San Fernando Valley State College

ASPECTS OF THE RELATIONSHIP BETWEEN CENTRAL FUNCTIONS AND SIZE OF UNINCORPORATED URBAN PLACES IN TULARE COUNTY, CALIFORNIA

A thesis submitted in partial satisfaction of the requirements for the degree of Master of Arts in Geography

by

Gerald Flanders Thomas

June, 1971
The thesis of Gerald Flanders Thomas is approved:

Committee Chairman
San Fernando Valley State College
June, 1971
ACKNOWLEDGMENTS

Since the number of people who both directly and indirectly aided in the process of creating this thesis are too numerous to mention by name, and also I may unintentionally omit someone, I take this opportunity to collectively express my thanks. However, I do want to give special thanks to Dr. Richard Preston and the other members of my Committee who gave of their time to clarify problems and make needed corrections. Additionally, the members of the cartographic services staff, who are often taken for granted, deserve a special thanks in helping me prepare the final copies of the figures and map. Also Miss Ann Welling deserves a special thanks for typing the final draft.

Finally, I want to thank my mother for always giving me support, and Jean who clarified many problems.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>iii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>vi</td>
</tr>
<tr>
<td>LIST OF ILLUSTRATIONS</td>
<td>vii</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>viii</td>
</tr>
<tr>
<td>CHAPTER</td>
<td></td>
</tr>
<tr>
<td>I. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Problem, Procedure and Overview</td>
<td></td>
</tr>
<tr>
<td>Theoretical Concepts</td>
<td></td>
</tr>
<tr>
<td>Plan of the Study</td>
<td></td>
</tr>
<tr>
<td>II. ANALYSIS OF RELEVANT LITERATURE</td>
<td>9</td>
</tr>
<tr>
<td>Classical Theory</td>
<td></td>
</tr>
<tr>
<td>Walter Christaller</td>
<td></td>
</tr>
<tr>
<td>August Lösch</td>
<td></td>
</tr>
<tr>
<td>George Zipf</td>
<td></td>
</tr>
<tr>
<td>Empirical Tests</td>
<td></td>
</tr>
<tr>
<td>John E. Brush (1953)</td>
<td></td>
</tr>
<tr>
<td>H. E. Bracey (1953)</td>
<td></td>
</tr>
<tr>
<td>Rutledge Vining (1955)</td>
<td></td>
</tr>
<tr>
<td>Brian Berry and William Garrison (1958)</td>
<td></td>
</tr>
<tr>
<td>E. N. Thomas (1960)</td>
<td></td>
</tr>
<tr>
<td>James B. Kenyon (1967)</td>
<td></td>
</tr>
<tr>
<td>Summary and Hypotheses</td>
<td></td>
</tr>
<tr>
<td>III. ANALYSIS</td>
<td>38</td>
</tr>
<tr>
<td>The Data</td>
<td></td>
</tr>
<tr>
<td>Occurrence of Functions</td>
<td></td>
</tr>
<tr>
<td>Relations Between Population Size and Numbers of Establishments, Functions and Functional Units</td>
<td></td>
</tr>
</tbody>
</table>
The Relationship Between Number of Establishments and Population
Over-predicted Places
Under-predicted Places
The Relationship Between Number of Functions and Population
The Relationship Between Number of Functional Units and Population
The Hierarchy Question
The Existence of Universal Threshold Sizes
Functional Growth Ratios

IV. FINDINGS AND CONCLUSIONS. . . . . . . . . . . . . . . . . . . . . . 79

Findings with Theoretical Significance
Conclusion

BIBLIOGRAPHY. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 86

APPENDIX A. GLOSSARY. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 90

APPENDIX B. THE FUNCTIONAL BASES BY CLASS FOR UNINCORPORATED PLACES IN TULARE COUNTY. . 92

APPENDIX C. SURVEY METHODOLOGY. . . . . . . . . . . . . . . . . . 93
LIST OF TABLES

Table                                                                                      Page

1. Functional Complexity of Unincorporated Places in Tulare County                        42

2. Thirty Most Frequently Occurring Functions                                              46

3. Comparability of the Ten Most Frequently Occurring Functions in Tulare County and Other Areas 50

4. Percent of Total County Retail Sales by Business Group by City                           59

5. Place of Purchase for Selected Goods in Pixley and Tipton, Tulare County                 62

6. Correlations of Population and Selected Variables for Tulare County and Other areas     65
# List of Illustrations

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Number of Establishments and Population.</td>
<td>53</td>
</tr>
<tr>
<td>2.</td>
<td>Number of Functions and Population.</td>
<td>64</td>
</tr>
<tr>
<td>3.</td>
<td>Number of Functional Units and Population.</td>
<td>67</td>
</tr>
<tr>
<td>4.</td>
<td>Rank Size Distribution for Functions, Establishments, and Functional Units.</td>
<td>69</td>
</tr>
<tr>
<td>5.</td>
<td>Relations Between Selected Functions and Population.</td>
<td>72</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Map</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Tulare County Study Area.</td>
<td>39</td>
</tr>
</tbody>
</table>
ABSTRACT

ASPECTS OF THE RELATIONSHIP BETWEEN CENTRAL FUNCTIONS AND SIZE OF UNINCORPORATED URBAN PLACES IN TULARE COUNTY, CALIFORNIA

by

Gerald Flanders Thomas

Master of Arts in Geography

June, 1971

Central place studies have often identified relationships between functional complexity and population of urban places. Additionally, hierarchies have been found, and threshold populations for various functions identified. This thesis, based on survey data for small unincorporated places in Tulare County, California, shows that although there is a fairly high product moment correlation coefficient between population and the functional complexity of the places studied, that this relationship has little interpretative value because of significant variance around the regression lines. It is also shown that functional and population data are inadequate in identifying a hierarchy of places or threshold populations for various functions. Furthermore, there is not a proportional
increase of functional complexity with size of place. It is suggested that other indicators be used to more effectively identify centrality.
CHAPTER I

INTRODUCTION

Problem, Procedure and Overview

Urban areas constitute living space for the majority of people in developed countries, and, as such, interest scholars from a variety of fields.\(^1\) Urban geography is usually divided into two broad and often overlapping categories: (1) "The urban geographer is concerned with cities as entities--their locations, characters, growth, relations to the countryside and to each other," and (2) of equal interest are the "... patterns of the city's interior--land-use patterns, social and cultural patterns, patterns of circulation, patterns of the natural environment--all as they exist in interrelation and interaction in the urban area."\(^2\) This paper emphasizes the first type of urban geographic study. Urban places will be treated as punctiform entities providing goods and services to a surrounding tributary area.

The study will provide further evaluation of selected aspects of central place theory. More specifically, the
goal here is to consider the relation between the functional complexity* and the population size of urban places. Essentially then, this is an examination of a portion of central place theory within a specific area. The study will provide further insight into the arrangement of central places and relations between central places, their resident population, and tributary areas. Results are compared with those produced in similar studies by Brush (1953), Berry and Garrison (1958), Thomas (1960), Stafford (1963), Kenyon (1967), and Carter, Stafford and Gilbert (1970).³

Before proceeding to the substantive portion of the study, concepts and biases that this work is based upon will be discussed. Inclusion of these concepts is designed to simplify the way geographical phenomena are viewed here.

Theoretical Concepts

Geography, as is true with other social sciences, is confronted with two different types of problems.⁴ First, are explanatory type problems, characterized by the development of hypotheses and theories that attempt to explain 'why' something occurs or exists. An example of an

*Technical vocabulary is defined in a glossary. Technical terms are underlined the first time they occur in the text.
explanatory problem is: "Why have the Eskimos adapted their housing to Arctic conditions in a particular way?" The second type is the normative problem which deals with optimal solutions. The theories developed usually differ in part from reality. An example of a normative problem is: "What type of dwelling is best suited to Arctic conditions?" Generalizations and methods appropriate for these two types of problems are different: a usual explanatory theory must account for aspects of reality, while a normative theory need not. In this discussion both explanatory theory and normative theory are dealt with since central place theory has aspects of both. This duality exists because central place theory prescribes a degree of perfection or optimization in the organization of man's spatial behavior with regard to hierarchies, threshold populations, and ranges of goods. At the same time, applications of central place theory try to provide an understanding of important aspects of man's manner of distributing his towns and cities.

It is still too early to tell if a comprehensive, deterministic, explanatory theory can be developed in geography. But if it is possible, the theory will accomplish more than a mere forecasting from accumulated data;
it will explain the geographical distributions. Central place theory, a partial theory of the space economy, is a step in the right direction.

First, in central place theory, emphasis is placed on discovering order in what appears to be a chaotic world. For example, human occupancy patterns are the result of interaction between a whole host of variables, such as the cultural values of the population, levels of technological development, land tenure systems, and so on. To many the interaction of these variables produces apparently dis-organized conglomeration of economic activities. But order and disorder are differences in individual perception. Haggett has aptly stated

If we ask of a given region whether its settlements are arranged in some predictable sequence, or its land-use zones are concentric, or its growth cyclical, then the answer largely depends on what we are prepared to look for and accept as order. Order and chaos are not part of nature but part of the human mind; in Sigwart's words 'That there is more order in the world than appears at first is not discovered till the order is looked for' (Hanson, 1958, p. 204).5

One may look for order or disorder and come to two entirely different conclusions.

Central place theory is based on viewing phenomena as being ordered rather than disordered, general rather than unique. This is in the tradition of Schaefer and
Bunge, and of the school of geography that is attempting to make geography more scientific. Arguments supporting the uniqueness point-of-view have been well documented by Hartshorne and have been shown to be both consistent and logical. However, Bunge has demonstrated that science is diametrically opposed to the doctrine of uniqueness. It is willing to sacrifice the extreme accuracy obtainable under the uniqueness point of view in order to gain the efficiencies of generalization. Therefore, science will accept the class 'white rocks.' Science is cheerful in that it assumes it can become constantly more general and more clearly accurate through its inventive efforts, though it realizes it can never become completely accurate. Since inaccuracies can always be reduced, science does not ascribe the ever-present existence of these inaccuracies to uniqueness, but to the state of the art.

Progress toward development of theory in geography has been based on viewing phenomena as general. Within geography, growth of central place theory has been in the forefront of this development. Even though generalizations are difficult at the societal level, the procedure for achieving explanatory theory lies in viewing settlements and their attendant attributes as being general rather than unique. The present study regards central place patterns to be general rather than unique.

Plan of the Study

Chapter II consists of an overview of the development
of central place theory and the hypotheses to be tested. Key contributions are reviewed, with emphasis placed on those parts dealing with relationships between functions and population in central places. Chapter III considers the Tulare County study area, the data used, and an analysis of the hypotheses presented in Chapter II. Chapter IV presents findings and conclusions. A Glossary has been included as Appendix A; it contains many terms used in this study. Appendices B and C present a master table of commercial complexity and population by town, and the methodology employed in a sample survey.
FOOTNOTES


or more familiarly, Scientific Empiricism. Scientific Empiricists believe that the concepts of the different branches of science are not different but belong to one coherent system. "It is an aim of the future development of science to come, if possible, to a simple set of connected, fundamental laws from which the special laws in the different branches of science, including the social sciences, can be deduced." Carnap, Rudolf, "Scientific Empiricism; Unity of Science Movement," Dictionary of Philosophy, 1961, p. 286.


9. This viewpoint has implications on the formation of hierarchies of central places. If it is accepted that places can be viewed as being general, then places can be classified into categories according to the degree they are similar to the model representing the class. If places are viewed as being unique, then only a continuum of places will result. There will be further discussion on these points in Chapter IV.
CHAPTER II

ANALYSIS OF RELEVANT LITERATURE

The volume of work dealing with central place theory precludes anything but analysis of a selection of the more important studies that have influenced the preparation of this project. The literature is divided into two broad groupings. First, the classical statements by Christaller, Lösch, and Zipf. Second, selected empirical tests that followed the original statements.

Classical Theory

Walter Christaller

"Are there laws which determine the number, sizes, and distribution of towns?"¹ This was the question that Christaller posed for himself prior to developing his theory for the number, sizes, and distribution of towns. Like most economists and geographers, Christaller believed laws do exist that determine, in a general way, the behavior of man.² His quest for ordering laws resulted in a general deductive theory known as "the theory of the location of urban trades and institutions" (now commonly known
as Central Place Theory). Christaller believed this theory would explain why central place systems are as they are, and that it would correspond to Thunen's theory of agriculture location and Weber's theory of industrial location. His theory is economic and geographical, since Christaller believed economic factors were most important in creating and sustaining towns. In fact, Christaller thought "the chief profession--or characteristic--of a town is to be the center of a region." 

The economic factor that Christaller thought most influential in creating towns was a demand for the things a town offers. An effective demand must exist for the things a town has to offer before the town will exist, or before certain goods will be made available within a town. For our purposes we hold supply constant and deal only with demand. Effective demand depends on such things as population size, transportation costs, income levels, and the price of the goods being offered at a central place. The range of any goods is also determined by these factors.

A number of assumptions underlie Christaller's theory. He assumes (1) central places would be located on a uniform plain; (2) the rural population would be evenly distributed over the plain; (3) the population would have equal mobility, with goods being purchased from the nearest
center; (4) there would be a constant range for any one
central goods; (5) demand for central goods is uniform
among all people; (6) that people would try to maximize
income and the satisfaction of wants. From these assump-
tions, Christaller based a system of central places on the
upper and lower ranges of goods being offered at different
centers. If a good has a small lower limit then the good
will be frequently offered. If it has a large lower limit
then it will be infrequently offered.

The main components of Christaller's theory are now
well known and have frequently been outlined, even in
basic geography texts, so there is no need to duplicate the
theory here. Rather, this study reviews relations between
functional complexity and population and the existence of a
hierarchy of central places.

With the exception of the existence of a hierarchy,
the questions being asked here were not directly dealt with
by Christaller. It is true that he believed the importance
of a town was not necessarily parallel to the number of
inhabitants, in fact, he defined central places in terms of
surplus goods and services while recognizing no direct
correspondence to the number of inhabitants. Christaller
based importance, or more accurately, centrality, on the
centralized services which were concerned with administra-
tion, culture, religion, health, commerce, finance, the labor market, transportation, and communication. However, he did not consider explicitly the following relationships:

(1) the probable ratio between population numbers and the number of functions, and (2) the existence of universal threshold populations for the first entry of different functions. It should be noted that the first relationship is implicit in some of his tables. These relations will be considered explicitly in this thesis.

To measure centrality Christaller used the number of telephone connections rather than compiling specific data on the whole range of central services offered in each central place. The former method was both convenient and practical, and he believed the number of connections "... corresponds rather exactly to the importance of a place." According to this method, centrality of a place is measured by the formula:

\[ C = Tz - Ez \frac{Tg}{Eg} \]

where

C = the relative importance of a place or centrality

Tz = the number of telephone connections at the central place;

Ez = the number of inhabitants of the central place;

Tg = the number of telephone connections in the region;

Eg = the number of inhabitants of the region."
Christaller felt that individual central places could be classified according to an ordered hierarchy. Unfortunately, he was less than clear when describing the choices of where to make breaks in the hierarchy. An indication of how he assigned settlements to various classes within the hierarchy was given early in the work.

First, we must formulate a continuum of all towns according to their sizes; then we shall have, where a large number of towns are accumulated within the statistical series—if they are graphically represented—typical size values; and, where few towns appear in the series, we shall find typical boundaries between the size-groups.  

In a footnote, he states that this method is used in the second part of the book, meaning the section on Southern Germany where he empirically tested the theory, but he agrees that this method "... is not quite without shortcoming."  

August Lösch

Like Christaller, Lösch assumed a physically homogeneous plain occupied by self-sufficient farms that were regularly distributed over the area and by a population that had similar tastes. From this starting point, and using only economic reasons, Lösch shows that man will organize himself into urban places of different sizes because of economies of scale, transport costs, and agriculture's need for space. Lösch also discussed
industrial and agriculture location, but the concern here
is with his statement regarding urban centers.

Lösch began by explaining how spatial differentiation
will develop by using the example of a market area for beer
being sold from a brewery located at one of the farmsteads.
The farther one lives from the point of supply the higher
the price of beer because transport costs increase with
distance. Ultimately a distance is reached where the
selling or buying of beer is no longer profitable from the
one brewery. The highest demand would be at the point of
supply and then become smaller toward the periphery until a
point is reached where no beer is sold. New breweries
will be established over an area as long as profits can be
made. Competition squeezes together the circular trade
areas of the breweries until they become regular hexagons.
Christaller also used hexagons to describe trade areas but
Lösch provided proof that a hexagon is the optimum shape
for trading areas when there is a uniform distribution of
purchasing power.\(^{14}\)

Lösch was critical of Christaller's methods of de-
limiting a hierarchy. Referring to Christaller's classi-
ification of towns he states "... I cannot see that he
really succeeded except in two classes of places he called
A and K..."\(^ {15}\) Christaller, as stated above, did not define
clearly the breaking points within the hierarchy. Lösch suggested that

he may have arrived at it by arranging a number of places according to their functions and then finding that most places in a group fell in a definite size-class, which was thereupon regarded as typical for places with this function. But one can hardly speak of a clustering of the places about any representative central value within the size-class, save for the two exceptions mentioned.\textsuperscript{16}

Three methods of classifying central places into a hierarchy were thought possible by Lösch: "To classify them by direct observation of towns with different functions as Christaller apparently did; to derive the classification from a regularity that is independent of what is to be proved (Pareto's distribution formula, perhaps); or, finally, to obtain it by trial and error."\textsuperscript{17} Lösch used the last two methods to demonstrate the experience of a regional hierarchical system in Iowa. He first warned that a theoretically derived regional system must correspond to the actual regional system in more than one respect. The reason for this requirement is that town can be classified in such a manner

that their real number is equal to the theoretical number in every size class. But only when it appears further, perhaps, that the actual distance separating these town types from one another is the same as the theoretical distance can it be assumed that the classification is meaningful.\textsuperscript{18}
In Iowa, the theoretical number of settlements and their distance apart corresponded almost exactly with reality. Real distances between centers deviated by only 5 to 10 percent from the theoretical distances, and it appeared that Pareto's law of distribution was also applicable to the Iowa study area. Lösch does not discuss the aspect of functional complexity relative to town size. These relations are discussed in this study.

George Zipf

Both Christaller and Lösch developed theories for the arrangement of urban places. Missing from their analyses, however, was a specific consideration of the principles that motivate man. George Zipf, in a book on human ecology, presents his well known principle of least effort, which contains the germ of a general theory having applicability to many aspects of human geography and hence to central place theory.

In simple terms the Principle of Least Effort means, for example, that a person in solving his immediate problems will view these against the background of his probable future problems, as estimated by himself. Moreover he will strive to solve his problems in such a way as to minimize the total work that he must expand in solving both his immediate problems and his probable future problems. That in turn means that the person will strive to minimize the probable average rate of his work-expenditure.
(over time). And in so doing he will be mini-
mizing his effort, by our definition of effort. Least effort, therefore, is a variant of least
work.21

The following example is provided to illustrate the principle of least effort within a central place framework:
First assume a number of central places equal in terms of functional complexity and pricing policy, and which are evenly spaced over a level plain. Further assume that the limited demands of the population can be satisfied at a cost effort uniform among the central places. One would expect that most of the people in any given town, for ex-
ample, town A, purchase most of their goods in their town of residence. A few may go to towns in close proximity to purchase goods, but none travel a long distance to purchase goods that are locally available. Now interject a new variable. Merchants in town A raise prices while those in the surrounding towns maintain the same price level. It is now probable that some of the population of town A will travel to the nearest town offering the same goods desired to make purchases.

The applicability of Zipf's principle of least effort to central place theory lies in the requirement of movement in the daily life of economic man. Movements are most of-
ten means to an end and not ends in themselves. Exceptions
to this are a pleasure walk, drive, or trip. Zipf contends that when man desires something requiring movement, he will to the best of his knowledge and ability try to achieve this end with the least effort. Thus people desiring standard goods, such as most groceries and services, acquire these goods with least effort, which in most cases is at the least distance, or travel time, from their residence. Residence is used as a convenient starting point; the starting point could, of course, be any place. All of this is related to tributary area formation, the relation between population and functions offered, and the existence of a hierarchy. Most researchers have accepted the premise of least effort, or at least the attendant concept of least movement.22 This thesis examines the applicability of the principle of least effort to central place theory.

Empirical Tests

The theoretical framework of central place theory was established by Christaller, Lösch, and Zipf. Following their initial efforts, a large number of empirical studies discussed various aspects of the theory. The existence of a hierarchy; stability of size-distance relationships over time and over an area; behavioral patterns of a dispersed
population relative to central places; relations between central place populations and numbers and types of functions, and so on. Here only a representative sample of those works dealing with the relations between population and goods offered in a central place, and hierarchy identification will be discussed.

There have been two major types of research in hierarchy identification. First, have been those studies that assess central place importance in terms of the number and types of goods offered in a central place (or used some other index of centrality). Such studies develop a hierarchy and extrapolate tributary areas from such enumeration data. The other way has been to use a system of questionnaires identifying the area of dominance from shopping patterns, and then develop a hierarchical system based on consumer behavior. Most studies have been of the former type.

John E. Brush (1953)

Starting from the premise that small centers "... in agricultural areas of Anglo-America exist mainly because of their functions as central places for the exchange of goods and services ...", Brush developed a threefold division of hamlets, villages, and towns for Southwestern Wisconsin
that was based on functional complexity. The criteria for each division were: (1) hamlets must have at least five structures clustered within a quarter of a mile and they must contain at least one but not more than nine functional units; (2) villages must have a minimum of ten functional units and in addition to groceries, taverns, and filling stations found in hamlets, there must be at least four other functions; and (3) towns must have at least fifty functional units of which thirty are types other than grocery stores, taverns, and filling stations, and there must exist banks, weekly newspapers, high schools, physicians, dentists, veterinarians, and lawyers. Functional complexity, as indicated by diversity of functions, increased at each higher level; thus, towns commanded a larger tributary area than either hamlets or villages. However, Brush did not calculate correlations between population and functional complexity.

Brush cautions the reader that "... classes cannot be determined merely by functional attributes. Fundamentally it is the spatial relationships of the centers that determine the existence of three discrete classes." The hierarchy developed by Brush corresponds rather closely to the theoretical distances among centers if the centers were equally spaced in a hexagonal system.
Brush also discusses tributary and traffic areas. He notes that the linearity and clustering of the settlement pattern reduce village tributary areas and expands town tributary area. Further, he observes that "... tributary areas are seldom circular or hexagonal, but instead they tend to be elongated at right angles to the axes of rows of centers or extended eccentrically from centers in clusters." These observations have implications for the Tulare study area as will become evident in Chapter III.

H. E. Bracey (1953)

Bracey was one of the first to use a system of questionnaires to measure the degree towns in Somerset (Great Britain) were service centers. Questionnaires were completed by head-teachers, chairman of parish councils, village clergy, and other responsible persons living in villages. The questionnaire listed seven kinds of shops and eight professions, and asked for the names of places commonly visited for their provision. Each service was allocated one point, fractions were used if more than one town for a service was listed. Thus, if two towns were listed each would receive one-half point. Questionnaires were used in villages, but no effort was made to question the rural population.
From the information gathered Bracey identified three areas of dominance around the centers. The intensive central zone, where most services are used on most occasions, was defined as the area where all villages use the town exclusively for at least five professional services. The next zone is the extensive area where most services are used on some occasions; it was defined as the zone where at least five shopping and five professional services were obtained from one center, but other centers were also used. The fringe zone was where less than five services were used and where only some services were used on some occasions. 29

As with most central place studies, Bracey divides the centers into a hierarchy. He uses only three divisions—district centers, second grade centers, and centers. The latter are differentiated from villages and towns which have no services functions. 30 The highest order centers have a large rural service area and population as well as having the intensive area form a substantial proportion of the total service area. The other two divisions have progressively smaller tributary populations and areas.

Rutledge Vining (1955)

Although Brush and Bracey possessed insight into the spatial distribution of centers, the basic method of delimiting a hierarchy was arbitrary. Vining was quick to
note this and commented with special reference to Brush's article:

... the observer has as his basic data the array of communities and the listing of the kinds of activities represented by the establishments in each community. There is no evidence that I have seen suggesting that exactly three natural partitions may be observed in this array of numbers of establishments. Like pool, pond, and lake, the terms hamlet, village, and town are convenient modes of expression, but they do not refer to structurally distinct natural entities. As the number of establishments increased, the number of kinds of activities represented also increased. Clearly it is arbitrary to divide the array into three partitions rather than into a greater or lesser number; and similarly arbitrary in the determination of where to put the dividing points separating the different classes of types. Having drawn the lines, one may list certain kinds of activities which are typically found within each of the designated classes of center, and the ... table in ... Mr. Brush's article represents such a listing. It will be noted that not all members of a class will contain all the activities listed, and most of the communities within a class will contain activities not listed. Such a table is not an independently derived basis for a classification of communities by type. Rather it is itself derived from a previous partitioning of an array which appears as something similar to an arrangement of observations that have been made upon a continuous variable.31

Subsequent researchers have attempted to approach the question of hierarchy identification more objectively, as is done in this thesis.

Brian Berry and William Garrison (1958)

Working in 1958, Berry and Garrison came to grips with the problem of hierarchy identification. Using the concepts
of threshold and range of a good they identified the existence of a hierarchy of lower order centers in Snohomish County, Washington.

Central functions were classified as either "... variates--that is, numbers of stores performing these functions varied from place to place," or they were "... attributes--that is, central places either possessed a unit performing this function or did not possess such a unit."32 Thus, each central place function was identified as a variate or an attribute. For each of the fifty-two variates thereby identified, scatter diagrams were prepared to determine the relationship between population size and total number of establishments. "Each of the diagrams had thirty-three points, one for each of the thirty-three central places. Bestfitting curves of the exponential growth series $P A(B^n)$, where $A$ and $B$ are the parameters to be estimated, were fitted to each of the scatters using standard least square techniques, after logarithmic conversion."33 The central functions were then ranked according to the threshold population necessary for the first complete store to appear. For example, the threshold population for filling stations was 196, and that for jewelry stores was 827.
Relationships between attributes and the populations of the centers "... were determined by calculating the point biserial coefficient of correlation between each of the activities and the population of the centers." Activities were then ranked in ascending order according to these coefficients.

In response to Vining's criticisms of arbitrarily creating a hierarchy, the ranked central functions were tested in a more objective manner to see if groups existed. Threshold sizes for the variates were tested for randomness by using the Chi-square test. "The tests showed that the observed distributions of points were non-random at the 0.05 level of significance, and this observed distribution was non-random in a grouped rather than a 'more even than random' manner." Similar findings resulted from tests of the attributes. From these data Berry and Garrison identified three groups of central places having greater variation between groups than within groups and labeled them A, B, and C. They also noted "...that the three classes of towns tend toward discrete levels of population, as suggested by Christaller." After the original study in Snohomish County, Berry, with the aid of others, implemented a series of studies in the central portion of the United States. The study
areas were Chicago and its metropolitan area, the southern portion of South Dakota, and southwestern Iowa. These studies have been to date the most intensive and comprehensive central place studies undertaken. The goal was to test in a variety of different situations the existence of central place systems and the validity of a hierarchical arrangement of central places. In each area the establishments and functions were cataloged for the central places. The researchers identified a hierarchical arrangement of central functions in villages, town, and cities in southwestern Iowa and in the Aberdeen region of South Dakota, and concluded that towns in observed sparsely populated regions have fewer functions than equal size towns in densely populated areas.

In addition to cataloging functions, consumer behavior was checked by questionnaires for correspondence to the functional hierarchy. The result for Iowa was that consumer behavior displayed a hierarchy and that people tend to minimize their movement in the purchase of goods and services. The matters of functional complexity, hierarchical presence, and consumer behavior are all pertinent to this study.

E. N. Thomas (1960)

Functional complexity relative to urban population
has been the organizing theme for a series of studies within the United States and abroad. A study conducted by Thomas in 1960 exemplifies this approach. Dealing exclusively with a sample of forty-two incorporated places in Iowa, Thomas first identified a list of functions that he expected to find in the sample centers. Then the number of occurrences of each function for each center was noted. Although the functions did not appear to fall into natural groupings according to frequency of occurrence, Thomas made some interesting findings on the economic base of small centers and on the relationship between population and functional complexity.

First, after differentiating between functions, establishments, and functional units, Thomas found coefficients of correlations of .96 between number of establishments and population size, .86 between functions and population, and .95 between functional units and population. Focusing on the establishment-population ratio, he conjectured that

one extremely plausible explanation for the closeness of this relationship is that the people who reside in the small places generally receive direct or indirect economic support from employment in the establishments located there. Thus, as the number of establishments increases, so does the number of persons in the town.
However, he warns that this does not mean that the establishments receive all their support from the resident population.

This warning is based on the results of a straight line fitted through the observations which yielded the following regression equation: \( Y=9.6 + 6.6X \), (where \( Y \) is the number of establishments and \( X \) is population size). This means that 9.6 establishments can be expected to occur even when the population of the town is zero. Thomas believed that 9.6 represents "... the number of establishments which are supported by the population residing in the trade area of a place when the population of the town is very small." 41

The second observation by Thomas concerns the importance of the motor-vehicle complex to the centers studied. Over twenty-five percent of the functions occurring were either gasoline sales or auto repairing. Noting that there is much evidence correlating the decline of small centers to the greater mobility of the dispersed population as a result of the development of the automobile and the improvement of roads, "... to the economic decline of small towns may also provide an appreciable part of their raison d'etre." 42 As will be seen in Chapter III, this same pattern is repeated in Tulare County.

Golledge, Rushton, and Clark challenge the validity
of a central place system defined on the basis of the
functional complexity of urban centers, and suggest that
such systems should be based on the spatial behavior of
consumers. In the past most central place researchers
have cataloged the frequency and distribution of central
place functions and then have identified patterns of con-
sumer behavior. However in this study the authors were
primarily interested in the distance traveled for the
purchase of goods and services. Using data collected by
the Bureau of Business and Economic Research, University of
Iowa, which consisted of questionnaire results from an
areally stratified random sample of Iowa's dispersed popu-
lation, they were able to compile mean maximum distances
taveled to purchase thirty-three central goods. From
these data and subsequent analyses they identified two
interesting spatial characteristics:

1. that detailed information on individual spatial
   expenditure patterns for particular commodi-
   ties, deduced from a study of the occurrence
   of functions in an area, is not in agreement
   with similar information obtained from direct
   interview with the consumer, and

2. that the grouping of central place functions
   on the basis of travel behavior produces a
different ordering of functions than does grouping on the basis of occurrences of functions.

The authors developed two concepts of consumer spatial behavior that are of value to the present study. First was a good's "spatial flexibility", which helps explain varying distances traveled to purchase goods. Some goods, for example female clothing, encourage a great range of trips over a variety of distances and are hence very spatially flexible, while for other goods, such as groceries, the nearest occurrence is usually utilized. The second concept, that of "spatial competitive power", complements spatial flexibility. "Whereas flexibility is something inherent in the good, the competitive power is an expression of the 'degree' of attraction exerted by a good, and is not so much an inherent characteristic of the good, but is a spatial manifestation of people's evaluations of the goods." Degree of attraction is related to such things as price, quality, and traditional buying labels.

The findings by Gollledge, et al., relative to order-of-entry of goods and the grouping of central place functions, are at odds with findings by Berry, Barnum, and Tennant within a similar study area. The study outlined below is also at odds with some of the traditional ideas of
central place theory. Implications of both the enumeration and consumer behavior approaches to the study of central place systems are examined in this study.

James B. Kenyon (1967)

Kenyon expresses doubt in some of the basic tenets of central place theory. More exactly, he presents evidence that the size of places in the Athens area of Georgia does not conform closely to the rank-size rule, and that places do not fall into discrete size groupings forming hierarchies, and furthermore that the increase in number of establishments does not co-vary directly with the increasing size of a place.48 These findings are in direct conflict with those made by Berry and others. In a later chapter of this thesis differences will be discussed in detail and in comparison with the present study and with the studies discussed above. For the present it will suffice to say that a reformulation of central place theory is necessary. Kenyon suggests that such remedial action

... ought to take into account the economies of scale of the particular activity, the necessary size of its market, the actual size of its market (range of good times intensity of demand), and especially its constituent role in a linked system of activities which collectively create the environment necessary for the central place to accomplish its basic function, or
role, in the larger, external framework. \(^{49}\)

**SUMMARY AND HYPOTHESES**

The review of selected central place studies provides a synopsis of the trend of central place research. Researchers have tried to operationalize the major concepts of the Theory; e.g., centrality and threshold, so as to achieve a clearer grasp of what is a central place, and what are its functions. The present study works within a framework previously utilized by Thomas, Stafford, and others in identifying relations between functional complexity and population size of small towns. The end product adds to empirical knowledge, and hopefully also helps clarify some of the basic concepts of central place theory.

Therefore, study focuses on four questions. These questions seek to define elements of the relationship between central functions and the size of urban places, and can best be stated as hypotheses to be tested. It is hypothesized that:

1. there exists a positive correlation between the population size of a place and number of establishments, functions, and functional units in it;
2. there is a grouping of places into a hierarchy based on functional complexity of the centers;

3. there are universal threshold sizes for first entry of different functions; and

4. the number of functions found in central places increases directly with an increase in size of a central place.
FOOTNOTES


2. Ibid., p. 3. Christaller notes that perhaps the term law is too rigorous and that the term "tendency" could be used instead, since laws applied to human behavior are not as inexorable as natural laws.

3. Ibid., p. 7.

4. Ibid., p. 16.

5. Ibid., p. 3. There are noneconomic type towns existing for defensive, governmental, and religious reasons, but these were not directly considered by Christaller, nor are they of concern in the present study.


9. Ibid., p. 158. This is especially true in one table depicting the correlation between population and number of telephones. For example, a central place with approximately 800 people would have 5-10 telephones; one with 1,200 would have 10-20; those with 2,000 would have 20-50; and so on to places of 1,000,000 having 60,000 telephones.
10. Ibid., p. 143.

11. Ibid., p. 147.

12. Ibid., p. 60.

13. Ibid., p. 82.


16. Ibid.

17. Ibid.

18. Ibid., pp. 433-34.

19. Ibid., pp. 434-35.

20. Ibid., p. 435. As with Christaller, this relationship is implicitly contained within a table.


22. Haggett, *op. cit.*, Footnote 5, Chapter I.


24. Ibid., pp. 385-87.

25. Ibid., p. 390.

26. Ibid., p. 393.

27. Ibid., p. 397.

29. Ibid.

30. Ibid., p. 104.


32. Berry, Brian J. L. and William Garrison, "The Functional Bases of the Central Place Hierarchy," Economic Geography, Vol. 34, 1958, p. 151. The reader should not be confused over this particular use of the terms "variates" and "attributes". In fact, in normal statistical usage they are nearly synonymous. Apparently, Berry and Garrison intend that the word variate means a variable which may take on an external range of values, while they use attribute to mean a variable with a range of only two values.

33. Ibid.

34. Ibid.

35. Ibid., pp. 151-52.

36. Ibid., p. 154.


40. Ibid.

41. Ibid.

42. Ibid., p. 12.


44. For example, Christaller, *op. cit.*; Lösch, *op. cit.*; and Berry and Garrison, *op. cit.*


46. Ibid., p. 264.

47. Ibid., p. 271.

48. Kenyon, *op. cit.*, Footnote 3, Chapter I.

49. Ibid., p. 750.
CHAPTER III

ANALYSIS

The Tulare County Study Area

The portion of Tulare County that makes up the study area lies in the Central Valley of California (Map 1). The study area includes only the western third of Tulare County.* The western third of Tulare County was chosen because (1) the physical character of the area approximates the ideal established in classical central place theory, (2) the large number of small urban centers located within this part of the county, and (3) the location near to Los Angeles facilitated field research.

Tulare County's economic base is dominated by intensive agriculture. Presently over thirty percent of the labor force is directly involved in agriculture,¹ and a substantial proportion of the remainder is indirectly supported by agriculture in such activities as trucking,

*Henceforth reference to Tulare County will refer only to the western third of the county, unless otherwise stated.
box manufacturing, equipment maintenance, and so on. Because of good soils, adequate irrigation water, long growing season, and advanced agricultural technology, Tulare County is the number two agricultural county in the United States. The two counties to the immediate north and south respectively rank number one (Fresno County) and three (Kern County) in agriculture. Tulare's agricultural diversification, ranging from cotton to almonds and from grains to citrus, requires year-round activity with at least one crop harvested every month.

Agriculture is labor intensive, especially in harvesting and processing of citrus, grapes, and fruit crops. Other forms of hand labor include pruning in vineyards and deciduous orchards. Some of this accessory agricultural population locates in what are called here rural suburbs, while others are migratory, coming only at harvest, thus giving a seasonal prosperity to some central places. The importance of rural suburbs in the central place system will be discussed later. Additionally, the area is served by an excellent network of roads that allows for great freedom of movement (Map 1).

The Data

Two data series concerned with population size and functional complexity, are analyzed with reference to
central places in Tulare County. Neither fully meets the needs of this study because they only measure a portion of the complexities operative in the service centers studied.

The first series includes all the unincorporated places of the County. Such places are defined here as having a population of at least 100, a minimum of two establishments, and a spacing of buildings that give an appearance of compactness exceeding that of ordinary farmstead spacing or commercial ribbon development. For a place with little more than the minimum population and/or establishment number the maximum linear distance between the outermost buildings could not exceed one-quarter mile, if the place were to be included in the study. Thirty-five unincorporated places ranging in population from 100 to 2,950 met the criteria for further study (Map 1). Data were also collected for twelve additional unincorporated places. These were not included in the present study because they did not meet the above criteria.

Population and functional data for the thirty-five unincorporated places were compiled during two weeks of field work in February, 1967 (Table 1). Population estimates were made after a summation of every dwelling within each center had been made. Either of two methods were used to estimate population size: (1) if the place
TABLE 1  
Functional Complexity of Unincorporated Places in Tulare County

<table>
<thead>
<tr>
<th>Settlements</th>
<th>Population</th>
<th>Functions No.</th>
<th>Functions Ratio*</th>
<th>Establishments No.</th>
<th>Establishments Ratio*</th>
<th>Functional Units No.</th>
<th>Functional Units Ratio*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Orosi</td>
<td>1,720</td>
<td>49</td>
<td>35</td>
<td>78</td>
<td>22</td>
<td>97</td>
<td>18</td>
</tr>
<tr>
<td>2. Pixley</td>
<td>1,560</td>
<td>46</td>
<td>34</td>
<td>86</td>
<td>18</td>
<td>110</td>
<td>14</td>
</tr>
<tr>
<td>3. Strathmore</td>
<td>1,330</td>
<td>39</td>
<td>34</td>
<td>51</td>
<td>26</td>
<td>66</td>
<td>20</td>
</tr>
<tr>
<td>4. Earlimart</td>
<td>2,950</td>
<td>38</td>
<td>78</td>
<td>71</td>
<td>42</td>
<td>86</td>
<td>34</td>
</tr>
<tr>
<td>5. Cutler</td>
<td>2,240</td>
<td>31</td>
<td>72</td>
<td>52</td>
<td>43</td>
<td>65</td>
<td>34</td>
</tr>
<tr>
<td>6. Ivanhoe</td>
<td>1,760</td>
<td>31</td>
<td>58</td>
<td>51</td>
<td>35</td>
<td>64</td>
<td>27</td>
</tr>
<tr>
<td>7. Tipton</td>
<td>930</td>
<td>30</td>
<td>31</td>
<td>36</td>
<td>26</td>
<td>45</td>
<td>21</td>
</tr>
<tr>
<td>8. Terra Bella</td>
<td>1,000</td>
<td>29</td>
<td>34</td>
<td>39</td>
<td>26</td>
<td>47</td>
<td>21</td>
</tr>
<tr>
<td>9. Poplar</td>
<td>1,110</td>
<td>23</td>
<td>48</td>
<td>39</td>
<td>28</td>
<td>47</td>
<td>24</td>
</tr>
<tr>
<td>10. Goshen</td>
<td>1,130</td>
<td>19</td>
<td>59</td>
<td>29</td>
<td>39</td>
<td>39</td>
<td>29</td>
</tr>
<tr>
<td>11. Woodville</td>
<td>880</td>
<td>19</td>
<td>46</td>
<td>32</td>
<td>27</td>
<td>37</td>
<td>24</td>
</tr>
<tr>
<td>12. Traver</td>
<td>300</td>
<td>17</td>
<td>18</td>
<td>17</td>
<td>18</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td>13. Alpaugh</td>
<td>600</td>
<td>16</td>
<td>37</td>
<td>22</td>
<td>27</td>
<td>26</td>
<td>23</td>
</tr>
<tr>
<td>14. Richgrove</td>
<td>800</td>
<td>14</td>
<td>57</td>
<td>21</td>
<td>38</td>
<td>24</td>
<td>33</td>
</tr>
<tr>
<td>15. Sultana</td>
<td>430</td>
<td>14</td>
<td>31</td>
<td>16</td>
<td>27</td>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td>16. Liberty</td>
<td>220</td>
<td>13</td>
<td>16</td>
<td>9</td>
<td>24</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td>17. Plainview</td>
<td>560</td>
<td>12</td>
<td>47</td>
<td>14</td>
<td>40</td>
<td>19</td>
<td>29</td>
</tr>
<tr>
<td>18. Cotton Center</td>
<td>140</td>
<td>11</td>
<td>13</td>
<td>14</td>
<td>10</td>
<td>19</td>
<td>7</td>
</tr>
<tr>
<td>19. Lemon Cove</td>
<td>160</td>
<td>11</td>
<td>15</td>
<td>13</td>
<td>12</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>20. Plano</td>
<td>600</td>
<td>11</td>
<td>54</td>
<td>11</td>
<td>54</td>
<td>12</td>
<td>50</td>
</tr>
<tr>
<td>21. Ducor</td>
<td>230</td>
<td>10</td>
<td>23</td>
<td>10</td>
<td>23</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>22. London</td>
<td>920</td>
<td>10</td>
<td>92</td>
<td>14</td>
<td>66</td>
<td>19</td>
<td>48</td>
</tr>
<tr>
<td>23. Mitchells Corner</td>
<td>170</td>
<td>9</td>
<td>19</td>
<td>10</td>
<td>17</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Settlements</td>
<td>Population</td>
<td>Functions No.</td>
<td>Ratio*</td>
<td>Establishments No.</td>
<td>Ratio*</td>
<td>Functional Units No.</td>
<td>Ratio*</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------</td>
<td>---------------</td>
<td>--------</td>
<td>-------------------</td>
<td>--------</td>
<td>----------------------</td>
<td>--------</td>
</tr>
<tr>
<td>24. Delft</td>
<td>420</td>
<td>7</td>
<td>60</td>
<td>5</td>
<td>84</td>
<td>10</td>
<td>42</td>
</tr>
<tr>
<td>25. Elbow</td>
<td>850</td>
<td>7</td>
<td>121</td>
<td>13</td>
<td>65</td>
<td>16</td>
<td>53</td>
</tr>
<tr>
<td>26. Midway</td>
<td>380</td>
<td>6</td>
<td>63</td>
<td>6</td>
<td>63</td>
<td>6</td>
<td>63</td>
</tr>
<tr>
<td>27. Tuleville</td>
<td>190</td>
<td>6</td>
<td>32</td>
<td>4</td>
<td>48</td>
<td>7</td>
<td>27</td>
</tr>
<tr>
<td>28. Waukena</td>
<td>100</td>
<td>6</td>
<td>17</td>
<td>5</td>
<td>20</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>29. Monson</td>
<td>120</td>
<td>5</td>
<td>24</td>
<td>4</td>
<td>30</td>
<td>5</td>
<td>24</td>
</tr>
<tr>
<td>30. Yettem</td>
<td>190</td>
<td>5</td>
<td>38</td>
<td>7</td>
<td>27</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>31. Cameron Creek</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colony</td>
<td>340</td>
<td>4</td>
<td>85</td>
<td>4</td>
<td>85</td>
<td>4</td>
<td>85</td>
</tr>
<tr>
<td>32. Seville</td>
<td>230</td>
<td>4</td>
<td>57</td>
<td>4</td>
<td>57</td>
<td>6</td>
<td>38</td>
</tr>
<tr>
<td>33. East Orosi</td>
<td>250</td>
<td>3</td>
<td>83</td>
<td>2</td>
<td>125</td>
<td>3</td>
<td>83</td>
</tr>
<tr>
<td>34. Elderwood</td>
<td>110</td>
<td>3</td>
<td>37</td>
<td>2</td>
<td>55</td>
<td>4</td>
<td>27</td>
</tr>
<tr>
<td>35. Tonyville</td>
<td>210</td>
<td>3</td>
<td>70</td>
<td>3</td>
<td>70</td>
<td>3</td>
<td>70</td>
</tr>
</tbody>
</table>

*The ratio of population to one function, establishment, or functional unit.

Source: Compiled by the author, 1967.
had a population of over 1,000 in 1960 the mean number of persons per household for that center was computed from the 1960 Census of Population and multiplied by the number of dwellings counted during the field survey to obtain a population estimate; (2) if the place had fewer than 1,000 people in 1960 the mean number per household for the County Census Division that included the place was multiplied by the number of dwellings counted to arrive at a population estimate. All occupied dwellings were counted and included in the total for a place if they were within one-quarter mile of the continuous built up area. Frequently, the continuous built up area ended abruptly so that only rarely was it necessary to use the quarter mile rule.

Functional data for unincorporated places includes activities traditionally providing goods or services to the general population: (1) commercial goods and services; (2) social services as provided in churches and meeting halls; and (3) government services such as schools, post offices, and law enforcement facilities. Functional types were cataloged from a list of all the functions that were thought to occur. An effort was made to correlate functional types used in this study with those of previous studies and with the Standard Industrial Classification.
A total of 100 functions were identified. (See Table 2 for the thirty most frequently occurring functions).

A second data series describes the eight incorporated cities in the county. These data were available in the Census of Business for Retail Trade, 1967. This source includes numbers of retail establishments and volume of sales for selected groups of retail functions. Grouping of retail functions by generic class reduces the differentiation of sub-types. However, total sales figures do provide a quantitative measure for a range of central functions within the incorporated places. Population estimates for these places were taken from the California Statistical Abstract, 1967.

Most of the functional data for both series has been summarized for establishments, functions, and functional units. These terms were borrowed from other studies to facilitate comparison.

An establishment is essentially the physical manifestation of an activity and is generally the unit in which an activity is performed; e.g., the building in which the office for a filling station is located or the office of a physician are examples of establishments. In contrast, the term 'function' refers to activities performed in the establishments. According to these definitions, it is possible for more than one function to be associated
TABLE 2

Thirty Most Frequently Occurring Functions

<table>
<thead>
<tr>
<th>Kind of Function</th>
<th>Number of Functional Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline station</td>
<td>124</td>
</tr>
<tr>
<td>Car repair</td>
<td>119</td>
</tr>
<tr>
<td>Church</td>
<td>92</td>
</tr>
<tr>
<td>Food store</td>
<td>88</td>
</tr>
<tr>
<td>Drinking place</td>
<td>41</td>
</tr>
<tr>
<td>Eating place</td>
<td>40</td>
</tr>
<tr>
<td>Used miscellaneous</td>
<td>33</td>
</tr>
<tr>
<td>Barber</td>
<td>26</td>
</tr>
<tr>
<td>Primary school</td>
<td>23</td>
</tr>
<tr>
<td>Meeting hall</td>
<td>22</td>
</tr>
<tr>
<td>Beautician</td>
<td>21</td>
</tr>
<tr>
<td>Post office</td>
<td>21</td>
</tr>
<tr>
<td>Feed and farm supplies</td>
<td>19</td>
</tr>
<tr>
<td>Miscellaneous repair</td>
<td>18</td>
</tr>
<tr>
<td>Cleaner and laundry</td>
<td>17</td>
</tr>
<tr>
<td>Hardware</td>
<td>17</td>
</tr>
<tr>
<td>Fire station</td>
<td>15</td>
</tr>
<tr>
<td>Variety store</td>
<td>15</td>
</tr>
<tr>
<td>Real estate</td>
<td>13</td>
</tr>
<tr>
<td>Auto parts</td>
<td>11</td>
</tr>
<tr>
<td>Motel</td>
<td>11</td>
</tr>
<tr>
<td>Lumber sales</td>
<td>10</td>
</tr>
<tr>
<td>Used car sales</td>
<td>10</td>
</tr>
<tr>
<td>Wrecker</td>
<td>10</td>
</tr>
<tr>
<td>Liquor</td>
<td>9</td>
</tr>
<tr>
<td>Library</td>
<td>8</td>
</tr>
<tr>
<td>Locker</td>
<td>8</td>
</tr>
<tr>
<td>Insurance</td>
<td>7</td>
</tr>
<tr>
<td>Doctor</td>
<td>6</td>
</tr>
<tr>
<td>Speciality apparel</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total Functional Units</strong></td>
<td><strong>859</strong></td>
</tr>
</tbody>
</table>

Source: Compiled by the author, 1967. See Appendix B for a distribution of functional units by town.
with a particular establishment. Each occurrence of a function constitutes one functional unit. 6

Additionally, consumer behavior data were collected from sixty households located in the southern portion of the county. The questionnaire was designed primarily to discover the places where people purchased a range of goods. The questionnaire is presented in Appendix C. Additionally, a small amount of consumer behavior data collected by the Tulare County Planning Commission is used here.

Occurrence of Functions

As mentioned above, 100 functions were identified for the thirty-five unincorporated places. Not all of these occur with equal frequency; thirty-nine were noted only once, while an additional thirty-nine were observed from two to five times. At the other end of the scale the ten most common functions made up over sixty percent of all units observed (Table 2). Since there was such an unequal distribution of functions it was desirable to see if the most common functions could be grouped. This approach follows the assumption that functions which occur most frequently represent the goods and services most essential to the survival of these places, and as such are of interest to this study.
The most obvious grouping is a motor-vehicle complex. Fully twenty-seven percent of all functional units are of this type. For our purposes the motor-vehicle complex includes gasoline stations, auto repair, car wreckers, auto part sales, and used and new car sales. The importance of this grouping seems interesting with regard to the widespread belief that the automobile and all-weather road are the main technological achievements that have led to the economic decline of the small centers, simply because, as Thomas has so clearly stated, "both of these factors permit greater mobility on the part of the dispersed agricultural population and stimulate a spatial redistribution of purchasing behavior, i.e., buying can be done in larger towns located at greater distances from places of residences." In Tulare County, small centers exist because a sizable part of the economic structure is based on the provision of necessary goods and services to the automobile.

A second group encompasses the provision of facilities for social and religious gatherings. Stafford suggests that "since people seem to prefer to have contact with groups consisting of close friends and acquaintances, the small town is in reality performing a convenience service in providing for meetings of neighbors." Functions such as churches, meeting halls, eating places, and
drinking places help satisfy this demand. Within Tulare County's unincorporated places, nineteen percent of the functional units are of this type.

Finally, the ubiquity of the food store must be considered. In the study area nine percent of the functional units were food stores. Although common, many food stores were marginal in the sense that they only provided a portion of the total array of grocery items, such as milk products, bread, cigarettes, candy, wine, and beer, and did not offer the range of goods commonly found in the larger markets or supermarkets. Together the three groups of functions discussed thus far account for fifty-six percent of all functional units classified, and represent the main elements of economic and social attraction in the unincorporated places of Tulare County.

At this point, the similarity between frequency of occurrence of functions in Tulare County and in other areas can be noted. Comparisons are made in Table 3 where the ten most common functions in Tulare County are shown to be very similar to those identified in Southern Illinois and Iowa, and only slightly less similar to those for Wales and Snohomish County, Washington. One striking exception revealed by this comparison is that the miscellaneous used household furnishings function is found in Tulare
TABLE 3

Comparability of the Ten Most Frequently Occurring Functions in Tulare County and Other Areas*

<table>
<thead>
<tr>
<th>Function</th>
<th>Tulare</th>
<th>Iowa</th>
<th>Southern Illinois</th>
<th>Snohomish, Washington</th>
<th>Wales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline station</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Car repair</td>
<td>x</td>
<td>x</td>
<td>-</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Church</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Food store</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Drinking place</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Eating place</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Used miscellaneous</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Barber</td>
<td>-</td>
<td>-</td>
<td>x</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Primary school</td>
<td>-</td>
<td>-</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Meeting hall</td>
<td>x</td>
<td>x</td>
<td>-</td>
<td>-</td>
<td>x</td>
</tr>
</tbody>
</table>

*No order is to be implied from the Table, other than only the ten most frequently occurring functions were compared for each area.

County, but not in any of the other areas. This function is common throughout the San Joaquin Valley and appears primarily to supply the demand for low cost furnishings, appliances, and clothes for farm workers. Other differences in functional occurrence between the areas are products of (1) classifying procedures which are often a reflection of the biases of the individual researcher; (2) the failure to standardize functions, and (3) cultural differences between areas that express themselves in different functional mixes.

More significant to this paper are the correlations between functional structure and population, which will be discussed next.

Relations Between Population Size and Numbers of Establishments, Functions, and Functional Units

Inherent in Central Place Theory is a positive correlation between urban functional complexity and population size. This basic relationship is apparent to even the most casual observer. Although an apparent relationship exists, there are subsidiary questions that can be asked. First, to what degree is there a correlation between the three indices of settlement importance and population? Second, what effect does the nature of this relationship have on
the interpretation of classical central place concepts as threshold population, range of a good, and tributary areas? Third, have the smaller centers declined as low order suppliers of central goods? The following sections will deal with these and other questions within the framework of the first hypothesis; namely, that there exists a positive correlation between the population of a place and the number of establishments, functions, and functional units. Analysis is by correlation and regression, with population being the independent variable in each regression.

The Relationship Between Number of Establishments and Population

The general relationship between number of establishments and population is positive; the product moment correlation coefficient being .885. Regression of number of establishments and population reveals that wide variations in population are reflected by variations in the number of establishments, with the average increment for each 100 people being 1.9 establishments (Fig. 1). The range in number of establishments was from two for East Orosi and Elderwood to eighty-six for Pixley.

Although the correlation coefficient is positive and fairly high, there are a number of anomalies which must be
FIGURE 1  Number of Establishments and Population
considered. These anomalies are the places that fall outside one standard error of estimate. Six places fall outside, and represent seventeen percent of the places considered. These deviant cases can be placed into two groups: those that were over predicted and those that were under predicted.

Over-predicted Places

The former group includes not only those centers below the lower parameter line that are obviously deviant, but also smaller places that are over predicted and not below the standard error of estimate. These two sets of places are primarily rural suburbs; that is, places that house the labor force employed in agriculture, rather than centers primarily providing goods and services to a dispersed population. For example, in London over fifty percent of the labor force is employed directly as farm laborers. This pattern is repeated for other centers.

Another aspect of places with few establishments relative to the position of the regression line is their marginality in terms of the provision of central goods. The marginal central place concept may provide an explanation for so many over-predicted places; this concept has much in common with Christaller's concept of the auxiliary central place. A hypothetical case will serve
as an illustration of the applicability of this concept in explaining many of the smaller urban places.

Assume there exists a large number of hamlets, fewer villages, still fewer towns, and so on until the largest metropolitan center is reached. Here we have a classical hierarchical model of service centers providing goods and services to both resident and tributary populations, an arrangement that has often been 'found' in a variety of areas.\textsuperscript{12} The concept of marginality can be considered as a hypothesis. As applied to the Tulare County study area it would hold that while smaller places do provide central goods and services to their immediate tributary area and to their resident population, they nevertheless do not provide the full range and the total quantity of good theoretically expected from places of that size. Accordingly, residents of these places and their tributary areas must travel to higher order centers to acquire many lower order goods. Thus, many smaller centers do not fulfill their theoretical role as low order central places, and therefore two basic tenets of central place theory are challenged: (1) that there is "a constant range of any one central good, whatever the central place from which it is offered," and (2) that "distances moved by consumers to purchase ... goods and services should be minimized; i.e., goods are
purchased from the closest point." The marginal provision of a good in these places is exemplified by food (groceries), a good frequently cited as a lower order type. Theory states that consumers residing close to or living within a center offering groceries purchase their groceries from that center. However, in Tulare County the over-predicted places sell a rather small percentage of total groceries consumed by resident populations, even though they have grocery stores. For Goshen, with a population of over 1,100, only thirty-one percent of the resident population purchase the majority of their groceries in Goshen. The remainder travel over seven miles to Visalia, the most functionally complex place in the county, to purchase groceries. London, with a population of over 900, is greatly over predicted (Fig. 1); the percentage drops to seventeen. Again, the majority of people travel to a larger center, in this case Dinuba, over seven miles from London, to purchase their groceries.

The question that can now logically be asked is: What role do marginal central places perform? Their role is to provide a portion of the convenience goods demanded by the resident populations, by the dispersed populations in very close proximity to the place, and by the transient populations. This latter category is important for those
places located on the major north-south highway; e.g., Earlimart, Tipton, and Traver, all of which have establishments oriented to highway traffic.16

Another aspect of the establishment-population association in Tulare County is the characteristic of the regression line in comparison to regression lines for Iowa and southern Illinois. Both midwestern states have greater y-intercepts and steeper slopes:

- Iowa: \( y' = 9.60 + 6.6x \)
- Southern Illinois: \( y' = 5.49 + 3.8x \)
- Tulare County: \( y' = 1.86 + 2.9x \)

Tulare County has a much smaller y-intercept and flatter slope, indicating fewer establishments for equal size places by comparison with places in the two midwestern states. For example, a town in Iowa with a population of 1,000 would be expected to have seventy-six establishments, a southern Illinois town would have forty-three establishments, and a Tulare town only thirty-one establishments.

Two possible interpretations of these differences are made. First, that Tulare County consumers do not shop at the closest place where a good is available whereas consumers do in the other areas. Second, that establishments are larger on the average with fewer places supplying the same amount of goods provided by a greater number of establishments in the other areas. These interpretations
cannot be adequately tested with the data available in this study and are thus offered for future research.

Establishment deficiency is further exemplified when smaller places are considered separately. For Iowa a place with a very small population would be expected to have over nine establishments. Thomas believes the 9.6 in the expression "... may be interpreted as the number of establishments which are supported by the population residing in the trade area of a place when the population of the town is very small."17 If this is true, then the 1.86 figure for Tulare indicates that a small number of the dispersed population supports the establishments of small towns. This would especially be the case with those places that are marginal. To gain added insight into this question, sales data from the Census of Business for Retail Trade were examined (Table 4).

The first apparent finding revealed by this table was the dominance of the three largest incorporated cities over total retail trade in the county. While containing only twenty-five percent of the county's population, they command seventy-one percent of total retail sales. For some goods, such as apparel items, the figure is over eighty-five percent, and even for food sales it is fifty-six percent. The suggestion here is that only a very few
### TABLE 4

Percent of Total County Retail Sales by Business Group by City

<table>
<thead>
<tr>
<th>City and Population</th>
<th>All Establishments</th>
<th>Building Materials, Hardware, and Farm Equipment Dealers</th>
<th>General Merchandise Group Stores</th>
<th>Food Stores</th>
<th>Automotive Dealers</th>
<th>Gasoline Service Stations</th>
<th>Apparel and Accessory Dealers</th>
<th>Furniture, Furnishings, and Equipment Stores</th>
<th>Eating and Drinking Places</th>
<th>Drug Stores and Propriety Stores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visalia 25,000</td>
<td>39.0</td>
<td>35.7</td>
<td>69.4</td>
<td>27.6</td>
<td>49.2</td>
<td>27.0</td>
<td>52.2</td>
<td>41.3</td>
<td>30.4</td>
<td>43.4</td>
</tr>
<tr>
<td>Tulare 15,940</td>
<td>15.2</td>
<td>19.8</td>
<td>6.7</td>
<td>15.5</td>
<td>10.4</td>
<td>16.3</td>
<td>14.5</td>
<td>18.6</td>
<td>13.8</td>
<td>12.0</td>
</tr>
<tr>
<td>Porterville 9,260</td>
<td>16.8</td>
<td>13.3</td>
<td>12.4</td>
<td>12.9</td>
<td>23.8</td>
<td>15.0</td>
<td>18.9</td>
<td>16.2</td>
<td>16.8</td>
<td>23.0</td>
</tr>
<tr>
<td>Dinuba 7,840</td>
<td>5.5</td>
<td>3.2</td>
<td>2.9</td>
<td>7.8</td>
<td>5.4</td>
<td>6.4</td>
<td>6.1</td>
<td>9.4</td>
<td>4.7</td>
<td>6.5</td>
</tr>
<tr>
<td>Lindsay 5,600</td>
<td>4.3</td>
<td>2.0</td>
<td>D</td>
<td>5.1</td>
<td>5.3</td>
<td>2.5</td>
<td>D</td>
<td>4.4</td>
<td>3.3</td>
<td>D</td>
</tr>
<tr>
<td>Exeter 4,500</td>
<td>2.7</td>
<td>1.8</td>
<td>D</td>
<td>2.6</td>
<td>2.8</td>
<td>3.1</td>
<td>2.6</td>
<td>3.4</td>
<td>3.6</td>
<td>D</td>
</tr>
<tr>
<td>Farmersville 3,500</td>
<td>1.3</td>
<td>1.8</td>
<td>-</td>
<td>3.0</td>
<td>0.4</td>
<td>2.0</td>
<td>D</td>
<td>-</td>
<td>2.1</td>
<td>D</td>
</tr>
<tr>
<td>Woodlake 3,020</td>
<td>1.2</td>
<td>2.1</td>
<td>-</td>
<td>1.9</td>
<td>0.5</td>
<td>2.3</td>
<td>D</td>
<td>-</td>
<td>1.2</td>
<td>D</td>
</tr>
<tr>
<td>Three Largest</td>
<td>71.0</td>
<td>68.8</td>
<td>88.5</td>
<td>56.4</td>
<td>83.4</td>
<td>58.3</td>
<td>85.6</td>
<td>76.1</td>
<td>61.0</td>
<td>78.4</td>
</tr>
<tr>
<td>Remainder</td>
<td>14.0</td>
<td>20.3</td>
<td>6.5</td>
<td>23.6</td>
<td>2.1</td>
<td>25.2</td>
<td>1.7</td>
<td>6.5</td>
<td>23.9</td>
<td>5.9</td>
</tr>
</tbody>
</table>

(D) Withheld to avoid disclosure

places are really central places, and that the great
majority of places are marginal trade centers. One plaus-
ible explanation for this position is the degree of
mobility realized by use of private automobiles. When
people think of distance in terms of ten minutes rather
than ten miles, the real closeness of larger and function-
ally more inviting central places is put into clearer
spatial perspective. For instance, Visalia, in contrast to
many unincorporated places (where stores are often in poor
repair and offer only a limited range, even for convenience
goods) has new shopping centers, a recently modernized
central business district and all major governmental ser-
vices. These assets offer people attractions not available
in smaller places and thereby draw people to larger places
for even convenience goods.

Under-predicted Places

Representing the under prediction of establishments
are two extreme cases, Pixley and Orosi. Both towns have a
establishment total far above the regression line. Pixley
is under predicted by thirty-nine establishments, and
Orosi by twenty-six establishments (Fig. 1). Other less
notable cases are places above the regression line but
within the standard error of estimate. According to
theory, it is expected that they would attract persons from smaller less complex places, as well as from the dispersed population, to purchase a variety of goods since these places have a positive centrality in terms of an establishment/population relationship. Even though this would seem likely, results from a survey of households in Pixley reveal that consumer purchasing patterns are more complex than is denoted by simply numbers of establishments. It was discovered that twenty-two percent of those interviewed do not purchase groceries in Pixley, but travel fifteen miles to either of two larger centers--Tulare to the north, or Delano to the south. Only for gasoline sales was Pixley completely dominant; over ninety-five percent of those interviewed purchased their gasoline in Pixley. See Table 5 for a tabulation of responses to the questionnaire and Appendix C for survey methodology.

The Relationship Between Number of Functions and Population

The range of functions is from three in East Orosi, Elderwood, and Tonyville, to forty-nine in Orosi. The number of functions is less than for the number of establishments because a number of establishments can perform the same function in a given town; e.g. there was always
TABLE 5

Place of Purchase for Selected Goods in Pixley and Tipton, Tulare County

<table>
<thead>
<tr>
<th>Good</th>
<th>Pixley</th>
<th></th>
<th>Tipton</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Observations</td>
<td>Place of Purchase</td>
<td>Number of Observations</td>
<td>Place of Purchase</td>
</tr>
<tr>
<td></td>
<td>Town of Residence</td>
<td>Away</td>
<td>Town of Residence</td>
<td>Away</td>
</tr>
<tr>
<td>Groceries</td>
<td>36</td>
<td>27</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>Gasoline</td>
<td>30</td>
<td>28</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>Car repair</td>
<td>25</td>
<td>20</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Food and drink</td>
<td>21</td>
<td>17</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Movies</td>
<td>15</td>
<td>0</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Male clothing</td>
<td>31</td>
<td>1</td>
<td>30</td>
<td>16</td>
</tr>
<tr>
<td>Female clothing</td>
<td>28</td>
<td>2</td>
<td>26</td>
<td>13</td>
</tr>
</tbody>
</table>

Source: Collected by the author, 1967. See Appendix C for methodology.
more than one gasoline station, food store, or church in the larger places, while frequently smaller places had only one establishment representing each function located in the town.

There is a positive linear association between number of functions and population, the product moment correlation coefficient being .830 (Fig. 2). This correlation is less than for other study areas (Table 6). Also, the linear association is different from that found in Iowa and southern Illinois areas where curvilinear relationships were identified. In both midwestern areas the number of functions increased at decreasing rates while in Tulare County there exists a positive relationship but with a substantial variance around the upper end of the regression line (Fig. 2), which cannot be clearly identified as a curvilinear relationship. Fully ten places lie outside the standard error of estimate.

Such wide variance around the regression line is again indicative of the two basic types of small urban places in Tulare County; namely, places with a high degree of nodal-ity importance, and places that are marginal. If we assume that the regression line closely approximates a functional threshold for a functional mix in Tulare County, the six places above the standard error of estimate are more viable
FIGURE 2  Number of Functions and Population

N = 35  
\(r = .830\)
\(r^2 = .699\)
\(\bar{X} \text{ population per function} = 44.8\)
TABLE 6

Correlations of Population and Selected Variables for Tulare County and Other Areas

<table>
<thead>
<tr>
<th>Area</th>
<th>Establishments</th>
<th>Functions</th>
<th>Functional Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tulare</td>
<td>.885</td>
<td>.830</td>
<td>.872</td>
</tr>
<tr>
<td>Iowa</td>
<td>.96</td>
<td>.86</td>
<td>.95</td>
</tr>
<tr>
<td>Southern Illinois</td>
<td>.929</td>
<td>.892</td>
<td>.934</td>
</tr>
<tr>
<td>Snohomish, Washington</td>
<td></td>
<td>.750</td>
<td>-</td>
</tr>
<tr>
<td>Wales</td>
<td>.88</td>
<td>.87</td>
<td>.95</td>
</tr>
</tbody>
</table>

central places than those below the standard error of estimate. Further, observation of these places in the field revealed that there are obvious differences in the quality of buildings and general upkeep between settlements that are over predicted and settlements that are under predicted. This is evident in places like Orosi, Strathmore, and Terra Bella, places that have well kept, prosperous looking business areas. In contrast, London, Cutler, and Elbow, are places that have many businesses in poor repair, numerous vacant establishments, and unpaved streets. They convey generally a blighted appearance. As such, these places are not attractive to shoppers. Actual consumer behavior appears to be much more complex than implied by functional complexity population relationships.

The Relationship Between Number of Functional Units and Population

As expected, there is a positive linear association between number of functional units and population. The product moment correlation coefficient is .872 (Fig. 3). The range of functional units is large, varying from three in East Orosi and Tonyville to 110 in Pixley. On the average there is a 3.6 increase in functional units for
FIGURE 3  Number of Functional Units and Population

- Pixley
- Orosi
- Strathmore: \( y = 3.9x + 24.5 \)
- Cutler
- Earlmar
- London

35% confidence band for the regression line

- Population per functional unit: 25.1

- \( N = 35 \)
- \( r = 0.872 \)
- \( r^2 = 0.760 \)
each 100 persons in a center. As was the case with functions and establishments, there are a number of deviant towns outside the standard error of estimate. The explanation for these deviant places is similar to the explanation presented above.

On the basis of the preceding analyses, the hypothesis that a positive correlation between the population size of a place and number of establishments, functions, and functional units is accepted for Tulare County. However, it has also been shown there is little interpretative value in these correlations.

The Hierarchy Question

With the limited available data it would be presumptuous to extrapolate a hierarchy. Such is the case because no clear lines divide the centers into discrete groups in terms of either population or functional complexity. As was described by Vining, "like pool, pond, and lake, the terms hamlet, village, and town are convenient modes of expression, but they do not refer to structurally distinct entities." Refer to Figure 4 for a rank-size distribution for each variable. It is organizationally convenient to place the centers in a hierarchy, but this begs the question as to whether a functional hierarchy
actually exists. To arbitrarily form a hierarchy, and then show that there is greater variance among the different groups than within the groups can be accomplished with Tulare County data, but would tell us nothing that cannot be derived from the correlations already performed. Therein, it is clearly indicated that functional complexity is generally associated with population. Further, arbitrary designation of a hierarchy would tend to deceive the reader into believing that such a hierarchy exists, and that its structure is utilized by consumers in a hierarchical manner.

It has been suggested above that the assumptions on which hierarchies are formulated (that people travel to the nearest center offering a good and that there is an equal range for the same good when offered from different centers) may not be valid for Tulare County. It is suggested that spatial organization and consumer behavior are much more complex than has been assumed in previous research. Moreover, it is suggested that to explain the size and spacing of centers realistically it is necessary to question consumers to find out how they perceive and respond to offering of central goods and services at various locations. It is possible that there exists no hierarchical structure in terms of purchasing behavior, and
that customer behavior is spatially much more flexible than
is reflected by strictly functional oriented studies. \(^{20}\)
In sum, however, the hierarchy question cannot be resolved
on the basis of data collected for this study.

The Existence of Universal Threshold Sizes
The threshold, or minimum population required to
support a given function, has been used in conjunction
with the range of a good to identify central place hier-
archies. \(^{21}\) The hypothesis as formulated here was designed
to discover if there were universal threshold sizes for
first entry of different functions in Tulare County, and to
also see what comparability there was with findings from
studies conducted in other areas.

First, the ten most common functions were identified
(Table 3). Second, scatter diagrams were constructed with
unincorporated place population on the X axis, and number
of units of each function on the Y axis. The objective
was to examine the relation between population and each
function (Fig. 5). Each diagram has thirty-five points,
one for each of the thirty-five places. Researchers in the
past have taken such data, used least square techniques,
and have extrapolated growth curves by using the expo-
nential growth formula \(X = a(b^Y)\), where \(a\) and \(b\) are the
FIGURE 5 Relations Between Selected Functions and Population
FIGURE 5 Continued
parameters to be estimated. They were then supposedly able to estimate the threshold population of a center for the first store of a function to appear when \( Y=1 \). However, the great variability of Tulare County data preclude any meaningful extrapolation of threshold populations (Fig. 4), as explained below.

Seemingly, only a few functions; e.g., churches, food stores, and barber shops, express identifiable relationships. Woodville, with 880 people, and Cutler, with 2,240, a difference of over 1,300, each have six churches. Orosi, with 1,720 people, Terra Bella with 1,000, and Yettem with 190, each have three food stores. Such wide variations where there appear to be relationships between population and functions suggest that variables other than the qualitative existence of a function in a community are more important in explaining the existence of that function. Moreover, functions such as eating and drinking places, used miscellaneous, meeting halls, and beauticians, exhibit no perceptible relationship, and cast doubts on the whole concept of thresholds as currently operationalized. Are there threshold populations for these functions, when one place, Monson, with 120 people has no gasoline station, and Cotton Center with 140 people has three? It is possible
to average the data, make logarithmic transformations, establish confidence limits, plot growth curves, etc., and arrive at threshold populations, but would this result in an accurate evaluation of what actually exists? The answer must be negative, at least until other variables such as the impact of transient consumers can be worked into the threshold model. Thus, the hypothesis of the existence of universal threshold sizes is not accepted for Tulare County.

Functional Growth Ratios

Number of functions were regressed on population by standard least square techniques (Fig. 2). As previously stated, there is a positive linear association between these variables. However, there is not a constant ratio between the number of functions and population of places of varying size. On the contrary, there is wide variation around the least square line. Examples are Ivanhoe, with a population of 1,760 and thirty-one functions (ratio of 58/1), Orosi with a population of 1,720 and forty-nine functions (ratio of 35/1), Traver with a population of 300 has seventeen functions (ratio of 18/1), and Cameron Creek Colony with 340 people has only four functions (ratio of 85/1). Similar patterns of variation were discovered in
the number of functional units.

These findings again signify that there are variables other than population size influencing the functional population growth ratio. Suggested variables are transient trade, the mobility factor as a function of income and highspeed roads, distance to larger places, historical inertia, and consumer psychology. The findings produced here support Kenyon, who found "... significant differentiation of central place size-class by functional structure." The hypothesis of consistent functional growth ratios is thus not accepted for Tulare County.
FOOTNOTES


2. The basic form establishing a standard for the minimum population and/or establishment number was taken from Trewartha, Glen T., "The unincorporated Hamlet: One Element of the American Settlement Fabric," *Annals of the Association of American Geographers*, Vol. 33, 1943, pp. 31-81.

3. Berry and Garrison, *op. cit.*, Footnote 3, Chapter I; Thomas, *op. cit.*, Footnote 3, Chapter I; and Stafford, *op. cit.*, Footnote 3, Chapter I.


7. Ibid., p. 12.


10. For Goshen twenty-three percent were employed as farm laborers, Tulare County Planning Commission, *A Summary of the Goshen Community Survey, 1964*; and for Cutler forty percent were employed as farm laborers, Tulare County Planning Commission, *A Summary of the Cutler Community Survey, 1959*. Unfortunately data are available for only these three places.
11. Christaller, *op. cit.*, Footnote 1, Chapter II, p. 17. Christaller defines auxiliary central places as smaller places which usually have no central importance and which exercise fewer central functions than higher order central places.

12. Berry, *op. cit.*, Footnote 32, Chapter II. Hierarchies were identified in Iowa and South Dakota.

13. Getis, *op. cit.*, Footnote 6, Chapter II.


16. Gasoline stations and eating places easily accessible by off ramps from Highway 99, the major north-south highway in the county.


19. Vining, *op. cit.*, Footnote 31, Chapter II.


CHAPTER IV

FINDINGS AND CONCLUSIONS

Findings with Theoretical Significance

The major findings of this thesis may be summarized as follows:

1. There is a positive association between population of a place and numbers of establishments, functions, and functional units in Tulare County. However, regression analysis revealed that the variation is so great between population and each of the variables that one can extract little of interpretative value from the correlations.

2. There was little evidence to support the generalization that unincorporated places are grouped in a hierarchy by functional complexity or by population.

3. The development of central place functions does not appear to be a function of threshold population. Variability in the scatter
diagrams in Figure 4 make untenable the notion of universal threshold size.

4. The number of functions found in a central place does not increase proportionally to increases in population size. Again, extreme variability within the scatter diagrams between central place population and functional complexity suggests that other factors are important in affecting the provision of central functions.

The hypotheses examined in this study have in three out of four cases proven invalid as explanatory tools for identifying meaningful relationships between functional complexity and size of an urban place in Tulare County. Other approaches are necessary to provide a clearer understanding of this problem. For instance, the extensive use of questionnaires canvassing both consumers and establishment owners would reveal patterns of actual movement, and the degree to which places have an economic dominance over a population or area.

Conclusion

This study focused on the size-functional complexity relationship of small unincorporated places in Tulare County, California. Results provide us with increased
knowledge of the functioning of urban places in Tulare County, and additionally, as outlined below, give rise to questions regarding some tenets of central place theory.

First, it would appear that consumers do not always, nor even most frequently, travel to the nearest place offering a desired good. This certainly applies to shopping type goods, but also in varying degrees to convenience type goods. Evidence for this was found at two levels in the study: (1) from the results of available consumer surveys, and (2) from the diverse character of the relationships identified between different functions and population size of places which denotes that there is no strong correlation between these two variables that can be readily translated into threshold populations for various types of functions. Gollledge, et al., discovered a similar pattern in Iowa where people "... do not always purchase goods and services at the closest occurrence of these functions."¹

Second, there is not a constant range of any one central good from various centers. It appears, however, that the range of a good can be correlated with the size of the place offering the good. Visalia, the largest community in the county, completely dominates the provision of grocery items to its resident population, and also
attracts consumers from surrounding communities; e.g., Goshen, while smaller places may retain barely half their potential resident demand for groceries. This pattern may be repeated in varying degrees for all goods and services.

At the time (1967) the study was undertaken the concepts of threshold, range of a good, and hierarchy were not questioned, primarily because of their wide acceptance in the literature. Questioning here of these concepts developed when the assumptions relating to human behavior on which these concepts are based did not apply in the study area, i.e., there is "a constant range of any one central good, whatever the central place from which it is offered," and that "distances moved by consumers to purchase . . . goods and services should be minimized; i.e., goods are purchased from the closest point."²

The invalidity of these two assumptions in Tulare County casts doubt on spatially efficient definition for a range of a good, since large numbers of consumers fail to function within a framework that minimizes distance of travel to purchase goods and/or services. The logical conclusion is that consumer behavior is not as simple, or concise, as maps delimiting trade areas and hierarchies would lead us to believe, especially in areas that are serviced by good road networks, such as Tulare County.
Perhaps human behavior should be viewed from a different perspective. Generally, the assumption has been that man is a rational being who optimizes, or attempts to optimize, in his decision making. Economics is especially fond of using the concept of the rational economic man who knows all, and always acts optimally. However, reality differs in that man fails to optimize. Each individual decision, as Eliot Hurst and McDaniel observe, is a solution that is neither optimal or detrimental, but satisfactory "... within the learnt abilities of the individual."\(^3\) Additionally,

since no man can possibly be aware of all alternatives when we come to make one economic decision, and since we do not know the final outcome of our actions, ... we do not try to optimize but we satisfice. Thus we attempt to find a line of action that is satisfactory, and that we adopt it without necessarily being concerned about whether or not there may be a better course of action.\(^4\)

If we then view man's behavior as not trying to optimize but to satisfice, discord in economic space starts to be more meaningfully sorted out. This is not to say that deterministic models utilizing economic man have no place, but rather that we realize they do not explain reality completely. They only provide a base for which we can measure and evaluate the effects of man's action.
As stated in the Introduction, central place theory contains many aspects of normative theory. Unfortunately, central place concepts have been accepted as factual theory only, rather than primarily a model based on an optimizing consumer. This criticism applies also to much of this study and explains in part why most of the rather rigid hypotheses presented here were rejected. If the future of central place theory is to provide a factual theory and not a normative theory, then possibly meaningful research dealing with the operationalization of central place concepts such as centrality, range(s) of a good, and threshold can be realized.
FOOTNOTES


2. Getis, op. cit., Footnote 6, Chapter II.


4. Ibid.
BIBLIOGRAPHY


APPENDIX A

Glossary

Central good: Goods and services offered at a central place.

Centrality: The relative importance of a place with regard to the surrounding area; the degree to which a town exercises central functions.

Central place: An urban place providing goods and services to a surrounding tributary area.

Establishment: The physical manifestation of an activity providing goods or services; the building in which an activity is performed.

Function: The activity or activities performed in an establishment.

Functional complexity: The economic, social, and cultural makeup of an urban place.

Functional Unit: Each occurrence of a function.

Hierarchy: The grouping of urban places into discreet classes based on functional complexity and/or consumer behavior.

Partial theory: A theory dealing with a portion of the space economy, e.g., Christaller's central place theory.

Range of a good: The distance from a central place from which persons travel to the center to purchase a good or utilize a service.

Rural suburb: A nucleated settlement in a rural area that primarily houses persons employed in agriculture or related industries.

Space economy: The total interaction of economics in time and space.
Threshold: The minimum population size of a nucleated settlement required for the support of a central function.

Tributary area: An urban place's cumulative area of socio-economic dominance.
### APPENDIX B

#### THE FUNCTIONAL BASES BY CLASS FOR UNINCORPORATED PLACES IN TULARE COUNTY*

<table>
<thead>
<tr>
<th>Functions</th>
<th>Fiddy</th>
<th>Grant</th>
<th>Eastlake</th>
<th>Strathearn</th>
<th>Algoma</th>
<th>Tulare</th>
<th>Terra Bella</th>
<th>Tipton</th>
<th>Oakesville</th>
<th>Alpaugh</th>
<th>Richgrove</th>
<th>Tulare Center</th>
<th>Lemon Cove</th>
<th>Porterville</th>
<th>Mitchell Corner</th>
<th>Furnace</th>
<th>Holzwarth</th>
<th>East Oak</th>
<th>East Dale</th>
<th>East Stockton</th>
<th>East Tesla</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline station</td>
<td>15</td>
<td>7</td>
<td>9</td>
<td>7</td>
<td>6</td>
<td>9</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Car repair</td>
<td>17</td>
<td>10</td>
<td>9</td>
<td>7</td>
<td>8</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Church</td>
<td>8</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Food store</td>
<td>6</td>
<td>3</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Drinking place</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Eating place</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Used miscellaneous</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Barber</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Primary school</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Meeting hall</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Newsagent</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Post office</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Feed and farm supplies</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Miscellaneous repair</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Cleaner and laundry</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hardware</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Fire station</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Variety store</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Real estate</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Auto parts</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Motel</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lumber sales</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Used car sales</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Wrecker</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Liquor</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Library</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Locker</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Insurance</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Doctor</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

*Only the thirty most common occurring functions are listed.

Source: Compiled by the author, 1967.
APPENDIX C

Survey Methodology

During the Spring of 1967 a survey was conducted in Pixley, Tipton, Ducor, Terra Bella, and Richgrove by members of a Field Geography class from San Fernando Valley State College. A portion of the survey consisted of a questionnaire designed in part to identify where a variety of goods and services were obtained by the people residing in the above named towns.

The procedure was to question the occupant of every third residential unit. Because of limited time less than ten percent of the residential units were surveyed. Only for Tipton and Pixley were there enough responses to warrant inclusion of the results.

On the following pages is the questionnaire utilized.
To be filled in by the Interviewer

Name of Interviewer: __________________ Date: ________

1. Location of the Interview: Town________________________
   Address________________________
   Nearest intersection________________________

2. Approximate age of Interviewee: Under 18__; 18-39__; 40-59__; 60--
   Sex:________

3. Dwelling type: Single____; Multiple____

4. Approximate size of lot:________________________________

5. Qualitative statements of dwelling unit:
   a. Yard maintenance________________________
   b. Window styling________________________
   c. Roofing material________________________
   d. Condition of porch______________________
   e. Your description of the dwelling unit:

6. Description of Interview and Interviewee:
SCHEDULE
Questionnaire

Town Name___________________________________________________________

Introduction
Provide your name; College's name; that you are involved in doing an economic survey of the smaller communities in Tulare County; and that the information given to you will be made available to the Tulare County Planning Commission.

1. Dwelling and Rent
   a. Dwelling owned_____; rented_____
   b. Number of occupied dwellings on the lot_____
   c. Number of rooms_____
   d. Number of persons living in the dwelling_____; in the dwellings to either side_____; on the same lot_____

2. Residence (Head of household only)
   a. Period of years in present dwelling 0-4_____; 5-9_____; 10-19_____; 20-_____
   b. Period of years in this town 0-4_____; 5-9_____; 10-19_____; 20-_____
   c. Origin: this town_____; Tulare Co._____; San Joaquin V._____; Other_____
   d. Reason for moving to this town: employment_____; family_____; housing_____; other_________________

3. Transportation
   a. Number of vehicles owned 0_____; 1_____; 2_____; 3_____; 4+_____

4. Employment: professional_____; self employed_____; managerial_____; skilled worker_____; operative_____; farm labor_____; unskilled_____; retired_____; other_________________
   b. Location of work: town area_____; other town (name)___________ Tulare Co. rural_____; other___________
   c. Distance to work: local_____; 10-20_____; 21-30_____; 31-_____
   d. Means of travel: drive_____; car pool_____; walk_____.

Services. Place of primary purchase; name of town.

<table>
<thead>
<tr>
<th>Category</th>
<th>Place of Purchase</th>
<th>Name of Town</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groceries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>perishables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>non-perishables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beauty or barber</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>gas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>repair</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repairs-TV &amp; appliances</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal care items</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food and drink</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auto-laundry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cleaner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicine-not prescribed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicine-prescribed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical service</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Movies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clothing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>male</td>
<td></td>
<td></td>
</tr>
<tr>
<td>female</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Church</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>