dependent variable was marginally associated with per capita liquor retail sales, all commodity merchant wholesaler sales, and all commodity retail sales.

In addition to the above, a large number of positive correlation coefficients between per capita liquor merchant wholesaler sales and indicators of economic activity were found. This would seem to indicate a strong association between the two.

Per Capita Liquor Merchant Wholesaler Establishments.--The simple correlation coefficients between the dependent variable, mean per capita liquor merchant wholesaler establishments, and the selected independent variables are presented in Table 6.8.

Though there were no significant correlation coefficients for the study period, there was one marginally significant association. This was the association between the dependent variable and the independent variable, per capita income. Standing alone, this finding

Table 6.8. Correlation Coefficients (r) Between Mean per Capita Liquor Merchant Wholesaling Establishments and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Mean per Capita Liquor Manufacturing Establishments	Mean per Capita Liquor Retailing Establishments	Mean per Capita All Commodity Merchant Wholesaling Establishments
1948	.3645	.5629	.5236
1954	.1967	.3782	.5528
1958	.0215	.2842	.3207
1963	-.0230	.3691	.4328
1967	-.0917	.1980	.4951

Year	Mean per Capita Personal Income*	Population per Square Mile	Mean Nonagricultural Employment as Per cent of Total Employment
1948	.7743	-.0551	.7669
1954	.7774	-.0356	.5872
1958	.5835	-.1891	.3585
1963	.6331	-.1880	.4375
1967	.7291	-.0080	.4251

Year	Mean per Capita All Commodity Manufacturing Establishments	Mean per Capita All Commodity Retailing Establishments
1948	.5122	.3458
1954	.5511	.4828
1958	.2938	.0719
1963	.3493	.0069
1967	.3130	-.0172

*Marginally significant.

did not merit significance. However, it did seem to be related to the findings that were reported in the previous and subsequent sections of this chapter. Simply stated, this finding indicated a positive association between liquor channel related economic activities and the level of economic activity in a region.

Mean Sales per Liquor Merchant Wholesaler Establishment.--The single correlation coefficients between the dependent variable, mean sales per liquor merchant wholesaler establishment, and the selected independent variables are presented in Table 6.9. None of the correlation coefficients was significant for the study period.

Multiple Correlation Coefficients

A selected group of multiple (linear) regression analyses were conducted. The combinations of independent variables selected were presented in Chapter II. The purpose was to find those combinations of independent variables that provided significantly better association with the dependent variables than did single independent variables. In the liquor channel, however, none of the combinations of independent variables provided significantly higher (multiple) correlation coefficients.

Table 6.9. Correlation Coefficients (r) Between Mean Sales per Liquor Merchant Wholesaling Establishment and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Mean Value Added per Liquor Manufacturing Establishment	Mean Sales per Liquor Retailing Establishment	Mean Sales per All Commodity Merchant Wholesaling Establishment
1948	-.0325	.0084	.4640
1954	-.3891	-.0177	.0439
1958	-.3015	.0807	.2976
1963	-.0384	.1283	.2320
1967	-.0625	.2872	.0546

Year	Mean per Capita Personal Income	Population per Square Mile	Mean Nonagricultural Employment as Per cent of Total Employment
1948	-.1497	.4990	-.1284
1954	.3928	.6557	.5313
1958	.4755	.6026	.5061
1963	.3480	.6788	.4837
1967	.6040	.5807	.7272

Year	Mean Value Added per All Commodity Manufacturing Establishment	Mean Sales per All Commodity Retailing Establishment
1948	.1848	-.4296
1954	.2774	-.0653
1958	-.0165	.0600
1963	-.1104	.1008
1967	-.1621	.4334

Changes in the Regression Coefficients

As stated in Chapter I, the second hypothesis concerned changes over time of the relationship between the independent and dependent variables studied. In this section the regression coefficients and coefficients' standard errors of the liquor channel relationships are analyzed.

Per Capita Liquor Merchant Wholesaler Establishment Sales.--The regression coefficients and the coefficients' standard errors between the dependent variable, per capita liquor merchant wholesaler sales, and the selected independent variables are presented in Table 6.10.

None of the t values was statistically significant. However, three of them did have t values close to 2.00. These were for the independent variables per capita personal income, per cent nonagricultural employment, and per capita all commodity retail sales. All three of the regression coefficients were increasing during the study period. The level of all commodity and liquor retail establishment sales rose 91 and 75 per cent, respectively (Tables 4.5 and 6.5). The relatively slight difference in growth indicated that changes were occurring in the liquor merchant wholesaler sales patterns.

Table 6.10. Estimated Regression Coefficients (B) and Standard Error of Coefficients (σ_B) Between Mean per Capita Liquor Merchant Wholesaling Establishment Sales and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967. t Value of 1948 to 1967 Shift in Regression Coefficients. (Critical value of $t = 2.12$)

Year	Mean per Capita Liquor Manufactur- ing Establishments Value Added			Mean per Capita Liquor Retailing Establishments' Sales			Mean per Capita All Commodity Merchant Whole- saling Establish- ments' Sales			Mean per Capita Personal Income			Population per Square Mile			Mean Nonagricul- tural Employment as Per cent of Total Employment			Mean per Capita All Commodity Manufacturing Establishments Value Added			Mean per Capita All Commodity Retailing Establishments' Sales		
	B	σ_B		B	σ_B		B	σ_B		B	σ_B		B	σ_B		B	σ_B		B	σ_B		B	σ_B	
1948	-.001	.065		.636	.304		.752	.258		1.223	.222		.104	.091		1.454	.247		.354	.154		1.251	.345	
1954	.006	.082		.857	.310		1.053	.299		1.641	.185		.165	.103		2.422	.391		.543	.178		1.820	.469	
1958	.016	.068		.734	.252		1.073	.225		1.460	.186		.131	.094		2.466	.697		.486	.224		1.927	.497	
1963	.004	.070		.759	.202		.933	.308		1.466	.224		.131	.090		2.950	.733		.415	.248		1.891	.537	
1967	-.018	.085		.976	.331		.990	.479		2.085	.384		.162	.118		5.487	1.431		.445	.356		2.815	.814	
	$t_{48-67} = -.16$			$t_{48-67} = +.76$			$t_{48-67} = +.44$			$t_{48-67} = +1.95$			$t_{48-67} = +.12$			$t_{48-67} = +2.00$			$t_{48-67} = +.23$			$t_{48-67} = +1.77$		

Per Capita Liquor Merchant Wholesaler Establishments.--In Table 6.11 the regression coefficients and coefficients' standard errors are presented for the dependent variable, per capita liquor merchant wholesaler establishments and selected independent variables.

None of the changes in the regression coefficients (or t values) was statistically significant. Two of the t values were greater than $|1.00|$. These, the regression coefficients of the dependent variable with respect to the dependent variables, per capita liquor retail and manufacturing establishments, were decreasing.

Mean Sales per Liquor Merchant Wholesaler Establishment.--The regression coefficients and coefficients' standard errors between the dependent variable, sales per liquor merchant wholesaler establishment, and the selected independent variables are shown in Table 6.12.

One statistically significant t value was found. The regression coefficients between the dependent variable and the independent variable, per cent nonagricultural employment, rose from $-.192$ in 1948 to 3.865 in 1967. In addition, large positive increases, though not statistically significant changes, occurred in the regression coefficients of the independent variables, per capita personal income and sales per all commodity retail establishment.

The above changes indicate that the dependent variable, mean sales per liquor merchant wholesaling

Table 6.11. Estimated Regression Coefficients (B) and Standard Error of Coefficients (σ_B) Between Mean per Capita Liquor Merchant Wholesaling Establishments and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967. t Value of 1948 to 1967 Shift in Regression Coefficients. (Critical Value of $t = 2.12$)

	Mean per Capita Liquor Manufacturing Establishments		Mean per Capita Liquor Retailing Establishments		Mean per Capita All Commodity Merchant Wholesaling Establishments		Mean per Capita Personal Income		Population per Square Mile		Mean Nonagricultural Employment as Per cent of Total Employment		Mean per Capita All Commodity Manufacturing Establishments		Mean per Capita All Commodity Retailing Establishments	
	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B
1948	.171	.165	.569	.316	.720	.443	1.413	.437	-.019	.134	1.646	.520	.582	.369	1.622	1.664
1954	.047	.088	.288	.267	.659	.375	1.080	.330	-.009	.098	1.256	.654	.454	.260	1.384	.949
1958	.004	.077	.199	.253	.400	.446	.711	.374	-.042	.082	.873	.859	.232	.286	.223	1.170
1963	-.005	.079	.326	.311	.655	.515	.943	.371	-.044	.087	1.329	1.033	.301	.305	.032	1.752
1967	-.017	.070	.141	.264	.725	.481	.968	.343	-.002	.076	1.622	1.305	.275	.315	-.046	1.004
	$t_{48-67} = -1.05$		$t_{48-67} = -1.04$		$t_{48-67} = +.08$		$t_{48-67} = -.80$		$t_{48-67} = +.11$		$t_{48-67} = -.01$		$t_{48-67} = -.65$		$t_{48-67} = -.86$	

Table 6.12. Estimated Regression Coefficients (B) and Standard Error of Coefficients (σ_B) Between Mean Sales per Liquor Merchant Wholesaling Establishment and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967. t Value of 1948 to 1967 Shift in Regression Coefficients. (Critical Value of $t = 2.12$)

Year	Mean Value Added per Liquor Manufacturing Establishment		Mean Sales per Liquor Retailing Establishment		Mean Sales per All Commodity Merchant Wholesaling Establishment		Mean per Capita Personal Income		Population per Square Mile		Mean Nonagricultural Employment as Per cent of Total Employment*		Mean Value Added per All Commodity Manufacturing Establishment		Mean Sales per All Commodity Retailing Establishment	
	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B
1948	-.007	.089	.008	.348	1.060	.765	-.191	.476	.123	.081	-.192	.560	.176	.354	-.874	.695
1954	-.119	.106	-.021	.449	.102	.883	.560	.496	.174	.076	1.167	.703	.310	.405	-.201	1.163
1958	-.104	.124	.100	.467	.836	1.013	.749	.524	.173	.087	1.593	1.026	-.025	.578	.170	1.070
1963	-.012	.121	.537	.372	.527	.835	.522	.532	.175	.071	1.620	1.107	-.146	.496	.217	.809
1967	-.023	.137	.307	.387	.113	.788	1.117	.557	.163	.086	3.865	1.379	-.231	.532	1.014	.797
	$t_{48-67} = -.10$		$t_{48-67} = +.58$		$t_{48-67} = -.86$		$t_{48-67} = +1.78$		$t_{48-67} = +.34$		$t_{48-67} = +2.73$		$t_{48-67} = -1.00$		$t_{48-67} = +1.79$	

*Statistically significant.

establishment, has become more closely associated with the levels of several independent variables. Two of these variables, per capita personal income and mean nonagricultural employment as per cent of total employment, are measures of general economic activity.

CHAPTER VII

FINDINGS: THE LUMBER CHANNEL

In this chapter characteristics of the lumber merchant wholesaler channel sector are compared to selected characteristics of the lumber production and retail sectors. The merchant wholesalers' characteristics are also compared to selected economic characteristics.

Lumber Commodity Line Merchant Wholesaler Characteristics

The characteristics of the lumber merchant wholesaler sector selected for study were the total dollar sales, total establishments, and sales per establishment. The levels are presented in Table 6.1 for the census years during the period 1948 to 1967. The use of index numbers provided a method of comparing the relative changes that took place between characteristics, channel sectors, and channels.

During the study period all of the characteristics of the lumber merchant wholesaler sector increased (Table 7.1). The relative amount of the increases was smaller, however, than the increases for the all commodity merchant

Table 7.1. Selected Characteristics (and Index Numbers) of the Lumber Merchant Wholesaler Sector of the Lumber Distribution Channel for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Total Lumber Merchant Wholesaler Sales 000,000 (Index Number)		Total Lumber Merchant Wholesaler Establishments (Index Number)		Total Lumber Merchant Wholesaler Sales per Establishment (Index Number)	
1948	\$2793	(1.00)	3312	(1.00)	\$ 843,000	(1.00)
1954	3806	(1.36)	4304	(1.30)	884,000	(1.05)
1958	4221	(1.51)	4996	(1.51)	845,000	(1.00)
1963	5677	(2.03)	5956	(1.80)	953,000	(1.13)
1967	5795	(2.07)	5162	(1.56)	1,123,000	(1.33)

wholesaler sector. These comparisons were made in Table 7.2. For example, the total lumber merchant wholesaler sectors' sales increased 107 per cent compared to 169 per cent for the all commodity merchant wholesaler sector.

Lumber Commodity Line Manufacturing
Sector Characteristics

The characteristics of the lumber manufacturing sector are presented in Table 7.3. This manufacturing sector exhibited the lowest overall growth (in terms of value added) for the 1948 to 1967 study period. There was only a growth of 18 per cent in value added, which compares to a growth of 254 per cent for the all commodity manufacturing sector (Table 7.3). During the period there

Table 7.2. The Index Numbers of Selected Characteristics of the Manufacturing, Merchant Wholesaling, and Retailing Sectors of the All Commodity and Lumber Merchant Wholesaler Distribution Channels for the Years 1948, 1954, 1958, 1963, and 1967.

Manufacturing Sector						
Year	Total Value Added		Total Establishments		Value Added per Establishment	
	All Commodity	Lumber	All Commodity	Lumber	All Commodity	Lumber
1948	1.00	1.00	1.00	1.00	1.00	1.00
1954	1.58	1.02	1.19	1.04	1.32	0.98
1958	1.90	0.88	1.26	0.85	1.51	1.05
1963	2.58	1.04	1.29	0.67	1.99	1.54
1967	3.54	1.18	1.29	0.57	2.15	2.04

Merchant Wholesaling Sector						
Year	Total Sales		Total Establishments		Sales per Establishment	
	All Commodity	Lumber	All Commodity	Lumber	All Commodity	Lumber
1948	1.00	1.00	1.00	1.00	1.00	1.00
1954	1.33	1.36	1.27	1.30	1.03	1.05
1958	1.60	1.51	1.47	1.51	1.08	1.00
1963	2.06	2.03	1.62	1.80	1.27	1.13
1967	2.69	2.07	1.65	1.56	1.63	1.33

Retailing Sector						
Year	Total Sales		Total Establishments		Sales per Establishment	
	All Commodity	Lumber	All Commodity	Lumber	All Commodity	Lumber
1948	1.00	1.00	1.00	1.00	1.00	1.00
1954	1.31	1.27	0.98	1.15	1.30	1.10
1958	1.54	1.39	1.02	1.34	1.47	1.04
1963	1.89	1.37	0.96	1.11	1.88	1.23
1967	2.39	1.53	1.00	0.93	2.32	1.65

Table 7.3. Selected Characteristics (and Index Numbers) of the Lumber Manufacturing Sector of the Lumber Distribution Channel for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Total Lumber Manufacturing Establishments Value Added 000,000 (Index Number)		Total Lumber Manufacturing Establishments (Index Number)		Mean Lumber Manufacturing Value Added per Establishment (Index Number)	
1948	\$1476	(1.00)	19,039	(1.00)	\$ 77,525	(1.00)
1954	1503	(1.02)	19,778	(1.04)	75,993	(0.98)
1958	1306	(0.88)	16,102	(0.85)	81,108	(1.05)
1963	1531	(1.04)	12,831	(0.67)	119,320	(1.54)
1967	1734	(1.18)	10,936	(0.57)	158,559	(2.04)

was substantial reduction in the number of lumber manufacturing establishments, a decrease of 43 per cent compared to an increase of 56 per cent for the all commodity manufacturing sector. Even with this substantial reduction in the number of establishments, the lumber manufacturing value added per establishment was less than for the all commodity manufacturing value added.

Lumber Commodity Line Retail Establishments' Characteristics

The characteristics of the lumber retail sector are presented in Table 7.4. During the study period the level of lumber retail establishment sales as well as

Table 7.4. Selected Characteristics (and Index Numbers) of the Lumber Retailing Sector of the Lumber Distribution Channel for the Years 1948, 1954, 1958, 1963, and 1967.

Years	Total Lumber Retailing Establishments Sales 000,000 (Index Number)		Total Lumber Retailing Establishments (Index Number)		Mean Lumber Retailing Sales per Establishment (Index Number)	
1948	\$5,128	(1.00)	26,110	(1.00)	\$196,399	(1.00)
1954	6,503	(1.27)	30,177	(1.15)	215,495	(1.10)
1958	7,122	(1.39)	34,867	(1.34)	204,262	(1.04)
1963	7,022	(1.37)	28,979	(1.11)	242,313	(1.23)
1967	7,863	(1.53)	24,296	(0.93)	323,633	(1.65)

sales per establishment increased, while the number of lumber retail establishments declined.

The figures in Table 7.2 reveal the relative decline of the lumber channel compared to the all commodity channel. While the dollar sales for retailers increased 139 per cent, the dollar sales of the lumber retail establishments increased only 53 per cent. And the number of all commodity retailers remained constant, while the number of lumber retail establishments rose during the first two census intervals and declined during the last two. The sales per lumber retail establishment growth rate, then lagged behind the all commodity growth rate.

Mean per Capita Lumber Establishments'
Sales or Value Added and
Establishments

To offset the idfferences in the total levels of activity among the various geographic divisions, the least-squares analysis of the variables was conducted on a per capita basis. Tables 7.5 and 7.6 show the sales or value added and number of establishments on a per capita basis.

Results of the Lumber Channel Study

Regression Coefficients (B)

As was stated earlier (in Chapter II), the significance of the association between the dependent and independent variables was determined by analysis of the correlation coefficients.

Per Capita Lumber Merchant Wholesaler Sales.--The simple correlation coefficients between the dependent variable, per capita lumber merchant wholesaler sales, and selected independent variables are presented in Table 7.7.

There were neither significant nor marginally significant associations found for the dependent variable, per capita lumber establishments' retail sales.

Per Capita Lumber Merchant Wholesaler Establishments.--The simple correlation coefficients between the dependent variable, mean per capita lumber merchant

Table 7.5. Per Capita Sales or Value Added (and Index Number) for Lumber Manufacturing, Merchant Wholesaling and Retailing Establishments for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Mean per Capita Value Added by Lumber Manufacturing Establishments (Index Number)		Mean per Capita Sales by Lumber Merchant Wholesaling Establishments (Index Number)		Mean per Capita Sales by Lumber Retailing Establishments (Index Number)	
1948	\$10.11	(1.00)	\$19.13	(1.00)	\$35.12	(1.00)
1954	9.34	(0.92)	26.64	(1.29)	40.39	(1.15)
1958	7.51	(0.74)	24.26	(1.27)	40.93	(1.16)
1963	8.10	(0.80)	30.04	(1.57)	37.15	(1.06)
1967	8.76	(0.87)	29.27	(1.53)	39.71	(1.13)

Table 7.6. Lumber Manufacturing, Merchant Wholesaling and Retailing Establishments (and Index Numbers) for the Years 1948, 1954, 1958, 1963, and 1967, per 1,000,000 Population.

Year	Mean Lumber Manufacturing Establishments per 1,000,000 Population (Index Number)		Mean Lumber Merchant Wholesaling Establishments per 1,000,000 Population (Index Number)		Mean Lumber Retailing Establishments per 1,000,000 Population (Index Number)	
1948	13.04	(1.00)	22.68	(1.00)	17.88	(1.00)
1954	12.28	(0.94)	26.73	(1.18)	18.74	(1.05)
1958	9.25	(0.71)	28.70	(1.27)	20.04	(1.12)
1963	6.79	(0.52)	31.51	(1.39)	15.33	(0.86)
1967	5.52	(0.42)	26.07	(1.15)	12.27	(0.69)

Table 7.7. Correlation Coefficients (r) Between Mean per Capita Lumber Merchant Wholesaling Establishment Sales and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967. (Critical Value of $t = 2.12$)

Year	Mean per Capita Lumber Manufacturing Establishments Value Added	Mean per Capita Lumber Retailing Establishments' Sales	Mean per Capita All Commodity Merchant Wholesaling Establishments' Sales
1948	.2408	.2803	.4475
1954	.2781	.4543	.5101
1958	.4097	.1058	.4184
1963	.4836	-.0700	.3038
1967	.2988	-.4473	.2780

Year	Mean per Capita Personal Income	Population per Square Mile	Mean Nonagricultural Employment as Per cent of Total Employment
1948	.6031	-.0131	.4724
1954	.6506	-.1058	.3758
1958	.5281	-.0750	.2900
1963	.5055	-.0807	.3078
1967	.4575	.1807	.2650

Year	Mean per Capita All Commodity Manufacturing Establishments Value Added	Mean per Capita All Commodity Retailing Establishments' Sales
1948	.1826	.5795
1954	.2279	.7452
1958	.1367	.5264
1963	.0517	.5779
1967	.2296	.4372

wholesaler establishments, and the selected independent variables are presented in Table 7.8.

There were no significant nor marginally significant correlation coefficients for the study period. However, two independent variables did have interesting relationships with the dependent variable. The correlation coefficients (and the regression coefficients) for per capita lumber and all commodity retail establishments were negative for all years studied. The meaning of these slight associations was unclear, but they might reflect the low level of association of the per capita to lumber merchant wholesaling establishments with all of the selected independent variables.

Mean Sales per Lumber Merchant Wholesaler

Establishment.--The single correlation coefficients between the dependent variable, mean sales per lumber merchant wholesaler establishment, and selected independent variables are presented in Table 7.9.

None of the correlation coefficients was significant for the study period. However, the association between the dependent variable and the independent variable, mean sales per all commodity retail establishment, was marginally significant. This association appears to be the major component of the significant multiple correlation coefficient discussed in the next section.

Table 7.8. Correlation Coefficients (r) Between Mean per Capita Lumber Merchant Wholesaling Establishments and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Mean per Capita Lumber Manufacturing Establishments	Mean per Capita Lumber Retailing Establishments	Mean per Capita All Commodity Merchant Wholesaling Establishments
1948	.0734	-.3933	.4237
1954	.3240	-.3174	.2802
1958	.2424	-.5611	.0417
1963	.1279	-.4106	.1776
1967	.1684	-.5741	.1441

Year	Mean per Capita Personal Income	Population per Square Mile	Mean Nonagricultural Employment as Per cent of Total Employment
1948	.3160	.4302	.4684
1954	.3040	.2089	.3310
1958	.2067	.1829	.3012
1963	.3132	-.0307	.3095
1967	.2210	.1149	.4391

Year	Mean per Capita All Commodity Manufacturing Establishments	Mean per Capita All Commodity Retailing Establishments
1948	.4765	-.1437
1954	.4306	-.0373
1958	.2775	-.6147
1963	.2123	-.6848
1967	.2776	-.3530

Table 7.9. Correlation Coefficients (r) Between Mean Sales per Lumber Merchant Wholesaling Establishment and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967.

Year	Mean Value Added per Lumber Manufacturing Establishment	Mean Sales per Lumber Retailing Establishment	Mean Sales per All Commodity Merchant Wholesaling Establishment
1948	.2899	-.2040	.0058
1954	.3607	-.2366	.1910
1958	.5577	.1365	.3704
1963	.6013	.2208	.3216
1967	.2820	.0124	.5592

Year	Mean per Capita Personal Income	Population per Square Mile	Mean Nonagricultural Employment as Per cent of Total Employment
1948	.5765	-.5060	.2023
1954	.6493	-.2823	.2686
1958	.6151	-.2197	.2207
1963	.5889	-.1054	.2887
1967	.5003	.1824	.1194

Year	Mean Value Added per All Commodity Manufacturing Establishment	Mean Sales per All Commodity Retailing Establishment*
1948	-.3418	.8346
1954	-.0806	.6758
1958	-.2293	.8163
1963	-.3013	.7965
1967	.1438	.5324

*Marginally significant.

Multiple Correlation Coefficients

A selected group of multiple (linear) regression analyses were conducted. The combinations of independent variables selected were presented in Chapter II. The purpose was to find those combinations of independent variables that provided significantly better association with the dependent variable than did single independent variables.

In the lumber channel only one such combination was found. The dependent variable was the mean sales per lumber merchant wholesaler establishment. The independent variables were value added per all commodity manufacturing establishment, sales per all commodity wholesale establishment, and sales per all commodity retail establishment. These correlation coefficients are presented in Table 7.10.

The independent variable, sales per all commodity merchant wholesaler establishment, accounted for most of the association. However, the other independent variables provided enough association to raise the multiple correlation coefficient from an average of .7365 to .8536.

Changes in the Regression Coefficient

As stated in Chapter I, the second hypothesis concerning changes over time of the relationship between the independent and dependent variables was studied. In this

Table 7.10. Multiple Independent Variable Combinations that Provide Correlation Coefficients Significantly Superior to Each of the Independent Variable Correlation Coefficients Considered Separately for the Lumber Channel for the Years 1948, 1954, 1958, 1963, and 1967.

Combination of Dependent (Y) and Independent Variables (X_1, X_2, X_3) Studied	Year	Multiple and Single Correlation Coefficients		
		Multiple		Single
		$r_{YX_1 X_2 X_3}$	r_{YX_1}	r_{YX_2} r_{YX_3}
Sales per Lumber MW Est (Y)	1948	.9527	-.3418	.0058 .8346
	1954	.8547	-.0806	.1910 .6758
Value Added per All MF Est (X_1)	1958	.9490	-.2293	.3704 .8163
Sales per All MW Est (X_2)	1963	.8764	-.3013	.3216 .7965
Sales per All Rt Est (X_3)	1967	.7352	-.1438	.5592 .5324

section the regression coefficients and coefficients' standard errors of the lumber channel relationships are analyzed.

Per Capita Lumber Merchant Wholesaler Establishment Sales.--The regression coefficients and the coefficients' standard errors between the dependent variable, per capita lumber merchant wholesaler sales, and the selected independent variables are presented in Table 7.11.

None of the t values was statistically significant. However, one t value was -1.52. This was the relationship between the dependent variable and the independent variable, mean per capita lumber retail establishments' sales. This fluctuating regression coefficient was +.330 in 1948 and -.751 in 1967. During the study period small decreases in the regression coefficients for relationship between the independent variable and the dependent variables, per capita all commodity merchant wholesaler establishments' sales, and per capita personal income, were noted. Such declines may have been indicative of the relative change occurring in the lumber channel.

Per Capita Lumber Merchant Wholesaler Establishments.--In Table 7.12 the regression coefficients and coefficients' standard errors are present for the dependent

Table 7.11. Estimated Regression Coefficients (B) and Standard Error of Coefficients (σ_B) Between Mean per Capita Lumber Merchant Wholesaling Establishment Sales and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967. t Value of 1948 to 1967 Shift in Regression Coefficients. (Critical Value of $t = 2.12$)

Year	Mean per Capita Lumber Manufacturing Establishments Value Added		Mean per Capita Lumber Retailing Establishments Sales		Mean per Capita All Commodity Merchant Wholesaling Establishments Sales		Mean per Capita Personal Income		Population per Square Mile		Mean Nonagricultural Employment as Per cent of Total Employment		Mean per Capita All Commodity Manufacturing Establishments		Mean per Capita All Commodity Retailing Establishments	
	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B
1948	.077	.118	.330	.427	.663	.500	1.192	.596	-.005	.145	1.097	.774	.143	.291	1.308	.695
1954	.090	.117	.671	.497	.779	.496	1.291	.569	-.039	.139	1.147	1.069	.190	.307	1.903	.643
1958	.136	.114	.176	.624	.620	.509	.983	.597	-.025	.128	1.078	1.345	.127	.347	1.483	.905
1963	.136	.093	-.124	.668	.414	.490	.878	.567	-.024	.112	1.194	1.395	.044	.322	1.502	.802
1967	.082	.099	-.751	.567	.339	.443	.805	.591	.048	.099	1.340	1.843	.182	.291	1.175	.914
	$t_{48-67}=+.03$		$t_{48-67}=-1.52$		$t_{48-67}=-.49$		$t_{48-67}=-.46$		$t_{48-67}=+.30$		$t_{48-67}=+.12$		$t_{48-67}=+.10$		$t_{48-67}=-.12$	

Table 7.12. Estimated Regression Coefficients (B) and Standard Error of Coefficients (σ_B) Between Mean per Capita Lumber Merchant Wholesaling Establishments and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967. t Value of 1948 to 1967 Shift in Regression Coefficients. (Critical Value of $t = 2.12$)

Year	Mean per Capita Lumber Manufacturing Establishments		Mean per Capita Lumber Retailing Establishments		Mean per Capita All Commodity Merchant Wholesaling Establishments		Mean per Capita Personal Income		Population per Square Mile		Mean Nonagricultural Employment as Per cent of Total Employment		Mean per Capita All Commodity Manufacturing Establishments		Mean per Capita All Commodity Retailing Establishments	
	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B	B	σ_B
1948	.028	.145	-.260	.230	.460	.372	.456	.517	.120	.095	.794	.566	.428	.298	-.533	1.386
1954	.099	.110	-.175	.197	.248	.321	.313	.371	.049	.071	.525	.565	.263	.208	-.079	.803
1958	.063	.095	-.291	.163	.035	.318	.170	.305	.027	.056	.496	.593	.148	.194	-1.289	.625
1963	.028	.082	-.164	.137	.132	.277	.210	.240	-.004	.043	.462	.537	.090	.156	-1.560	.627
1967	.036	.079	-.206	.111	.113	.293	.157	.262	.012	.041	.896	.693	.130	.170	-.502	.503
	$t_{48-67}=+.05$		$t_{48-67}=+.21$		$t_{48-67}=-.73$		$t_{48-67}=-.51$		$t_{48-67}=-1.05$		$t_{48-67}=+.11$		$t_{48-67}=-.87$		$t_{48-67}=+.20$	

variable, per capita lumber merchant wholesaler establishments, and selected independent variables.

None of the changes in the regression coefficients (or t values) during the study period was statistically significant. Only one of the t values was greater than $|1.00|$. The shift of the regression coefficient between the dependent variable and the independent variable, population per square mile, and a t -value of -1.05 .

Mean Sales per Lumber Merchant Wholesaler Establishment.--The regression coefficients and the coefficients' standard errors between the dependent variable, sales per lumber merchant wholesaler, and the selected independent variables are presented in Table 7.13.

None of the shifts in the regression coefficients was statistically significant. Two of the t values were greater than $|1.00|$. These were the regression coefficients between the dependent variable and the independent variables, population per square mile ($t = 1.48$) and sales per all commodity retail establishments ($t = -1.39$). The increase of the regression coefficient, in the case of population per square mile, left it with a very small value (.036), indicating that the importance of the independent variable, with respect to sales per lumber merchant wholesaler establishment, was much reduced. The decrease in the level of the regression coefficient, sales per all commodity retail establishment, suggested that this

Table 7.13. Estimated Regression Coefficients (B) and Standard Error of Coefficients (σ_B) Between Mean Sales per Lumber Merchant Wholesaling Establishment and Selected Independent Variables for the Years 1948, 1954, 1958, 1963, and 1967. t Value of 1948 to 1967 Shift in Regression Coefficients. (Critical Value of $t = 2.12$)

Year	Mean Value Added facturing Establishment			Mean Sales per Lumber Retailing Establishment			Mean Sales per All Commodity Merchant Whole- saling Establish- ment			Mean per Capita Personal Income			Population per Square Mile			Mean Nonagricul- tural Employment as Per cent of Total Employment			Mean Value Added per All Commodity Manufacturing Establishment			Mean Sales per All Commodity Retailing Establishment		
	B	σ_B	B	B	σ_B	B	B	σ_B	B	B	σ_B	B	B	σ_B	B	B	σ_B	B	B	σ_B	B	B	σ_B	
1948	.108	.134	-.300	.544	.013	.866	.736	.394	-.125	.081	.304	.556	-.326	.339	1.705	.425								
1954	.138	.135	-.410	.636	.472	.916	.978	.433	-.079	.102	.622	.843	-.095	.444	2.220	.907								
1958	.187	.105	.247	.676	.872	.827	.812	.394	-.053	.089	.583	.973	-.294	.471	1.940	.519								
1963	.146	.073	.290	.485	.553	.615	.669	.347	-.021	.073	.732	.917	-.301	.360	1.298	.372								
1967	.073	.094	.013	.386	.818	.458	.648	.424	.036	.073	.444	1.397	.144	.374	.872	.524								
	$t_{48-67}=-.21$		$t_{48-67}=+.47$		$t_{48-67}=+.82$		$t_{48-67}=-.15$		$t_{48-67}=+1.48$		$t_{48-67}=+.09$		$t_{48-67}=+.93$		$t_{48-67}=-1.39$									

variable was also decreasing in importance as an indicator of trends in the dependent variable, sales per lumber merchant wholesaler establishment.

CHAPTER VIII

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Summary

In Chapter I certain characteristics (sales, establishments, sales/establishment) of wholesalers in the United States were reviewed for the period 1948-1967. Special emphasis was placed on the merchant wholesaler type of wholesale establishments because they are the most significant type of wholesale establishment on the basis of dollar sales. In addition, the Census provided the most detailed data on the merchant wholesaler type of wholesale establishment. Selected characteristics of the consumer good commodity line distribution channel and economy were proposed for possible association with certain characteristics of the merchant wholesaling sector. It was then hypothesized that these selected independent characteristics are associated with the characteristics of the commodity line merchant wholesaler. And, in addition, it was hypothesized that these associations will change over time. The identification of such independent variables may aid the merchant wholesale manager in planning strategy for the future. Given his unique

position in service to both manufacturers and retailers, the merchant wholesaler should be aware of any changes in either sector and their implications for his operation.

In Chapter II the geographic division was selected as the geographic control unit. The methodology selected was the linear least-squares analysis and the Zellner-Aitken (ZA) estimators to provide the "best fit" line. The criteria to judge the significance of the findings were also developed.

Conclusions and Implication

The conclusions and implication were derived from the findings in Chapters III, IV, V, VI, and VII. The conclusions are divided into seven sections. The first two concern the hypotheses proposed for this study, the third, the questions raised in Chapter I in regards to the selected independent variables. The fourth regards the observed differences between channels, and the fifth, the possible implication following from the conclusion in the first four sections. Finally, the last two sections deal with the methodology used in this study.

Association of the Merchant Wholesaler Characteristics with Selected Independent Variables

Significant associations between certain characteristics of the merchant wholesaler and the selected characteristics of the manufacturing and retail channel

sectors were found. Also, significant relationships between the merchant wholesaler characteristics and the selected economic characteristics were discovered. The combinations of significant characteristics varied from commodity line to commodity line (Table 8.1). For example, there was a significant association between the per capita drug merchant wholesaling sales and the independent variable, per capita all commodity merchant wholesaling sales. The association between the per capita liquor merchant wholesaling sales and the same independent variable, per capita all commodity merchant wholesaling sales, on the other hand, was only marginally significant. And the association between the per capita lumber merchant wholesaling sales and the same independent variable was not significant. These different combinations reflect the varied character of the distribution channels in the United States. Such findings also reveal that the merchant wholesalers in each of the commodity line channels studied face a unique situation.

Changes in Regression Coefficients
Between the Dependent and
Independent Variables

Shifts (though not all were statistically significant) were found in the regression coefficients between the dependent and independent variables (characteristics) in every channel studied. The independent variables included the selected characteristics of the manufacturing and

Table 8.1. The Significant Associations Between Certain Characteristics of the Merchant Wholesaling Sectors and the Selected Independent Variables of the Commodity Line Channels Studied for the Period 1948-1967. (t-Values for Shifts of the Regression Coefficients for Period 1948-1967)

Merchant Wholesaling Sector Characteristic	Commodity Line			
	All Commodity	Drug	Liquor	Lumber
Per Capita Sales	Per Capita Personal Income*(-.14)	Per Capita All MW Sales**(+.16)	Per Capita Personal Income**(+1.95)	
		Per Capita Personal Income**(-.46)	Per cent Nonagri- cultural Employment** (+2.00)	
		Per Capita All RT Sales*(-.13)	Per Capita Liquor RT Sales*(+.76)	
			Per Capita All MW Sales*(+.44)	
			Per Capita All RT Sales*(+1.77)	
Per Capita Establishments	Per Capita Personal Income**(-1.67)	Per Capita All MW Est.**(+.20)	Per Capita Personal Income*(-.80)	
	Per Capita All MF Est.*(-1.46)	Per Capita Drug MF Est.* (+1.10)		
	Per cent Nonagri- cultural Employment* (+.19)			
Sales per Establishment				Sales per All RT Est.*(-1.39)

*Marginally significant.

**Significant.

Key: All = All Commodity Line; Comm. = Commodity Line; Est. = Establishment; MW = Merchant Wholesaling; MF = Manufacturing; RT = Retailing.

retail channel sectors and the economy. The greatest number were found in per capita establishments and sales per establishments. This finding emphasized the shifts of these characteristics in the merchant wholesaler sector relative to the retail and manufacturing sectors.

The degree and direction of the shifts varied from channel to channel (Table 8.2). For example, the regression coefficient between per capita drug merchant wholesaling establishments and per capita drug manufacturing establishments increased. However, the regression coefficient between per capita liquor merchant wholesaling establishments and per capita liquor manufacturing establishments decreased. Such variation indicates that an individual analysis would be required for each channel selected for study.

Questions Concerning Selected Independent Variables

There is diversity and sparseness in the significant findings discussed in the preceding two sections. This situation makes it impossible to adequately resolve the questions raised in Chapter I concerning the independent variable selected for the study. Briefly, the various authors suggested that the activity in the wholesaling sector should or should not shift with changes in the manufacturing and retailing sectors. In addition, the relationships between the wholesaling sector and several economic variables were included for consideration.

Table 8.2. Noted Shifts (and t-values) of the Regression Coefficients Between Certain Characteristics of the Merchant Wholesaling Sectors and Selected Independent Variables of the Commodity Lines Studies for the Period 1948-1967.

Merchant Wholesaling Sector Characteristic	Commodity Line			
	All Commodity	Drug	Liquor	Lumber
Per Capita Sales				
	Per Capita All MF Est. (-1.46)	Per Capita Drug RT Est. Sales (-1.43)	Per Capita Personal Income (+1.95)	Per Capita Lumber RT Sales (-1.52)
	Per Capita RT Est. (-2.20)		Per cent Nonagricultural Employment (+2.00)	
	Per Capita Personal Income (-1.67)		Per Capita All RT Sales (+1.77)	
Per Capita Establishments				
	Per Capita All MF Est. (-1.46)	Per Capita Drug MF Est. (+1.10)	Per Capita Liquor MF Est. (-1.05)	Population per Square Mile (-1.05)
	Per Capita RT Est. (-2.20)	Per Capita Drug RT Est. (-1.01)	Per Capita Liquor RT Est. (-1.04)	
	Per Capita Personal Income (-1.67)	Per Capita All RT Est. (-1.70)		
Sales per Establishment				
	Per Capita Personal Income (+1.41)	Per Capita Personal Income (+1.21)	Per cent Nonagricultural Employment (+2.73)	Population per Square Mile (+1.48)
	Value Added per All MF Est. (+1.31)		Value Added per All MF Est. (-1.00)	Sales per All RT Est. (-1.39)
			Sales per All RT Est. (+1.79)	
			Per Capita Personal Income (+1.78)	

Key: All = All Commodity Line; Comm. = Commodity Line; Est. = Establishment; MW = Merchant Wholesaling; MF = Manufacturing; RT = Retailing.

The following questions were presented in Chapter I with respect to the independent variables selected:

1. Do the selected variables have significant associations with the characteristics of the merchant wholesaling sector?
2. Do these associations shift over time?

The first question is answered by the data presented in Table 8.1. Of the seventy-eight associations calculated, six were significant and ten were marginally significant. The sixteen significant or marginally significant were associated with nearly all of the proposed independent variables. Two were associated with the all commodity manufacturing sector, three with the all commodity merchant wholesaling sector, and four with the retailing sectors. In addition, five were associated with per capita personal income and two with per cent nonagricultural employment. Therefore, the existence of associations between the characteristics of the merchant wholesaling sectors and the selected independent characteristics was established. As can be seen in Table 8.1, the combinations of significant independent and dependent variables varied from channel to channel.

As noted earlier, the second question concerned the shifts in the association between the independent and dependent variables. The combinations of independent and

dependent variables studied for level of shift were those that had a significant level association with each other. This meant there was a meaningful association between the variables during the period of the study. The t -values of these shifts are presented in Table 8.1 along with the significant associations.

In Chapter I a principle of marketing was presented. It was: "As changes occur in the retail structure, changes occur in the wholesaling system" (10:64). The findings in the study (Table 8.1) verify this principle, however, these changes do not follow a single pattern. While the t value between the per capita drug merchant wholesaling establishments' sales and per capita all commodity retailing sector sales decreased .13, the association between per capita liquor merchant wholesaling establishments' sales and per capita all commodity retailing establishments' sales increased 1.77.

As in the case above, the shifts in the regression coefficients between the characteristics of the merchant wholesaling sector and both the characteristics of the manufacturing sector and the economic sector are both positive and negative in direction. Because of the limited number of channels examined, generalizations concerning the shifts in associations could not be made.

The economic variable, per capita personal income was the independent variable most closely associated with

the characteristics of the merchant wholesaling sector. In three of the four channels studied, this variable had a significant or marginally significant association with per capita merchant wholesaling establishment sales. This finding certainly indicates that there is an association between the level of merchant wholesaling activity and the purchasing power of the consumer population.

The economic variable, per cent nonagricultural employment, had a significant association with only one dependent variable, per capita liquor merchant wholesaling establishment sales. This finding does not support the proposition that this measure of economic development is associated with the level of activity in the merchant wholesaling sector. This should not be too surprising for the United States, where in recent years the per cent nonagricultural employment has nearly reached or exceeded 90 per cent in each geographic division. With such a limited variance, it is unlikely that this variable will provide significant levels of associations with the dependent variables.

The demographic variable, population per square mile was not significantly associated with any of the selected characteristics of the merchant wholesaling sectors studied. To determine any existing associations between the consumers' location and the characteristics of

merchant wholesaling sectors, additional measurements would be needed.

The Relative Changes in the
Channel Sector Character-
istics During the Period
1948-1967

Although it was not a purpose of this study, differences in the growth rate of the channel sectors' characteristics were noted. These differences occurred between channel sectors and commodity lines (Table 8.3). For example, drug manufacturing establishments' value added increased 710 per cent during the study period, while the drug merchant wholesaling sales increased only 150 per cent during the same time. And the number of liquor merchant wholesaling establishments decreased 3 per cent during the period, while overall the number of merchant wholesaling establishments increased 65 per cent.

These differences in growth (or decline) rates indicate the magnitude of the differences that exist between the various merchant wholesaling distribution channels. Reasons for these differences may be assigned to changes in the retailing structure. Other changes may follow efforts of large manufacturing and retailing firms to engage in vertical intergration, and often take the form of manufacturers' establishing sales branches or sales offices, thus taking commodity lines away from merchant wholesalers.

Table 8.3. The Index Numbers of Selected Characteristics of the Manufacturing, Merchant Wholesaling and Retailing Sectors of the All Commodity, Drug, Liquor, and Lumber Distribution Channels for the Years 1948, 1954, 1958, 1963, and 1967.

Sector	Total Sales or Value Added ^a					Total Establishments					Value Added or Sales per Establishment				
	Year					Year					Year				
	1948	1954	1958	1963	1967	1948	1954	1958	1963	1967	1948	1954	1958	1963	1967
Commodity Line															
Manufacturing															
All Commodity	1.00	1.58	1.90	2.58	3.54	1.00	1.19	1.26	1.29	1.29	1.00	1.32	1.51	1.99	2.15
Drug	1.00	1.92	3.10	4.27	6.14	1.00	1.00	0.96	0.87	0.75	1.00	1.90	3.22	4.90	8.10
Liquor	1.00	0.78	0.96	1.30	1.59	1.00	0.61	0.56	0.51	0.49	1.00	1.27	1.71	2.54	3.24
Lumber	1.00	1.02	0.88	1.04	1.18	1.00	1.04	0.85	0.67	0.57	1.00	0.98	1.05	1.54	2.04
Merchant Wholesaling															
All Commodity	1.00	1.33	1.60	2.06	2.69	1.00	1.27	1.47	1.62	1.65	1.00	1.03	1.08	1.27	1.63
Drug	1.00	1.58	2.06	2.62	3.47	1.00	1.27	1.38	1.51	1.38	1.00	1.25	1.50	1.74	2.50
Liquor	1.00	1.34	1.51	1.91	2.46	1.00	0.99	0.95	0.96	0.97	1.00	1.35	1.59	1.98	2.50
Lumber	1.00	1.36	1.51	2.03	2.07	1.00	1.30	1.51	1.80	1.56	1.00	1.05	1.00	1.13	1.33
Retailing															
All Commodity	1.00	1.31	1.54	1.89	2.39	1.00	0.98	1.02	0.96	1.00	1.00	1.30	1.47	1.88	2.32
Drug	1.00	1.31	1.69	2.11	2.72	1.00	1.00	0.91	0.98	0.96	1.00	1.30	1.81	2.16	2.83
Liquor	1.00	1.23	1.63	2.01	2.58	1.00	0.94	1.11	1.20	1.19	1.00	1.32	1.47	1.68	2.18
Lumber	1.00	1.27	1.39	1.37	1.53	1.00	1.15	1.34	1.11	0.93	1.00	1.10	1.04	1.23	1.65

^aTotal sales for retailing and wholesaling sectors, value added for manufacturing sectors.

Possible Implications of the Preceding Findings

The associations between the dependent and independent variables that were significant varied from commodity line channel to commodity line channel in this study. Several possible explanations for these differences are outlined below.

1. Groups of Commodity Line Channels. There may be groups of commodity line distribution channels whose characteristics have significant associations with the same independent variables. A possible grouping might be made on the basis of the type of goods handled in the channels. For example, the commodity lines might be classified as convenience, shopping, or specialty goods. The merchant wholesalers handling the commodity lines within a specific classification may share significant associations with the same independent factors. Because of the limited number of commodity lines analyzed in this study, however, it was not possible to test this approach.

2. Unique Commodity Line Channels. It may be that each commodity line distribution channel is unique. That would mean that either each commodity line merchant wholesaling sector has a unique combination of independent factors with which it is associated or that it has such a complex association with the independent factors that it cannot be discovered with present methodology.

3. The Independent Variables Selected for Analysis. There is always the possibility that when a finite number of independent variables are selected for analysis, those having significant associations with the dependent variable were not included in the selection. This type of omission can only be discovered by the inclusion of additional factors in future analyses.

EFFEST and ZA Estimators

EFFEST estimates from the Van Tassel study and the ZA estimates from this study were analyzed. The technique was simply a comparison of the results from the two studies with the least-squares approach on approximately the same data. It was concluded that the results, using these methods, were not correct for two reasons. First, they resulted in biased estimates of the computed values of the regression coefficients. That is, the methods did not provide a better estimate of the population regression coefficients than was obtained by using least-squares analysis.

This does not imply, however, that EFFEST or ZA are inappropriate for all situations. Nevertheless, in situations where the independent variables are highly correlated and/or there is only a single dependent variable, the methods should not be applied. In other situations, even when the necessary conditions are met, careful review of the estimates is strongly advised.

Second, the conditions for the application of the methodology outlined by Zellner were not met. For these reasons, it was concluded that it is not correct to apply the EFFEST or ZA methods to the linear regression analysis in this study.

Geographic Control Units

The geographic units used were too large for precise analysis. Larger units were necessary, however, so that some of the desired variables could be included in the analysis. The use of smaller geographic units might provide less variability within units and more variability between units.

Suggested Areas for Future Research

Academic

The differences between the various commodity line merchant wholesaling sectors have been documented in this study. Additional research might be directed toward determining if these differences can be grouped on other bases, such as classification of goods.

Additional independent variables might be proposed, and a study could be directed toward determining if significant associations exist between these variables and the merchant wholesaling sector.

Further research might be conducted considering two other changes from the methods used in this study.

First, the geographical control units could be reduced in size to provide more variability between geographical units. Second, the manufacturing sector might be dropped so that additional commodity line distribution channels could be analyzed. Because of the limited number of manufacturing establishments in many channels, these channels were not included in this study.

Applied

At the current state of development, the methodology investigated in this study has limited application to "real world" problems. However, the research does indicate the need for the individual merchant wholesaler to recognize the uniqueness of the channel sector to which he belongs.

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SELECTED LITERATURE

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