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ABSTRACT

SELECTED SPATIAL IMPACTS OF CONSUMER BEHAVIOR IN THE RETAIL SERVICE AREA OF GREATER AALBORG, DENMARK

by Charles F. Hess

The purpose of this study was to describe and analyze the spatial impacts and relations resulting from the decision-making processes of consumers on the retail service area of a major central place. The tributary area of Greater Aalborg, the regional capital of Northern Jutland, was used as an example.

The greater part of the information forming the basis for the results presented in this study was derived from a sample consisting of 547 questionnaires distributed among households residing in the 44 township retail service area of Greater Aalborg. This non-random sample proved useful in supplying data otherwise not available from conventional sources.

Twenty consumer goods and services such as ladies' apparel, men's clothing, dental and legal services were selected to indicate the magnitude of purchasing done in Greater Aalborg by the households sampled. It was found that the drawing power of this central place and the frequency of travel to it diminish rapidly with an increase in time-distance which indicated a division of the retail service into two subregions, viz., the proximal and peripheral

retail service areas. The areal extent of the former is relatively small and its outer limits can be reached from Greater Aalborg in approximately 15 minutes by automobile or 30 minutes by bus.

Subsequently, it was shown that the occupation of the head of the household influences his family's behavior as a consumer unit. The proportion of goods and services purchased in Greater Aalborg was greater for households with a higher social status as compared to those with a lower social standing.

A multiple correlation and regression analysis was used to test hypothesized statements about factors which were assumed to determine for each household the proportion of 20 goods and services obtained in Greater Aalborg. The results indicated the following are the most important in explaining the variance observed in the proportion of goods and services purchased in Greater Aalborg: (1) a household's time-distance to this central place; (2) its choice of this city as the preferred service center; and (3) the consumer unit's frequency of travel to Greater Aalborg. The occupation of the head of the household because of its intercorrelation with other variables, the ownership of a motor vehicle, the place of employment of the head of the household, the type of population node in which the household resided, and the straightline distance of the consumer unit to the nearest major central place did not add greatly to the explanation of the observed variations.

Charles F. Hess

In summary, the findings suggest that more studies of this nature are needed to illuminate this behavioral facet of geography. Such studies can prove, modify, or disprove existing theories as well as open new avenues of research.

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IN THE RETAIL SERVICE AREA OF
GREATER AALBORG, DENMARK

By

Charles Frank Hess

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CHAPTER I

INTRODUCTION AND CONCEPTUAL FRAMEWORK

Introduction

The behavior of consumers is studied by social and behavioral scientists in reference to their specialized interests. Traditionally, geographers have achieved this indirectly by analyzing and theorizing about central places and their tributary areas without paying much attention to the spatial impacts resulting from the behavior of users of goods and services. A dual relationship exists between a central place and the people residing in its tributary area. The habits of these residents influence the kind and number of retail and service establishments in a central place and vice versa the establishments have a bearing on the actions leading to purchases by consumers.

This study is an attempt to describe and analyze the spatial relations between a central place and the households in its tributary area.¹ To do this, both original data and information from already collected source materials were used. The original data were derived from a sample composed of some of the households located in the area surrounding the central place chosen for this study,

¹A household is the basic consumer unit used in this study.

namely Aalborg, the regional capital of Northern Jutland, Denmark.

The data obtained were used to examine (1) the areal extent and the varying consumer purchase intensities for a number of goods, (2) the manner in which the occupation of the head of a household affects spatial aspects of consumer behavior, and (3) hypothesized statements reflecting the impact of consumer behavior which will be stated after the conceptual framework has been established.²

The techniques used to accomplish these three objectives were (1) cartographic presentation and evaluation of frequency distributions of various data representing and related to the purchases of goods, and (2) a multiple correlation and regression analysis testing the validity of the hypothesized statements. The results obtained by these techniques provide the bases for explaining spatial aspects of consumer behavior in the retail service area of Greater Aalborg. To set the stage for geographic interpretation of the areal impacts of consumer behavior, a conceptual framework follows.

Consumption

Consumption is the use of goods that satisfy human desires.³

²Consumer purchase intensity refers to the degree to which a member of a household or a household in a civil division obtains goods from a central place.

A "good" refers to a commodity or service offered by the operators of a retail and/or service establishment in a central place.

³John W. Alexander, Economic Geography (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1963), p. 6.

It is the most diffused and widespread economic activity of mankind. In general, the economic geographer emphasizes the areal relationships of the production of goods rather than their consumption. Alexander states two reasons for this: (1) the already stated geographic spread of consumers; and (2) the lack of sufficient scientifically useful information about consumers.⁴ This points out the need to obtain facts about the behavior of consumers which are applicable to geographic analysis and may aid in the development of theories. The concepts presented here are based on the findings of economists, social-psychologists, and geographers.

Economic Points of View

The traditional economic view of the consumption of goods is the theory of maximization of utility.⁵ Economists using this normative approach are primarily concerned with how consumers should act on the basis of a theoretical model and not in the manner in which they really act. Thus, it is assumed that man is a rational economic being, and can only survive in a competitive world by maximizing the utility of goods.⁶ In this type of a setting, consumers

⁴Ibid., p. 28.

⁵David L. Huff, "Toward a General Theory of Consumer Travel Behavior" (unpublished Ph.D. dissertation, University of Washington, 1959), p. 5.

⁶Herbert A. Simon, "Theories of Decision-Making in Economics and Behavioral Science," American Economic Review, Vol. 49, 1959, p. 254.

are supposed to attain maximum utility or satisfaction with the least amount of expenditure of effort, time, and money. The latter can be measured but the former is a factor of the socio-psychological milieu surrounding the consumer and is difficult to quantify.⁷

Simon proposes that if a consumer would always obtain maximum utility he has to possess perfect knowledge of his milieu as well as perfect predictive abilities to take care of uncertainties. This is not the case in the real world, and he continues by stating:

Broadening the definition of rationality to encompass goal conflict and uncertainty made it hard to ignore the distinction between the objective environment in which the economic actor "really" lives and the subjective environment that he perceives and to which he responds. When this distinction is made, we can no longer predict his behavior--even if he behaves rationally--from the characteristics of the objective environment; we also need to know something about his perceptual and cognitive processes.⁸

Similarly, but in a more general vein, Katona, while making a case for economists to use findings of the disciplines dealing with human behavior, writes:

It is necessary, but not enough to know about the objective circumstances in which people behave differently. People's attitudes, motives, and frames of reference shape their perception of the environment as well as their behavior. In order to understand economic processes, as well as other manifestations of behavior, subjective variables must also be studied.⁹

⁷Huff, loc. cit., p. 41.

⁸Simon, loc. cit., p. 256.

⁹George Katona, Psychological Analysis of Economic Behavior (New York: McGraw-Hill, 1951), p. 3.

Although the consumer may want to maximize utility and can do so when the choices to be made are uncomplicated, he can hardly attain maximum utility when matters are complicated. The action of a consumer to obtain a good originates from motivation that such an action will bring him closer to his self-image which is always changing. Before engaging in an action leading to the obtaining of a good, a consumer has to make a decision which is the selection of one specific action from a gamut of alternatives.¹⁰

The Decision-Making Process

Figure 1 shows the decision-making process in general. The components of this process are: (1) the total environment which consists of physical and man-made phenomena; (2) the perception of this environment based on an individual's experiences in the past; (3) the perceived information is fed into the decision-maker whose basis is also experience and who (a) tends to predict the future based on a possible course of action and (b) more or less simultaneously evaluates this in relation to his self-image; and (4) a decision is made leading to a course of action.¹¹

¹⁰Irvin D. J. Bross, Design for Decision (New York: The Macmillan Co., 1953), p. 1.

¹¹Ibid., pp. 28-29.

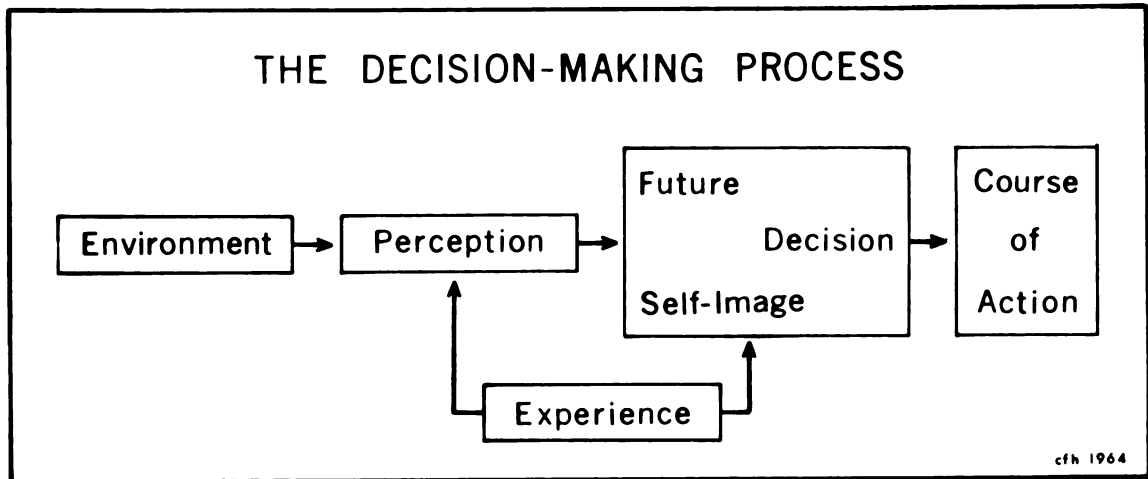


Figure 1

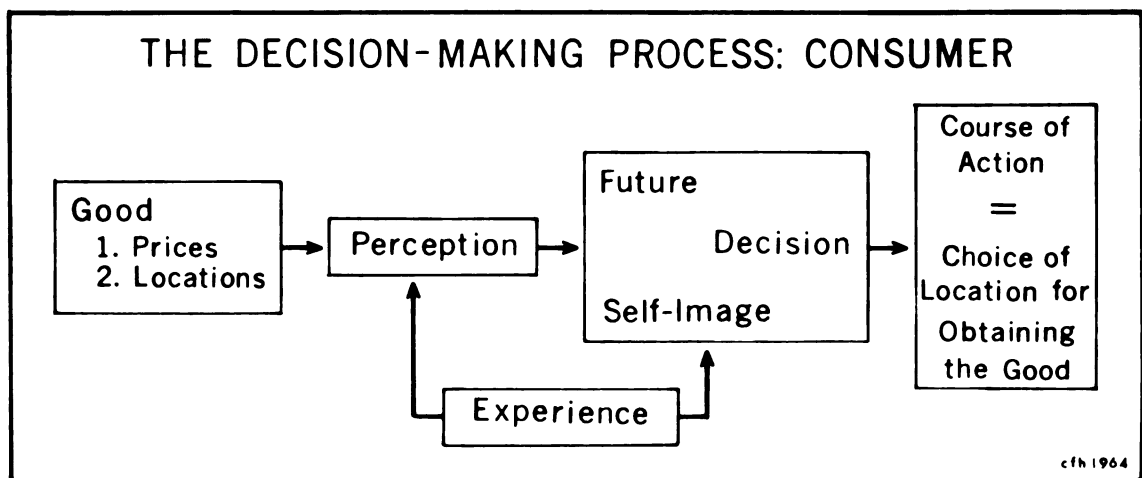


Figure 2

This diagrammatic presentation and description of the decision-making process brings again to the fore the fallibility of assuming that man can be rational, although many men think they are. In the diagram, it is supposed that the total environment can be perceived at a given time and place. This is not the case.

Whatever is perceived may be quite different from reality. As

Simon states:

The decision-maker's model of the world encompasses only a minute fraction of all the relevant characteristics of the real environment, and his inferences extract only a minute fraction of all the information that is present¹²

Moreover, experience is a limiting factor in total perception because no one knows everything. Therefore, although man may be rational in his decision-making process, he only has a limited amount of data available to make decisions. Similarly, experience is a limiting factor in prediction and evaluation. And again, maximization of utility becomes an unattainable goal.

A simplified model of consumer decision-making is presented in Fig. 2. The flow of the information is the same as in the first diagram. The difference is that an identical good offered at various prices and at various locations has replaced the environment.

¹²Simon, loc. cit., p. 272.

Space and Time

At this point, it should be stated that this mental process mentioned above has spatial as well as temporal attributes, because it occurs at a specific place and time. By omitting purchases made on impulse and assuming that a decision for a course of action leading to the acquisition of a good is made at the residence of a consumer, then this kind of deliberation of the latter involves two locations, viz., (1) the place of residence, and (2) the location of an establishment offering a desired good. Thus, ideally a consumer in his decision-making process selects a location for obtaining a good which will minimize his expenditure of effort, time, and money, and according to his judgment will afford him the greatest degree of satisfaction.

Types of Decisions and the Selection of Goods Used in This Study

Being concerned with the locations where consumers purchase goods, a selection of goods obtainable in various locations has to be made. This can be done on the basis of classifying decision processes. Here, the stress will be on goods for which consumers usually deliberate before deciding what and where to obtain them. Simon refers to this as a "nonprogrammed" decision and Katona calls this a "genuine" decision in contrast to a "habitual" decision, because the

former is only made from time to time.^{13, 14} In this study the emphasis is on consumer goods and services such as ladies' apparel, radios, motor vehicles and dental service as opposed to staples such as groceries, bread and vegetables, because to acquire the former, consumers engage in a nonprogrammed decision-making process.

Central Places and the Obtaining of Consumer Goods

The majority of consumer goods can be acquired normally in population nuclei having establishments offering such goods. These population nodes are henceforth referred to as central places. Aalborg, the major central place used in this study, is conceived as a point on a plane, its tributary area being the plane. Not only for this reason is Aalborg's internal geographical variation omitted, but also because it is assumed that this city is considered as an entity by the households in its environs.

Individuals patronize a large central place for various reasons. A major population node like Aalborg contains a greater number of establishments than other population nuclei within its tributary area.

¹³Herbert A. Simon, "The Role of Expectations in an Adaptive or Behavioristic Model," Expectations, Uncertainty, and Business Behavior, ed. Mary Jean Bowman (New York: Social Science Research Council, 1958), p. 49.

¹⁴Katona, loc. cit., p. 49.

Thus it affords a greater selection of establishments and hence goods for shopping purposes. The Danish consumer views this as greater competition, not so much in regard to prices as to the variety of goods available from which to chose.¹⁵ This means that a consumer can shop around until he finds the exact item which, in his estimation, will provide him with the greatest satisfaction in the future.

Another advantage of shopping in a large central place, at least for part of the consumers, is anonymity. At times, a consumer, desiring to acquire an item and shopping for this in a small central place--in which he resides or one close to his residence--may be forced indirectly to purchase a good, even though it may not totally satisfy him. Such purchases are made because the consumer does not wish to offend the sales person, who, in this case, may be acquainted with the customer. Subconsciously, the buyer may fear the possibility of real or imagined gossip with subsequent damage to his social relations within his home community. Obviously, in a sizable central place, this does not need to be the case; because the out-of-town customer is usually not known by name to the sales person.¹⁶

¹⁵In general, Danish retail prices are regulated by the manufacturer or the importer of a commodity. Thus good A costing x Danish crowns will carry identical price tags at all retail establishments offering this good.

¹⁶The factor of anonymity was brought to the fore during an interview with Mr. J. Nielsen, Circulation Manager of the Aalborg Stiftstidende, a major Aalborg newspaper, November 17, 1961.

A further consideration is that such trips to Greater Aalborg may be combined with accomplishing additional goals such as calling on relatives and/or friends, selling or buying livestock and other agriculturally associated items, visiting a medical and/or other professional service establishment, attending a movie, play, or symphonic concert. These are some of the stimuli that make people, within a retail service area, decide to travel to the major regional population node.

The distance between the location of a residence of a consumer and the location of the establishment or the central place chosen for obtaining a good has to be covered by some type of transportation. It also involves decision-making.

In summary, the decision-making process of man in relation to consumer behavior results in certain spatial patterns. The hypothesized statements and data presented in this study shed light on the nature of some of these patterns.

The Hypothesis

The hypothesis, as presented here, measures the relationships between the use made of a central place, Aalborg, by consumers in its tributary area and selected attributes of these consumers. The data obtained from the sample and other sources were applied to the following hypothesized statements:

The variations in the proportions of a selected group of goods obtained in a specific central place is a function of

- (1) the occupation of the head of the household;
- (2) the distance in minutes from the place of residence to the central place;
- (3) ownership of an automotive vehicle;
- (4) the type of population node in which a household is located;
- (5) the location of the place of employment of a household's head;
- (6) the frequency of trips to the central place by a household's purchaser of goods;
- (7) the central place chosen by a household's members as its preferred service center; and
- (8) the straightline distance from the household's residence to the nearest major central place.

Summary

A spatial examination of these statements will be developed in the five chapters which follow. Chapter II describes the sampling technique and general characteristics of the sample as well as of the region where the study took place. The areal variations of the consumer purchase intensities and associated spatial phenomena are discussed in Chapter III. Chapter IV covers the relationship between

occupations of heads of households and spatial characteristics of consumer behavior. Descriptions of the variables used in the hypothesized statements and the results of the multiple correlation and regression analysis are presented in Chapter V. Chapter VI summarizes the findings.

Thus, this study samples and analyzes the varying geographical relationships of consumer purchasing behavior to a specific regional node. The findings expressed as generalizations may be applicable and useful to investigations of other regions served by a central place.

CHAPTER II

CHARACTERISTICS OF THE SAMPLE AND THE GREATER AALBORG REGION

The Sampling Technique

Aalborg and its tributary area were selected because it was felt that data would be more readily available for this study in this region than in any other part of Denmark.¹ As already mentioned, the major part of the data was obtained from a sample composed of a number of households within Aalborg's tributary area. The sampling was done by means of a questionnaire.² During January 1962, these questionnaires were distributed to the students of the following educational institutions in Aalborg: Aalborgshus

¹This choice was made after consultation, in September 1961, with Professor Niels Nielsen, Chairman of the Geographical Institute of the University of Copenhagen. Professor Nielsen suggested that information needed for this study would be available in this region. Contemporaneous with my collection of the field data, an analysis for a regional plan was initiated by Professor Peter Bredsdorff, a regional planner, his associates, and the administrative authorities within the region. Cf. Peter Bredsdorff, "Regionplanlægning i Nordjylland: Forslag til Planlægningsprogram" (Copenhagen: 1962), p. 4. (Mimeographed.)

²See Appendix A for the English translation of this questionnaire. The author drafted the original questionnaire which later was revised and edited in consultation with Torkil Jensen, city planner in Aalborg, Stefan Ott and Hans Mammen, regional planners, and Mrs. Stefan Ott, a sociologist.

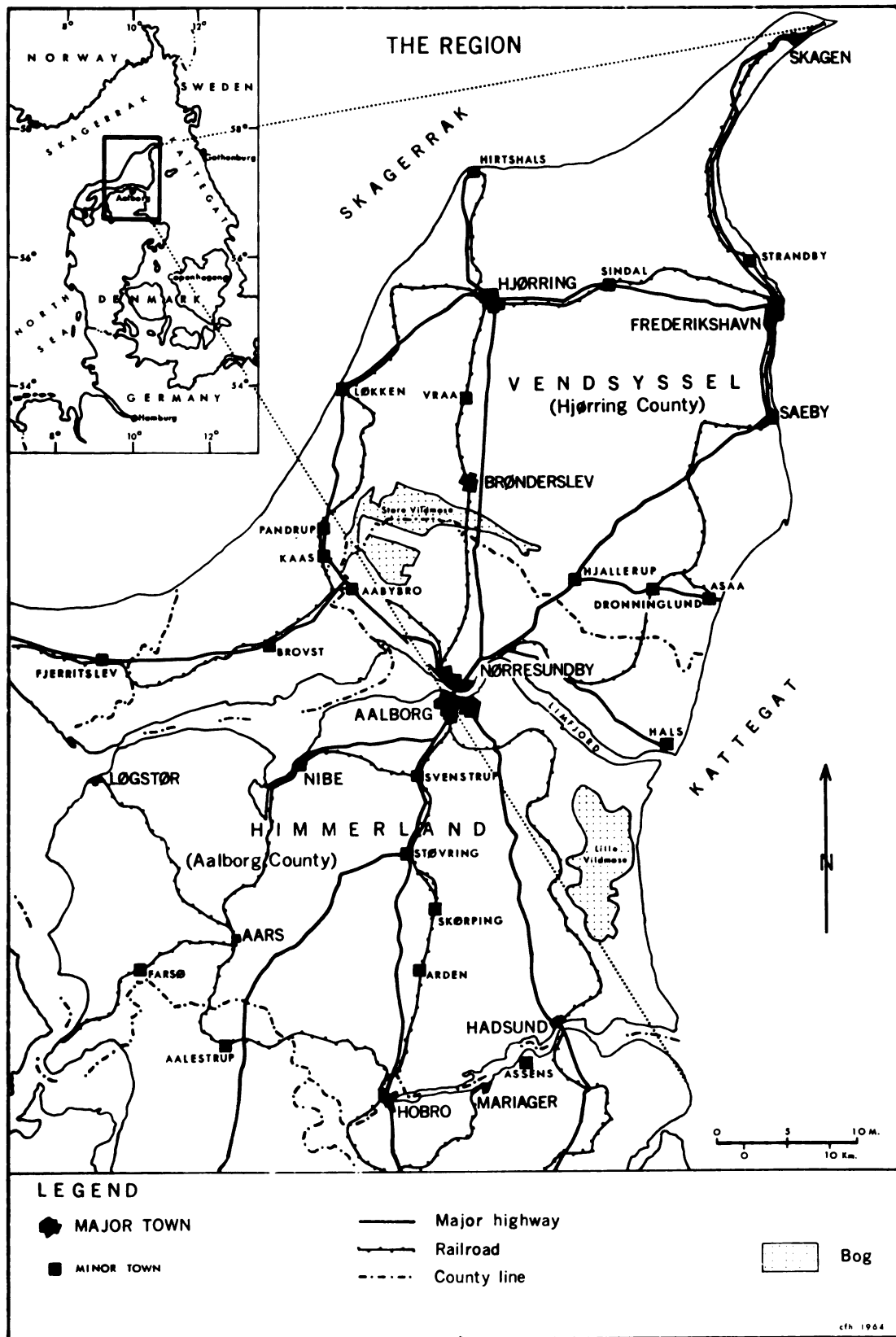


Figure 3

Statsgymnasium, Aalborg Kathedralskole, Aalborg Studenterkursus (these are academic high schools), Aalborg Seminarium (Teacher's College), Aalborg Børnehaveseminarium (Kindergarten Teacher's College), Aalborg Tekniske Skole (Technical Institute), and Aalborg Handelsskole (Commercial Institute). These schools were selected because they are attended not only by students from Aalborg and environs but also by students from other parts of Northern Jutland.

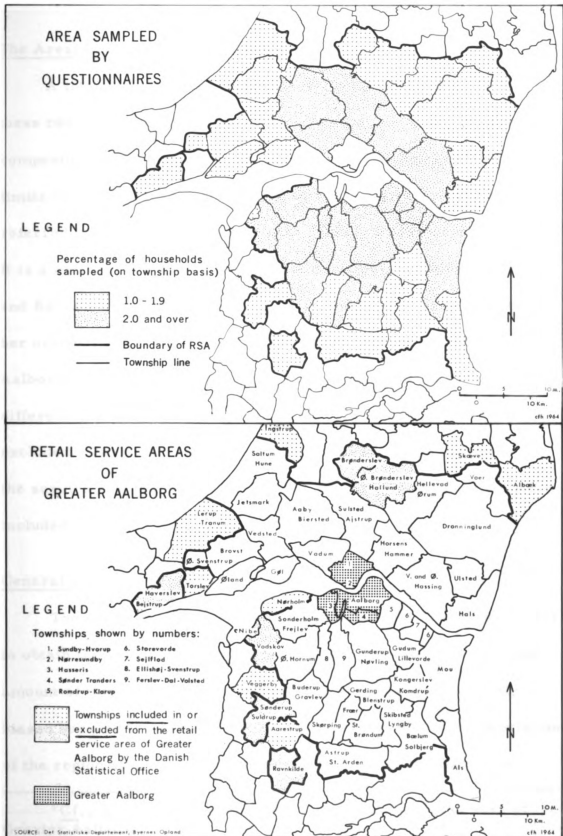
Each questionnaire covered a household of which the student respondent was a member. In this study, a household is the basic statistical unit, whereas the township in which the household is located becomes the basic areal unit.³

Determining the Size of the Sample

The completed questionnaires were initially sorted according to whether or not: (1) they had been properly answered for inclusion in subsequent tabulation, and (2) the total number from each township constituted one per cent or more of the total number of households in that township as of 1955.⁴

³ The Danish equivalent of a township is "kommune."

⁴ The year 1955 was used as the base year for the number of families in each township because the data for 1955 were the most recent available. Cf. Det Statistiske Department, Byernes Opland: En Inddeling af Landet i Handelsomraader med Oplysning om Areal, Antal Husstande og Folketal (Copenhagen: 1960), pp. 35-37.



Figures 4 and 5

The Areal Origin of the Questionnaires

A total of 547 questionnaires from 44 townships satisfied these two requirements. The spatial distribution of the households composing the sample is shown in Fig. 4. This figure also delimits the region considered in this study. This region will be referred to as the retail service area (RSA) of Greater Aalborg.⁵ It is a contiguous region with the exception of Haverlev-Bejstrup and Ravnkilde townships, and is almost identical in extent and number of townships included in the retail service area of Greater Aalborg determined in 1960 by the Danish Statistical Office.⁶ In differentiation from the RSA used by the author eight townships are excluded. However, seven other townships which are not a part of the service area as determined by the Danish Statistical Office were included (Fig. 5).

General Characteristics of the Sample

The decision to collect a non-random sample was made in order to obtain the greatest possible return of questionnaires in the least amount of time with the least cost. Such a sample is inherently biased because it represents only a limited segment of the population of the region studied. Its deviation from the average Danish or

⁵Cf., p. 20 for the delimitation of the metropolitan area of Greater Aalborg.

⁶Det Statistiske Department, loc. cit., pp. 35-37.

regional population may be stated as follows:

- (1) The sample covers only those households containing a child or children attending one of the educational institutions in which questionnaires were distributed.
- (2) The youngest respondent was born in 1947, i.e. was 15 years of age when the sampling was carried out. It could be assumed that the youngest set of parents was at least 35 years of age. From the above it may be concluded that households without children, or offspring under 15 years of age or over 20 years old are not represented in the subsequent analyses.
- (3) The occupational composition of the sample shows that a relatively greater number of income-earning heads of these 547 households belong to the professional and managerial classes than would be expected in the total population.⁷
- (4) An indication that the households constituting this sample are economically better off than the average population is derivable from the fact that 347 households or 63.6 per cent of the sample owned motor vehicles, whereas the national average is one motor vehicle for every three households, or 33.3 per cent (1961).⁸

⁷Cf., Table 7, p. 60.

⁸Cf., p. 78.

Although this sample is not fully representative, it presents advantages such as (1) differentiation between its occupational groups, and (2) original information hitherto not available. A description of the region where this sample was obtained is presented in the ensuing paragraphs.

The Administrative Composition of Greater Aalborg

The city of Aalborg is situated along the southern bank of the Limfjord at the narrowest point of its eastern part; this body of water divides Vendsyssel and Himmerland (Fig. 3).^{9,10} The metropolitan area of Aalborg consists of four other communities, viz., to the south of the Limfjord the townships of Hasseris and Sønder Tranders, and to the north of the Limfjord the city of Nørresundby and the township of Sundby-Hvorup.¹¹ This metropolitan area is henceforth referred to as Greater Aalborg. In this study, it is considered as a

⁹ The coordinates for the tower of the Budolphi Cathedral in downtown Aalborg are 57° 2' 54" N.; 9° 55' 15" E.

¹⁰ Vendsyssel and Himmerland are the regional names for Northern Jutland and the northern part of Central Jutland, respectively.

¹¹ The five administrative units comprising Aalborg's metropolitan area were chosen on the basis of a sample consisting of 609 households residing in these communities. The purchase intensities of these households for selected goods available in Aalborg's central business district were: (1) shoes 95.7%; (2) ladies' apparel 95.2%; (3) men's clothing 91.8%; (4) books 84.8%; (5) furniture 83.8%; (6) radio and television 78.7%; and (7) hosiery 77.9%. These purchase intensities indicate the strong attractive force exerted by the central business district of Aalborg on the four communities surrounding this city.

major focal point for the households of the 44 townships surrounding it.

History of Aalborg

The historical development of Aalborg plays a role in drawing customers from the RSA. The Danes have an image of Aalborg as the regional capital of Northern Jutland. This is borne out not only by the number of people, Aalborg having approximately four times as many inhabitants as Frederikshavn, the second most populous city of Northern Jutland, but also by its more diverse functions. Both are related to historical developments. Aalborg's merchants have controlled the commerce of the region for many centuries, taking advantage of the town's location and of the privileges in its charter of 1340.¹²

Early in the history of Denmark, the Vikings already used the narrowness of the Limfjord between Aalborg and Nørresundby as a place to cross this body of water. Prior to the latter part of the 19th century, the Limfjord was a major obstacle in linking Vendsyssel with the remainder of Jutland. The community leaders of medieval Aalborg recognized this hindrance to transportation as a feature

¹²Peter Riismøller, Aalborg: Historie og Hverdag (Aalborg: Aalborg By, 1942), pp. 42-45.

Privileges refer to advantages such as self-government enjoyed by medieval towns with a charter.

which would allow the breaking of bulk commodities to be distributed in Northern Jutland, and also as a collection point for goods produced within the region.

By the beginning of the 17th century Aalborg's merchants and artisans had gained a de facto monopoly over commerce and trades in the Limfjord region.¹³ This arose from a privilege that prohibited the settling of merchants and craftsmen in a circular area with a radius of 18.8 miles (4 Danish miles) centered on Aalborg, which is still apparent in the absence of large central places in the immediate vicinity of Greater Aalborg (Fig. 10).¹⁴ A national law regulating commerce and trades revoked this privilege in 1857.¹⁵ Thus, chartered towns retained the right of excluding merchants and craftsmen in a radius of 4.7 miles (1 Danish mile) from the town center.¹⁶ More recent laws completely removed this anomaly.

The Contemporary Scene

At present, the city is a major commercial and administrative hub of Northern Jutland not only because of its early start, but also

¹³ Ibid., p. 105.

¹⁴ Ibid., p. 148.

¹⁵ C. S. Klein, Samling of endnu Gjældende Love og Anordninger m.v. af Mere Almindelig Interesse 1849-1859 (Copenhagen: J. H. Schultz, 1861), pp. 405-432.

¹⁶ Riismøller, loc. cit., p. 212.

because of its continuing advantageous position and improved site. Good connections over bodies of water to other parts of Denmark, Norway, England, and other countries of Europe were and still are considered an advantage by Aalborg businessmen. Its wholesale trade in grains, fertilizers, petroleum, petroleum products, cattle, groceries, and other commodities is considerable and involves all of Northern Jutland.

In addition, industrialization began early in Aalborg compared to other parts of Northern Jutland. Denmark's largest tobacco processing plant is located in Aalborg, its cement manufacturing is of great importance to the national economy, and it is the only major population node in this country with an industry based on locally mined raw materials, viz., chalk and clay. Further, all Danish aquavit, the popular national alcoholic drink is distilled here from potatoes grown within the RSA. Other industries are textile mills, apparel manufacturing establishments, furniture plants, a large shipyard, a fertilizer plant, a number of meat packing plants, and numerous small manufacturing establishments mainly of local rather than national significance.

With the growth of commerce and industry, the transportation network has been expanded. The city's transportation facilities provide Northern Jutland with the best connection to Copenhagen by air, rail, and sea.

Culturally, Aalborg is also a regional focal point with its variety and number of secondary schools, a municipal symphonic orchestra, theater, exhibition hall, and popular entertainment center--Karoline-lund, a permanent amusement park. Also, the city has the best hospital facilities and medical specialist services in Northern Jutland.¹⁷

The Population of the Region

In 1960, the population of the RSA and Greater Aalborg numbered 228,295 persons. Of these 108,644 (47.6%) lived in the RSA. The number of households in both areas was 69,382 in 1955 (the most recent year for which this information was available) and of these households 30,863 (44.5%) were located in the RSA. The sample

¹⁷ The following present detailed descriptions of the city's history and industrial development:

Jens L. Hamre and O. Esben-Petersen, Aalborg i Aaløbenes Tid (Copenhagen: Gyldendalske Boghandel-Nordisk Forlag, 1945), 71 pages.

L. Andkjaer Jensen, "Lidt om Tobakkens Historie," Danske Virksomheder, Vol. 34, 1957, pp. 1-16.

Aalborg Portland Cement Fabrik A.S. (Aalborg: Aalborg Portland Cement Fabrik A.S., 1951), not paginated.

Trustkommissionen, Betænkning vedrørende Cementbranchens Konkurrenceforhold og F. L. Smidth-Koncernen (Copenhagen: Statens Trykningskontor, 1959), 97 pages.

Aktieselskabet De Danske Spritfabrikker (Copenhagen: A. S. De Danske Spritfabrikker, 1952), 36 pages.

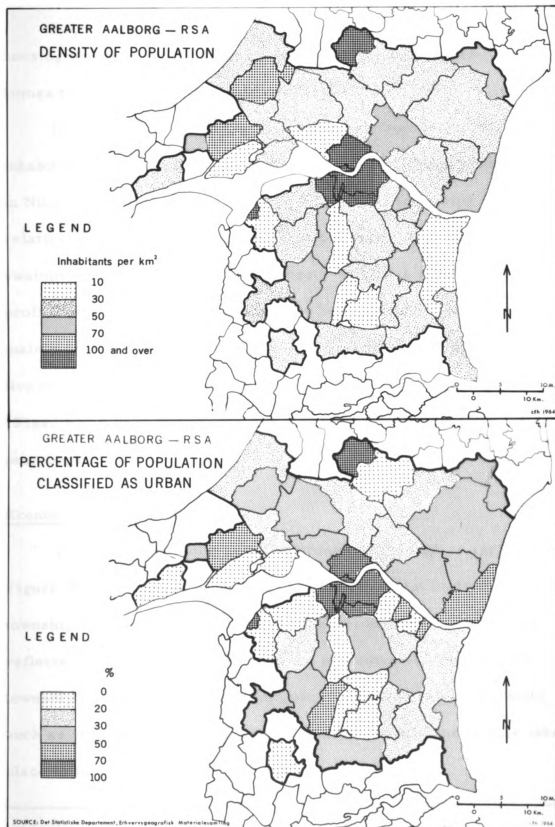
comprised 547 or 1.77 per cent of these RSA households.

Between 1950 and 1960 the number of inhabitants in the RSA and Greater Aalborg as a unit did not increase greatly. However, population growth was accelerated in Greater Aalborg. Here, a relatively large increase of population took place in the suburban townships of Hasseris, Sundby-Hvorup, and Sønder Tranders (Table 1). This is apparently due to an overall increase of households owning motor vehicles--a condition which favors settlement in suburbs. Also, from time to time, the national government slows

Table 1.--Population of Greater Aalborg and its RSA 1950-1960^a

Areal Unit	Number of Persons		Growth 1950-1960		Number of Households 1955
	1950	1960	Number of Persons	Percentage	
Greater Aalborg:					
Aalborg	79,806	85,617	5,811	7.3	28,697
Norresundby	8,872	10,331	1,459	16.4	3,434
Hasseris	8,077	10,388	2,311	28.6	2,897
Sundby-Hvorup	8,416	11,878	3,462	41.1	3,183
Sønder Tranders	887	1,437	550	62.0	308
Subtotal	106,058	119,651	13,593	12.8	38,519
The RSA (44 townships)	108,392	108,644	252	0.2	30,863
Total	214,450	228,295	13,845	6.5	69,382

^aDet Statistiske Department, Byernes Opland: En Inddeling af Landet i Handelsomraader med Oplysning om Areal, Antal Husstande og Folketal (Copenhagen: 1960), pp. 35-37.



Figures 6 and 7

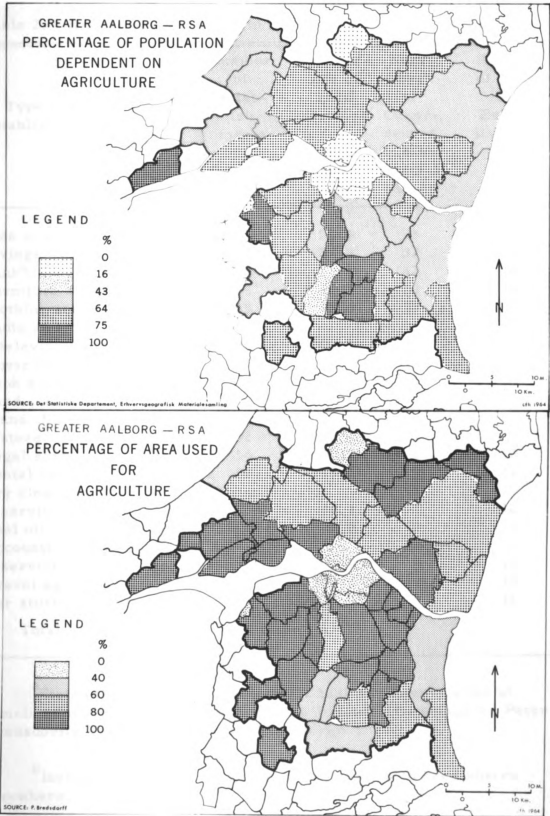
housing construction in cities by only issuing building permits for homes to be constructed in suburban areas.

In the RSA the population density varies from a low of 16 inhabitants/km² in Vadum township to a high of 711 inhabitants/km² in Nibe, a city with a charter (1955 data). The townships with relatively low population densities are primarily those which have swamps, dunes, poor soils, and forests which are handicaps to profitable agriculture. The relatively high population densities are mainly encountered in townships where proportionally more persons live in hamlets, villages and towns rather than on scattered farms (Figs. 6 and 7). The sparsest population density is found in the peat-bogs.

Economic Pursuits of the RSA

The major economic activity throughout the RSA is agriculture. Figure 8 shows the percentage of persons dependent on farming on a township basis.¹⁸ The importance of this economic activity is also reflected in Fig. 9 which indicates the percentage of area of each township used for agricultural purposes. Other economic pursuits such as retailing, repair services and some manufacturing also take place in the various population nodes of the area.

¹⁸Data giving the number of persons employed in agriculture were not available on a township basis.



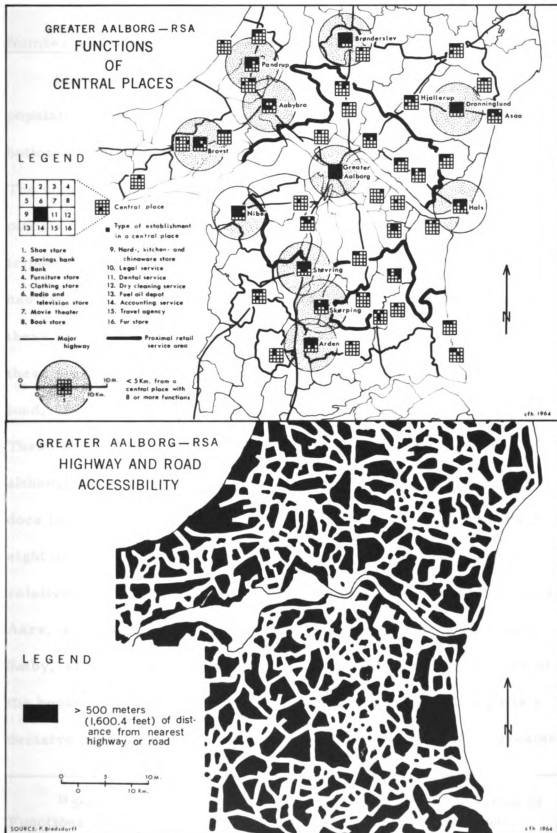
Figures 8 and 9

Table 2. --Retail establishments in Greater Aalborg and its RSA^a

Type of Establishment	Total Number of Establishments	Number of Establishments in Greater Aalborg	Percentage of Total Number of Establishments	Number of Occurrences in RSA Central Places	Ranking of Type of Establishment as to Frequency
Shoe store	101	53	52.4	33	1
Savings bank	44	12	27.3	32	2
Bank ^b	54	19	35.2	32	3
Furniture store	101	68	67.3	20	4
Clothing store	77	55	71.4	17	5
Radio and television store	60	40	66.7	16	6
Movie theater	25	10	40.0	15	7
Book store	33	17	51.5	15	8
Hard-, kitchen and chinaware store	46	32	69.6	11	9
Legal service	73	56	76.7	10	10
Dental service	62	50	80.6	9	11
Dry cleaning service	32	25	78.1	7	12
Fuel oil depot	10	9	90.0	2	13
Accounting service	18	18	100.0	1	14
Travel agency	9	9	100.0	1	15
Fur store	4	4	100.0	1	16
Total	749	477	63.7		

^aStefan Ott and Hans Mammen, "A List and Enumeration of Functions of Central Places in Northern Jutland" (Copenhagen: Peter Bredsdorffs Tegnestue, 1962). (Manuscript.)

^bIncludes branches of financial institutions with head offices elsewhere.



Figures 10 and 11

Number and Distribution of Central Places

Since most goods are obtained from establishments located in population nodes, it is of significance to note the number and distribution of central places within this RSA besides Greater Aalborg. The commodities and services used for determining a central place's drawing power were worked out on the basis of their centripetal force.¹⁹ A total of 46 places, including Greater Aalborg, had one or more of the establishments listed in Table 2. Eleven of these places had eight or more of these establishments. Among these places are Aabybro, Arden, Brovst, Brønderslev, Dronninglund, Greater Aalborg, Hals, Nibe, Pandrup, Skørping, and Støvring. These places are rather evenly distributed throughout the RSA, although none is in the immediate vicinity of Greater Aalborg nor does the southeastern part of the RSA have any population nodes with eight or more of these functions (Fig. 10). In addition to these, relatively large central places beyond the limits of the RSA such as Aars, Fjerritslev, Hadsund, Hobro, Løgstør, Løkken, Mariager, Sæby, and Vraa also compete to a certain degree for the monies of the households within the region (Fig. 3). Greater Aalborg has a decisive advantage over these places not only because of its greater

¹⁹Stefan Ott and Hans Mammen, "A List and Enumeration of Functions of Central Places in Northern Jutland" (Copenhagen: Peter Bredsdorffs Tegnestue, 1962). (Manuscript.)

number, proportion and variety of functions, but also because the transportation network facilitates the movement of consumers towards this metropolitan area.

Transportation

The two principal types of surface linkages are highways and railroads (Fig. 3). The network of roads is dense and very well developed (Fig. 11) and can be used by any kind of vehicle regardless of its weight. The major means of public transportation are buses which run frequently. Consumers who do not own motor vehicles patronize the buslines in preference to the trains.²⁰ The latter serve fewer towns, run less frequently, and often present the problem for those persons not living in a town with a railroad station of having to transfer from one type of transportation to another. The well-integrated transportation network greatly aids the commercial enterprises of Greater Aalborg in drawing customers from the RSA. Persons arriving in Aalborg by bus, train, or vessel have to walk only for five or ten minutes to get to the heart of the town. Those desiring to go to other parts of the metropolitan area are served by an efficient privately owned bus system and by private taxicabs.

The description of physical characteristics is aimed at showing that these present few hindrances to the movement of people within

²⁰Cf., Table 6, p. 54.

the RSA. The landforms are of a subdued nature and do not offer obstacles to easy access to Aalborg. Once the peat-bogs of Store and Lille Vildmose and the Limfjord made access to Aalborg difficult. Today the bogs are crisscrossed by roads and the flow of traffic across the Limfjord has been facilitated by the construction of railroad and highway bridges connecting Aalborg with Nørresundby to the north.

Icy roads, snow, sleet, and fog during the fall, winter and spring are the major weather impediments to surface communication between the RSA and Aalborg. These inclement weather conditions may occasionally prevent people from traveling.

Thus it becomes evident that many factors have to be taken into account when considering the drawing power of Greater Aalborg as a retailing center and comparing it to other regional central places. Many of these factors also play a role in the decision-making process of the households in the RSA, on which the results presented in the following chapters are based.

CHAPTER III

AREAL VARIATIONS OF CONSUMER PURCHASE INTENSITIES

Introduction

In general, the retail service area of a central place is depicted as a homogeneous region lacking internal variation in consumer purchase intensities for goods.¹ Assuming that users of goods have different images of individual items and the locations where these can be obtained, both of which influence their decision-making, it follows that consumer purchase intensities should vary accordingly. Using this assumption, it should not only be possible to determine the range of a good but also the varying purchase intensities of it in reference to a specific central place, in this case Greater Aalborg, on the basis of aggregate data derived from a sample consisting of consumers. It should also be possible to establish the degree to which consumers in the RSA use central places other than Greater Aalborg, and, moreover, the areal patterns resulting from such use and their association with other geographical factors such as transportation.

¹For the definition of consumer purchase intensity see p. 2.

The Computation of Consumer Purchase Intensity

Purchase intensities of households (on a township basis) for goods obtainable in Greater Aalborg were computed by use of the following formula:

$$I = \frac{h}{g}$$

where \underline{I} is the purchase intensity, expressed as a percentage, \underline{h} is the number of households sampled in a township purchasing a particular good in Greater Aalborg, and \underline{g} represents the total number of households sampled within that township.

This value was determined for each of the 20 goods used in this study and for each of the 44 townships comprising the RSA.² The values were subsequently grouped into percentage quartiles which were mapped to reveal the areal distribution of consumer purchase intensities. Averages of the latter are enumerated in Table 3 and the number of times a good occurred in any of the percentage quartiles is shown in Table 4.

²The 20 goods were: (1) ladies' apparel; (2) shoes; (3) men's clothing; (4) hard-, kitchen-, and chinaware; (5) hosiery; (6) radio and television; (7) books; (8) furniture; (9) pharmaceuticals; (10) motor vehicles; (11) dental service; (12) legal service; (13) accounting service; (14) barber's service; (15) beautician's service; (16) banking service; (17) savings banking service; (18) automotive repair service; (19) movie house tickets; and (20) dry cleaning service. These goods were chosen because consumers engage primarily in a nonprogrammed decision-making process in obtaining these goods. Cf., p. 8.

Table 3. --Average consumer purchase intensities for goods in the Greater Aalborg RSA

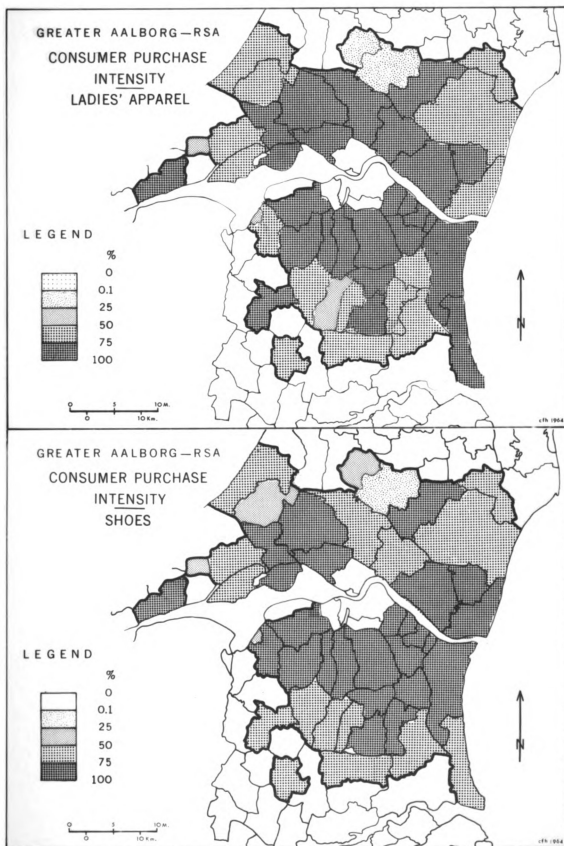
Rank	Good(s)	Number of House-holds of the Total of 547 in the RSA Purchasing a Good in Greater Aalborg	The Average Purchase Intensity or Per Cent of Total Sample
1	Ladies' apparel	403	73.7
2	Shoes	392	71.6
3	Men's clothing	375	68.6
4	Dry cleaning service	364	66.5
5	Books	355	64.9
6	Dental service	336	61.4
7	Furniture	297	54.3
8	Hosiery	282	51.6
9	Movie house attendance	254	46.4
10	Radio and television	228	41.7
11	Hard-, kitchen-, and chinaware	226	41.3
12	Legal service	221	40.4
13	Accounting service	198	36.2
14	Banking service	182	33.3
15	Motor vehicles	175	32.0
16	Pharmaceuticals	136	24.9
17	Savings banking service	118	21.6
18	Beautician's service	102	18.6
19	Automotive repair service	90	16.4
20	Barber's service	71	13.0

Table 4. --Quartile frequency of occurrence of purchases of specified goods in Greater Aalborg by township

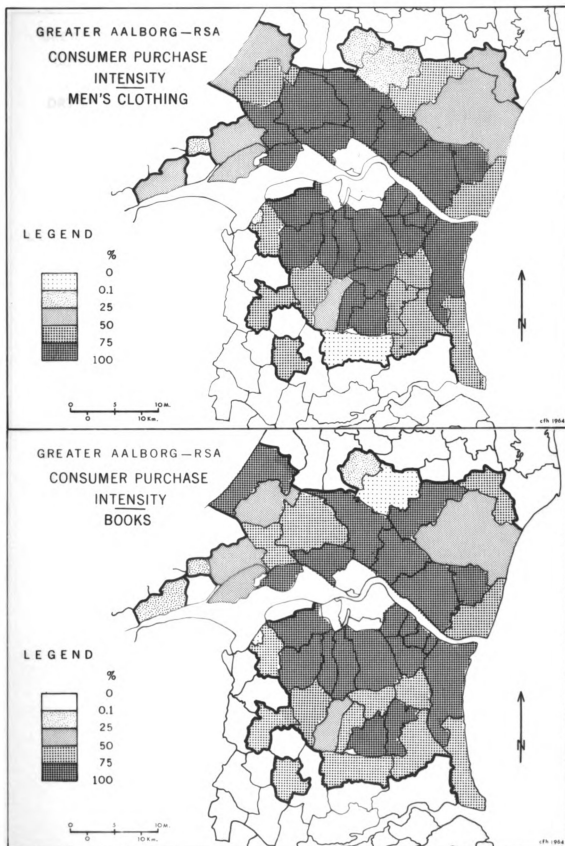
Good(s)	Quartile				No. of Townships ^b
	First ^a	Second	Third	Fourth	
	No. of Townships	No. of Townships	No. of Townships	No. of Townships	
1. Ladies' apparel	24	15	3	2	0
2. Shoes	24	15	4	1	0
3. Men's clothing	21	12	7	4	0
4. Dry cleaning service	21	10	7	5	1
5. Books	20	14	5	3	2
6. Dental service	18	13	6	5	2
7. Furniture	14	7	16	7	0
8. Hosiery	11	11	12	8	2
9. Movie house attendance	9	12	7	13	3
10. Radio and television	7	12	15	7	2
11. Hard-, kitchen-, and chinaware	8	8	13	13	2
12. Legal service	11	8	8	5	12
13. Accounting service	2	11	23	5	3
14. Banking service	8	7	4	12	13
15. Motor vehicles	2	7	19	10	6
16. Pharmaceuticals	5	4	2	11	22
17. Savings banking service	2	6	5	13	18
18. Beautician's service	0	4	10	15	15
19. Automotive repair service	0	2	11	17	14
20. Barber's service	0	2	8	14	20

^aThe quartiles from first to fourth are respectively (75.0%-100.0%), (50.0%-74.9%), (25.0%-49.9%), (0.1%-24.9%).

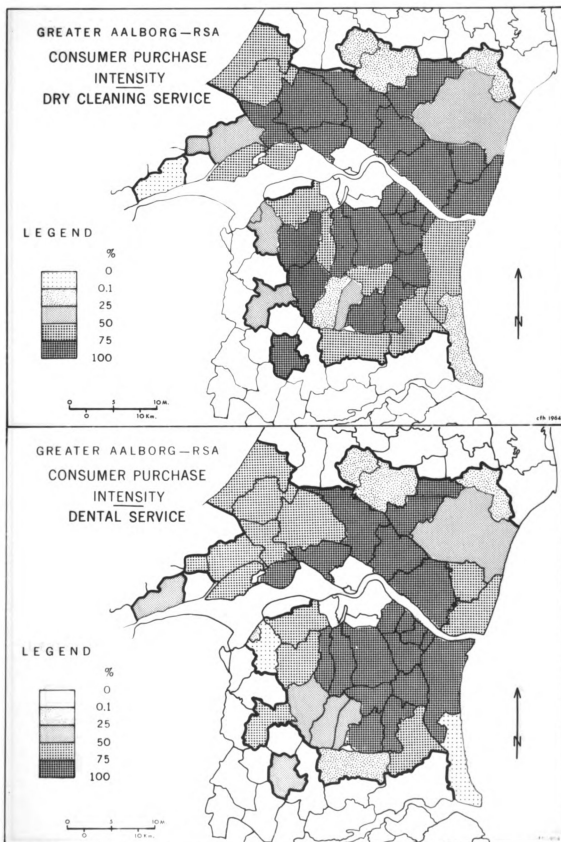
^bThe last column indicates townships in which the households do not purchase specified goods or services in Greater Aalborg.



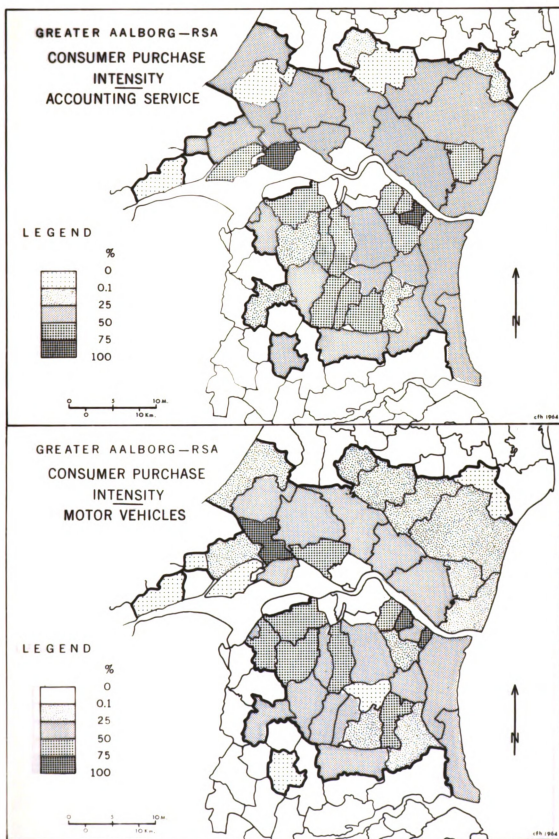
Figures 12 and 13



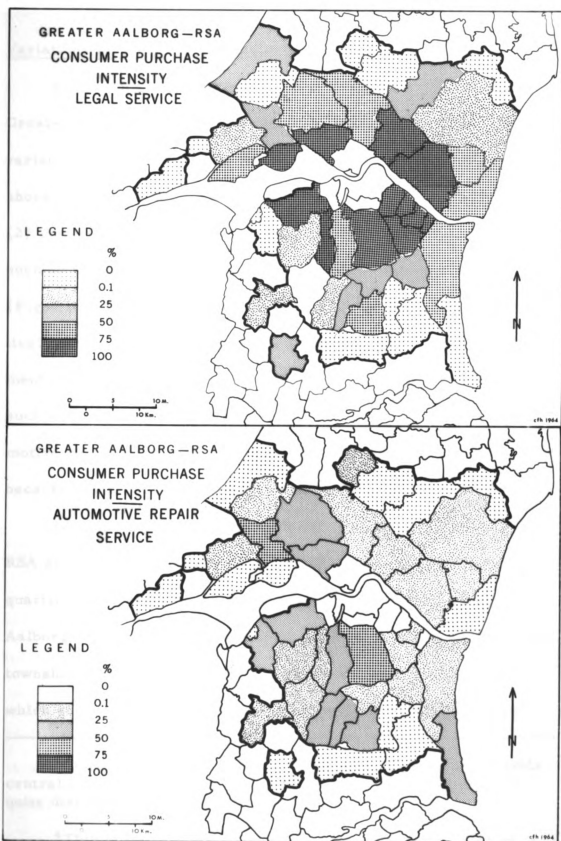
Figures 14 and 15



Figures 16 and 17



Figures 18 and 19



Figures 20 and 21

Variations in Consumer Purchase Intensities

Goods with high average purchase intensities, in reference to Greater Aalborg, are (1) those which consumers desire in many varieties (both as to quality and quantity) such as ladies' apparel, shoes, men's clothing, and books (Figs. 12, 13, 14, and 15); and (2) those that usually are available only in a sizable central place such as dry cleaning service, dental service, and accounting service (Figs. 16, 17, and 18).³ The last named reflect the fact that a relatively large number of consumers is necessary to make establishments offering such services profitable.⁴ Some goods and services such as motor vehicles, legal service, accounting service, automotive repair service do not have high average purchase intensities because not all of the households use them (Figs. 19, 20, and 21).

Goods with high average consumer purchase intensities in the RSA also have the greatest areal distribution and the first percentage quartile as expected is located in townships bordering Greater Aalborg (Figs. 12, 13, 14, and 15). Moreover, households in these townships buy in Greater Aalborg a greater proportion of goods which generally rank low (based on average purchase intensity)

³Consumers prefer to obtain these kind of goods in a sizable central place, even though establishments offering them may be quite dispersed throughout the RSA.

⁴This is obvious from the small number of these types of establishments present in the RSA. Cf., pp. 29-31.

among the 20 goods considered (Figs. 19, 20, and 21) than residents of communities at a greater distance from this central place.

It is obvious that analysis of only the frequency of occurrence and the areal distribution of retail establishments in a region, may lead to erroneous conclusions about the actual use made of regional retail facilities, if little or nothing is known about the consumers utilizing such establishments. Thus, the data cited above (Tables 3 and 4, and Figs. 12 to 21) was organized and evaluated as follows in order to obtain more valid generalizations: (1) the selection of preferred service centers by the households composing the sample; (2) the number of times a township fell into the first percentage quartile; and (3) a comparison of the areal distribution of this last pattern with the regional pattern of transportation.

Preferred Service Centers

Each household sampled indicated the central place it considered its preferred service center. About three-fifths of the sample (338 households or 61.8 per cent) mentioned Greater Aalborg; the remaining 209 households chose 59 other localities. These are mainly small, local retail centers, although some of these localities have eight or more of the functions used in describing the central places of the RSA (Table 2 and Fig. 10). Places selected by six (approximately one per cent of the sample) or more households are

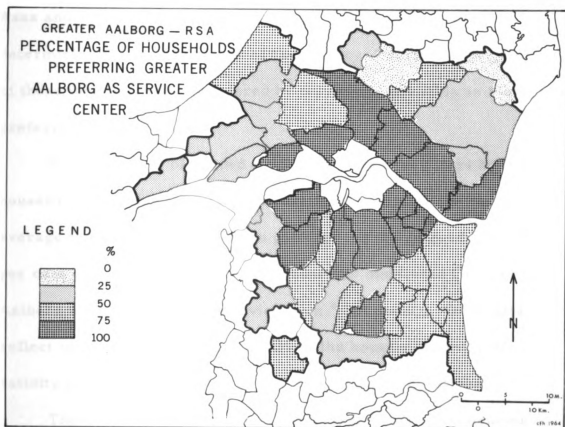


Figure 22

shown by name in Fig. 10. There are 12 such places: Aabybro, Arden, Asaa, Brovst, Brønderslev, Dronninglund, Greater Aalborg, Hjallerup, Nibe, Pandrup, Skørping, and Støvring. Two of these, Asaa and Hjallerup, had less than eight of the functions used in determining the central places of the region. Hals which has eight of these functions was considered by only two households as their preferred service center.

Some evidence of graded evaluation of central places by the households was encountered. For example, Brønderslev had an average purchase intensity of ten per cent for the 20 goods but 44.4 per cent of the households from Brønderslev mentioned Greater Aalborg as their preferred service town.⁴ Of course, these data reflect interpretations of individuals in the households and their validity as far as application is concerned may be questioned.

The areal distribution, on a percentage basis, of consumer units preferring Greater Aalborg as their service town is shown in Fig. 22. Generally, the highest percentages occur contiguously in townships in the immediate vicinity of Greater Aalborg with the exception of Ellishøj-Svenstrup township. An outlier of the above pattern is Store Brøndum township. The overall spatial distribution

⁴Although theories have been constructed to prove the existence of central places in a hierarchical order, this does not mean that, in reality, such places are used in that order.

elucidates the lack of sizable central places around Greater Aalborg and the strong tie-in between this metropolitan area and the residents in its nearby surroundings. Although the southeastern part of the RSA, rather distant from Greater Aalborg is also relatively strongly linked to this major central place, especially because it lacks major central places excepting Hobro and Hadsund which are outside the RSA (Fig. 3).

Comparing this distributional pattern with those of Figs. 12 to 21, similarities are observed in that the higher consumer purchase intensities occur in the same townships in which households preponderously prefer Greater Aalborg as their service center. Combining these areal distributions results in an indication of the magnitude of Greater Aalborg's centripetal force.

Consumer Purchase Intensity and Subregions of the RSA

A combination of the available data permits a division of the RSA into two subregions. This was done by establishing on a township basis the frequency of occurrence of the first quartile of consumer purchase intensity for each of the 20 goods (Table 5 and Fig. 23). The first quartile of consumer purchase intensity occurred seven or more times in 16 townships adjacent to Greater Aalborg excepting Store Brøndum, Mou and Gøl townships. All of these communities are in what has been termed the proximal (near to

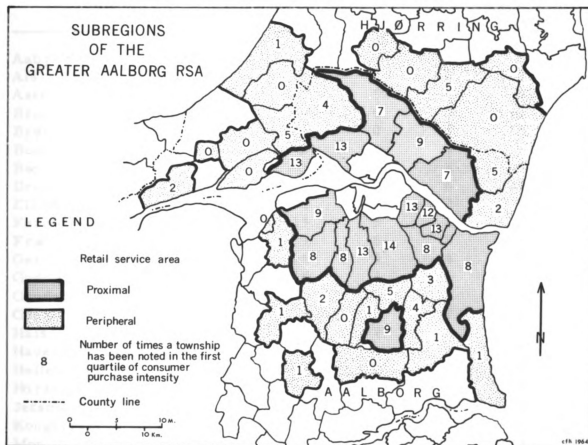


Figure 23

Table 5. --Quartile ratings of townships on basis of relative frequency of purchase of 20 selected goods

Township	Quartiles			
	First	Second	Third	Fourth
Aaby-Biersted ^a	4	7	6	3
Als	1	3	7	2
Astrup-Stor Arden	0	5	5	8
Brovst	0	9	9	16
Brønderslev	0	0	1	14
Buderup-Gravlev	2	4	9	5
Bælum-Solbjerg	1	6	4	4
Dronninglund	0	2	6	11
Ellishøj-Svenstrup	8	6	2	4
Ferslev-Dal-Volsted	13	5	2	0
Fræer	1	5	8	0
Gerding-Blenstrup	5	5	4	4
Gudum-Lillevorde	8	3	5	3
Gunderup-Nøvling	14	3	3	0
Gøl	13	3	2	0
Hals	2	7	1	5
Haverslev-Bejstrup	2	1	4	3
Hellevad-Ørum	5	2	5	5
Horsens-Hammer	9	5	3	3
Jetsmark	0	4	6	3
Kongerslev	3	4	6	6
Mou	8	4	5	3
Nibe	0	0	5	4
Ravnskilde	1	4	5	3
Romdrup-Klarup	13	4	3	0
Saltum-Hune	1	6	7	3
Seilflod	13	2	2	2
Skibsted-Lyngby	4	5	1	5
Skørping	0	2	9	5
Store Brøndum	0	3	7	0
Storvorde	12	5	1	2
Sulsted-Ajstrup	7	7	3	3
Sønderholm-Frejlev	9	8	3	0
Sønderup-Suldrup	1	4	5	8
Ulsted	5	6	2	6
Vadum	13	4	3	0
Vedsted	5	9	2	3
Vester and Øster Hassing	7	2	7	4

Table 5. --Continued

Township	Quartiles			
	First	Second	Third	Fourth
Voer	0	3	2	9
Øland	0	8	5	0
Øster Brønderslev	0	0	0	10
Øster Hornum	8	5	2	5
Øster Svenstrup	0	1	5	11

^aThe Danish alphabetical order has been used.

Greater Aalborg) retail service area. The remaining 28 townships are considered to be in the peripheral (distant to Greater Aalborg) retail service area. Both Mou and Gøl townships lack major central places apart from Greater Aalborg. The population density in these two communities is too low to support a sizable central place, and access to Greater Aalborg is good. Store Brøndum was also noted as an exception as regards choice of preferred service center (Fig. 22). Adequate cause for the deviation of Store Brøndum township from the general pattern cannot be given. It may be that the socio-economic attributes of the sampled households cause this anomaly.

It is apparent from Figs. 12 to 23 that the areal extent of consumer purchase intensities and preference of Greater Aalborg as a service center are greater in the area south of the Limfjord. This is mainly due to the fact that (1) households in the latter area are

attracted to a greater degree to Greater Aalborg than those north of the Limfjord (for reasons explained below); (2) the past and present influence of the boundary between Aalborg and Hjørring counties, a boundary partly coinciding with the limits of the proximal retail service area (Fig. 23); and (3) the better access to Greater Aalborg by several routes from the south. The highway bridge connecting Aalborg with Nørresundby to the north is a bottleneck to highway traffic because its capacity is too small for the present density of motor vehicles. Moreover, 26 per cent of the households in the proximal retail service area south of the Limfjord travel annually more than 52 times to Greater Aalborg as compared to 16.5 per cent of those residing in the proximal retail service area north of this body of water. This also indicates the stronger ties between Greater Aalborg and the southern portion of the RSA.

In the peripheral retail service area two townships, Hellevad-Ørum and Vedsted, stand out. Both have a greater number in the first quartile of consumer purchase intensities than communities east and west of them. Their deviation from the general pattern as well as that of Store Brøndum, Mou and Gøhl townships is also apparent from the maps dealing with consumer purchase intensities and the choice of Greater Aalborg as the preferred service center (Figs. 12 to 22). The sample from these townships consists mostly of farmers, independent merchants, and master craftsmen. This may indicate

that households in which the heads pursue this kind of non-salaried occupation, coupled with good transportation facilities to the major central place, by-pass the nearest central places when on a purchasing trip, and go directly to the major regional population node.

Transportation and the RSA

It has already been stated that the region is well provided with transportation arteries.⁵ Two aspects of transportation will be considered: (1) the type and frequency of transportation used by the examined sample of households, and (2) time-distance comparisons of various carriers utilized within the Greater Aalborg RSA.

The households' buyers travelled to Greater Aalborg by automobile, bus or train. Automotive use is by far predominant as 347 households owned motor vehicles. However, 44 buyers from these consumer units used buses and three trains, either because they did not know how to operate a motor vehicle or because the vehicle was used by another member of the household in pursuit of his occupation.

The greater frequency of those travelling by automobile to Greater Aalborg is not only a matter of convenience but also of proportional cost. In relation to personal income, the cost of travel to the buyer who uses his own car plays a less important decision-making role than it does to the train-user. As seen earlier, of the

⁵Cf., p. 31 and Figs. 3 and 11.

two, bus travel is preferred.⁶ Moreover, bus-users visit Greater Aalborg more often than train-users. This differentiation must be viewed with caution because too few riders of trains are represented in the sample (Table 6).

In relation to distance, the greatest number of trips to Greater Aalborg originate in the proximal retail service area. Analysis of Fig. 24 offers conclusions that are somewhat difficult to draw because increasing traffic densities about Greater Aalborg are, to an unknown degree, caused by the convergence of roads. East of Store Brøndum township and south of the boundary of the proximal retail service area, traffic densities decrease indicating the diminishing drawing power of Greater Aalborg and the effect of competing central places such as Hobro and Hadsund. In the northwest, the high density is due to traffic to the coast in pursuit of recreation on the beach.

Since straightline distance is an unrealistic measurement, time-distance mapped in the form of isochrones, has been used. The isochrones indicate the amount of time needed to cover a distance by various means of transportation. The time-distance is doubled because each trip must be figured as a round trip.⁷

In terms of one-way travel by automobile, most of the proximal

⁶Cf., p. 32.

⁷Emery Troxel, Economics of Transport (New York: Rinehart and Company, Inc., 1955), pp. 144-145.

Table 6. --Type and frequency of use of means of transportation in the RSA in Travel to Greater Aalborg

Type of Transportation	Frequency per Year														Totals			
	> 52		26-52		18-25		12-17		6-11		3-5		2					0
	Number of Persons	Percentage of Group	Number of Persons	Percentage of Group	Number of Persons	Percentage of Group	Number of Persons	Percentage of Group	Number of Persons	Percentage of Group	Number of Persons	Percentage of Group	Number of Persons	Percentage of Group	Number of Persons	Percentage of Group	Number of Persons	Percentage of Total Sample (547)
Auto- mobile	53	17.7	70	23.4	55	18.3	46	15.3	47	15.7	21	7.0	7	2.3	1	.3	300	54.9
Bus	23	11.4	24	11.9	32	15.8	28	13.8	44	21.8	44	21.8	7	3.5	-	-	202	36.9
Train	-	-	7	15.6	7	15.6	7	15.6	10	22.2	11	24.4	2	4.4	1	2.2	45	8.2
Totals	76	13.9	101	18.5	94	17.2	81	14.8	101	18.5	76	13.9	16	2.8	2	.4	547	100.0

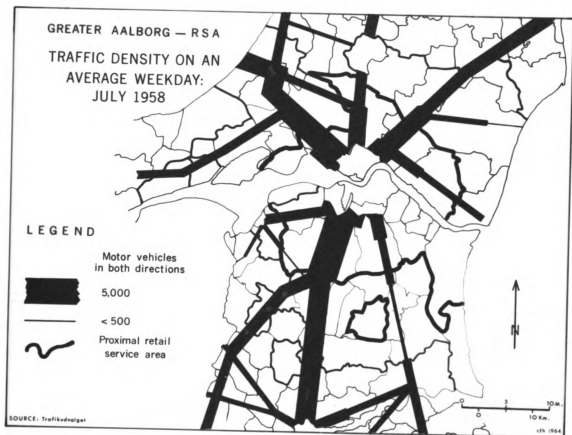
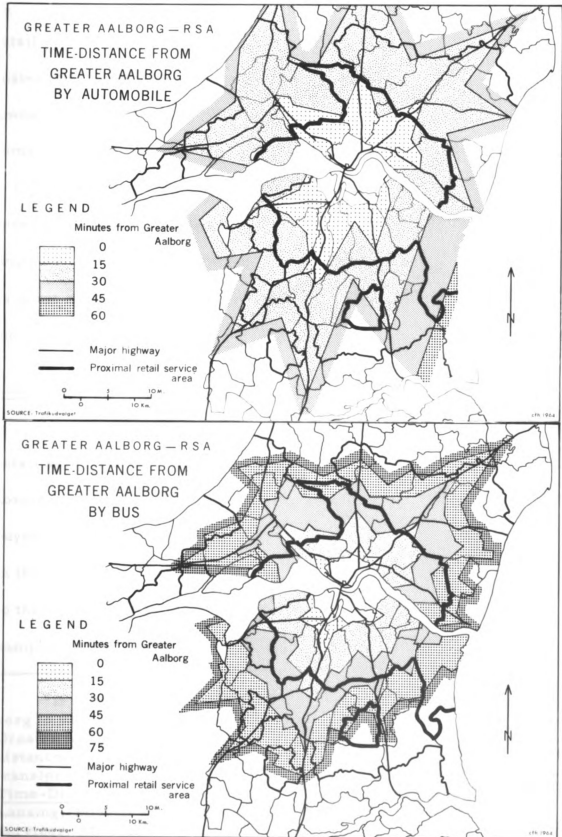


Figure 24



Figures 25 and 26

retail service area falls into the 15-minute zone, however, in the eastern part of this area this increases to 30 minutes and for Mout township to 45 minutes. This time-distance is also applicable to the remainder of the RSA. Als township has the greatest time-distance to Greater Aalborg, namely, 60 minutes (Fig. 25). The same general pattern is noticeable with bus-travel but in this case the time-distance from most locations to Greater Aalborg is about twice as great as that for automobiles, because of the slower speeds and the frequent stops of the buses (Fig. 26).⁸

Conclusion

In summary, the spatial patterns of consumer behavior in the retail service area of a population node as Greater Aalborg are not homogeneous. The highest purchase intensities are effected by buyers from townships in the immediate vicinity of a central place. In the aggregate, their pattern of areal behavior conforms quite well to the distribution of the preferred central places selected by the sampled participants. The drawing power of a central place as

⁸If sufficient detailed data on travel time from Greater Aalborg to various points in the RSA were available, a map with Greater Aalborg as the center, scaled in units of time rather than distance could have been constructed. For this type of map transformation see Donald A. Blome, A Map Transformation of the Time-Distance Relationships in the Lansing Tri-County Area (East Lansing, Michigan: Institute for Community Development and Services, Michigan State University, 1963), pp. 1-9.

regards retailing does not extend evenly into its retail service area. The unevenness is grouped into two subdivisions called proximal and peripheral retail service areas. The rapid decrease of Greater Aalborg's drawing power is mainly caused by increasing time-distance and competition from other central places. It now remains to be seen whether or not social attributes have a bearing on the relations between households in a retail service area and a specific central place.

CHAPTER IV

RELATIONSHIPS BETWEEN OCCUPATION OF HEADS OF
HOUSEHOLDS AND SPATIAL CHARACTERISTICS
OF CONSUMER BEHAVIOR

Introduction

As already demonstrated goods have a varying attracting power on residents of an RSA of a specific central place. This is observable in the areal differences of consumer purchase intensities for various goods. In describing these spatial patterns resulting from the aggregate behavior of individuals, it was assumed that the sampled households had identical images of each good which is not necessarily true.

The central hypothesis of this chapter is that households or groups of more or less similar households have dissimilar images of individual goods and of the environment. Consequently, the image and use of a central place to obtain a good or goods may vary as may the time-distance and the frequency of travel to a specific central place.¹

¹Cf., p. 10.

The Occupational Groups

To validate the above idea, data obtained from the sample were used. In order to facilitate the use of these data, the population of the sample has been divided into seven groups based on the occupation of the head of household. In Denmark, as in most other countries, occupations are indicators of social status. These seven groups are arranged from highest to lowest status based on estimated income (Table 7).² The variations in purchase intensities of the households, in selection of Greater Aalborg as preferred service center, and in the varying frequency of travel to Greater Aalborg by the seven occupational groups will be accounted for in the paragraphs that follow.

Table 7.--Occupational groups

Occupational Group	Number of House- holds	Per Cent of Sample
1. Professional and managerial	78	14.3
2. Shopkeepers, merchants, and master craftsmen	144	26.3
3. Farmers	181	33.1
4. Office and government employees	27	4.9
5. Skilled labor	40	7.3
6. Semi-skilled labor	5	.9
7. Unskilled labor	72	13.2
Totals	547	100.0

²In this classification income data were not considered. Information on income was not asked because it was felt that if such confidential information was included, many would not answer; especially so, because many of the questionnaires could be traced to the respondent.

Variations in Consumer Purchase Intensities, in Selection of
Greater Aalborg as a Preferred Service Center, and in the
Use of Means of Transportation within Occupational Groups

It is apparent from Table 8 that each of the seven occupational groups has different purchase intensities, expressed as percentages, for each of the 20 goods. Table 8 also shows the number of times that an occupational group attained the first or second highest purchase intensity for a good. Moreover, the selection of Greater Aalborg as a preferred service center also varies from group to group (Table 9). A similar observation can be made in regard to frequency of travel to Greater Aalborg (Table 10).

Some of these variations in purchase intensities, in choice of preferred service center, and in the frequency of travel can be explained on the basis of what is known about these seven groups and their points of view about goods. However, a number of the observable differences may be affected by the group either being too small in number or too diverse in its occupational and social composition. Further, the wants of individual households comprising a group may vary greatly, or the differences in purchase intensities of the groups may be too minuscule to be of great significance. Therefore, Groups 5, 6, and 7 (skilled, semi-skilled, and unskilled labor) have been generally omitted from the analysis that follows.

Table 8. ---Percentage of goods purchased in Greater Aalborg by occupation of head of household

Occupational Groups	1			2			3			4			5			6			7			Totals		
	Number of Households	Per Cent of Group	Shopkeepers, Merchants and Master Craftsmen	Number of Households	Per Cent of Group	Farmers	Number of Households	Per Cent of Group	Office and Government Employees	Number of Households	Per Cent of Group	Skilled Labor	Number of Households	Per Cent of Group	Semi-skilled Labor	Number of Households	Per Cent of Group	Unskilled Labor	Number of Households	Per Cent of Group	Number of Households	Per Cent of Group	Number of Households	Per Cent of Group
Number of Households	78		144			181			27			40			5			72			547			
Good(s)																								
Ladies' apparel	68	87.2 ^a	100	69.4		142	78.4 ^b		19	70.4		29	72.5		3	60.0		42	58.3		403	73.7		
Shoes	63	80.8 ^a	103	71.5		140	77.3 ^b		17	63.0		24	60.0		3	60.0		42	58.3		392	71.6		
Men's clothing	58	74.4 ^b	93	64.6		133	73.5		18	66.7		25	62.5		4	80.0 ^a		44	61.1		375	68.6		
Dry cleaning service	53	67.9	97	67.4		124	68.5		19	70.4 ^b		30	75.0 ^a		2	40.0		39	54.2		364	66.5		
Books	53	67.9	88	61.1		132	72.9 ^a		19	70.4 ^b		22	55.0		3	60.0		38	52.8		355	64.9		
Dental service	44	56.4	82	56.9		123	68.0 ^a		18	66.7 ^b		25	62.5		2	40.0		42	58.3		336	61.4		
Furniture	39	50.0	71	49.3		117	64.6 ^a		16	59.2 ^b		22	55.0		2	40.0		25	34.7		297	54.3		
Hosiery	49	62.8 ^a	71	49.3		104	57.5 ^b		13	48.1		17	42.5		0	--		28	38.9		282	51.6		
Movie house attendance	46	59.0 ^b	69	47.9		86	47.5		17	63.0 ^a		16	40.0		0	--		20	27.8		254	46.4		
Radio and television	33	42.3	53	36.8		69	38.1		17	63.0 ^a		23	57.5		3	60.0 ^b		30	41.7		228	41.7		
Hard-, kitchen-, and chinaware	43	55.1 ^a	56	38.9		83	45.8 ^b		11	40.7		12	30.0		1	20.0		20	27.8		226	41.3		
Legal service	28	35.9	54	37.5		89	49.2 ^b		14	51.8 ^a		14	35.0		2	40.0		19	26.4		221	40.4		
Accounting service	28	35.9	75	52.1 ^a		62	34.2		10	37.0 ^b		8	20.0		0	--		15	20.8		198	36.2		
Banking service	34	43.6 ^a	42	29.2		71	39.2 ^b		8	29.6		12	30.0		1	20.0		14	19.4		182	33.3		
Motor vehicles	33	42.3 ^b	70	48.6 ^a		48	26.8		10	37.0		7	17.5		1	20.0		6	8.3		175	32.0		
Pharmaceuticals	22	28.2	30	20.8		52	28.7		8	29.6 ^a		13	32.5 ^b		0	--		9	12.5		136	24.9		
Savings banking service	23	29.5 ^a	21	14.6		50	27.6 ^b		4	14.8		10	25.0		0	--		10	13.9		118	21.6		
Beautician's service	22	28.2 ^b	25	17.4		35	19.3		8	29.6 ^a		6	15.0		0	--		8	11.1		102	18.6		
Automotive repair service	25	32.1 ^a	31	21.5 ^b		25	13.8		5	18.5		3	7.5		0	--		1	1.4		90	16.4		
Barber's service	13	16.7 ^b	17	11.8		25	13.8		7	25.9 ^a		6	15.0		0	--		3	4.2		71	13.0		
No. of times in highest percentage	7		2			3			6			1			1			--						
No. of times in second highest percentage	5		1			7			5			1			1			--						

^aHighest percentage.^bSecond highest percentage.

Table 9. --Selection of preferred service center by occupation of head of household

Occupational Groups	Greater Aalborg		Local Service Centers	
	Number of House-holds	Per Cent of Group	Number of House-holds	Per Cent of Group
1. Professional and managerial	59	75.6	19	24.4
2. Shopkeepers, merchants and master craftsmen	92	63.9	52	36.1
3. Farmers	102	56.4	79	43.6
4. Office and government employees	20	74.1	7	25.9
5. Skilled labor	23	57.5	17	42.5
6. Semi-skilled labor	1	20.0	4	80.0
7. Unskilled labor	<u>41</u>	56.9	<u>31</u>	43.1
Totals	338	61.8	209	38.2

Observations about Occupational Group 1

Group 1 (professional and managerial) has the greatest total number of highest purchase intensities (Table 8). This group has also the greatest preference for Greater Aalborg as its service center (Table 9). However, in frequency of travel to Greater Aalborg, this group, measured in percentage of the group, occupies second place after Group 2 (shopkeepers, merchants, and master craftsmen), see Table 10.

The goods and services for which Group 1 has the highest purchase intensities are: (1) ladies' apparel; (2) shoes; (3)

Table 10. -- The annual frequency of trips to Greater Aalborg by occupation of head of household

Occupational Group	>52		26-52		18-25		12-17		6-11		3-5		2		0		Totals	
	Number of Households	Per Cent of Group	Number of Households	Per Cent of Group	Number of Households	Per Cent of Group	Number of Households	Per Cent of Group	Number of Households	Per Cent of Group	Number of Households	Per Cent of Group	Number of Households	Per Cent of Group	Number of Households	Per Cent of Group	Number of Households	Per Cent
1. ^b	15	19.2	21	26.9 ^a	14	17.9	13	16.7	11	14.1	4	5.1	--	--	--	--	78	100.0
2.	30	20.8	26	18.0	20	13.9	21	14.6	23	16.0	18	12.5	4	2.8	2	1.4	144	100.0
3.	13	7.2	31	17.1	40	22.9	29	16.0	35	19.3	28	15.5	5	2.8	--	--	181	100.0
4.	5	13.5	6	22.2 ^a	4	14.8	2	7.4	3	11.1	6	22.2 ^a	1	3.7	--	--	27	100.0
5.	6	15.0	7	17.5	7	17.5	5	12.5	10	25.0 ^a	5	12.5	--	--	--	--	40	100.0
6.	--	--	1	20.0	--	--	1	20.0	3	60.0 ^a	--	--	--	--	--	--	5	100.0
7.	7	9.7	9	12.5	9	12.5	10	13.9	16	22.2 ^a	15	20.8	6	8.3	--	--	72	100.0
Tl.	76	13.9	101	18.5	94	17.2	81	14.8	101	18.5	76	13.9	16	2.8	2	0.4	547	100.0
																		Per Cent of Total Sample (547)

^a Highest percentage in the occupational group.

^b 1. = Professional and managerial; 2. = Merchants and master craftsmen; 3. = Farmers; 4. = Office and government employees; 5. = Skilled labor; 6. = Semi-skilled labor; 7. = Unskilled labor.

hosiery; (4) hard-, kitchen-, and chinaware; (5) banking; (6) savings banking; and (7) automotive repairs. Generally, these are goods for which a consumer desires to have a wide range of selection before deciding to make a purchase.³

The levels of education and incomes of the households comprising this group may be assumed to be higher than those of the six other groups. This presumably results in greater knowledge and appreciation of the real world and a greater availability of money that can be spent for travel. Hence these households are more sophisticated in the use of their milieu. Their desires are not easily satisfied in relatively small service centers. The fact that this group occupies first place in selecting Greater Aalborg as its preferred service center indicates this (Table 9).

The above might lead to the conclusion that Group 1 has greater mobility within the RSA than the other groups, which is somewhat contradictory as it has already been noted that this group travels less frequently to Greater Aalborg than Group 2. Also the proportion of households owning motor vehicles is less than in Group 2 (Tables 10 and 11). In analyzing the questionnaires, however, it was noted that several of the households in Group 1 did

³Savings banks are generally local institutions whereas banks are branches of financial institutions in Aalborg and Copenhagen.

Table 11. --Motor vehicle ownership presented on basis of occupational groups

Occupational Group	Total Number of Households in Group	Number of Motor Vehicle Owners	Per Cent of Group
1. Professional and managerial	78	65	83.3
2. Shopkeepers, merchants, and master craftsmen	144	127	88.2
3. Farmers	181	101	55.8
4. Office and government employees	27	20	74.1
5. Skilled labor	40	17	42.5
6. Semi-skilled labor	5	1	20.0
7. Unskilled labor	<u>72</u>	<u>15</u>	20.8
Totals	547	346	63.3

some of their purchasing in Copenhagen.⁴ In many cases, this is influenced by the fact that the head of the household obtained part of his education in Denmark's capital. This indicates that households in this group may travel further to obtain certain goods than the remainder of the sample.

Observations about Occupational Group 2

Group 2 (shopkeepers, merchants, and master craftsmen) has generally received less education than Group 1. However, some

⁴This was corroborated during several visits to Copenhagen in the spring of 1962. From time to time, I encountered women from Greater Aalborg shopping in the large department stores of Copenhagen.

households in Group 2 may have a higher income than some households in Group 1. Group 2 had only two first places in highest purchase intensity, viz., accounting service and the purchase of motor vehicles (Table 8). Accounting establishments are not available in the RSA except in Greater Aalborg.⁵ Thus in Group 2, many households that use accounting services in their businesses obtain these in Greater Aalborg. The greater intensity of purchases of motor vehicles probably results from the need for special types of motor vehicles used by the heads of these households in exercising their occupation.

The frequency of travel of Group 2 to Greater Aalborg appears to be higher than that of Group 1, but this does not seem to lead to higher purchase intensities. Group 2 makes apparently many trips to Greater Aalborg for business purposes, such as calling on wholesale establishments, obtaining merchandise, and so on, without making purchases of goods for the household. Other considerations for the relatively low purchase intensities of this group are that its households do a great deal of their shopping locally, because their livelihood depends to a certain degree on the goodwill towards them in their home communities. Some of these households in Group 2 may even have a number of the goods used in this study available in their own businesses.

⁵Cf., Table 2, p. 29.

Observations about Occupational Group 3

Group 3 (farmers) has only three first places in highest purchase intensities in Greater Aalborg, viz., (1) books; (2) dental service; and (3) furniture. On the other hand, seven second places are noted, viz., (1) ladies' apparel; (2) shoes; (3) hosiery; (4) hard-, kitchen-, and chinaware; (5) legal service; (6) banking; (7) savings banking (Table 8). This group's level of education and income is generally lower than that of Groups 1 and 2. The relatively smaller percentage of motor vehicle ownership, as compared to Groups 1 and 2, is one indicator of the lower income (Table 11).

This group also travels less frequently to Greater Aalborg than Groups 1 and 2 (Table 10). I have observed while doing the field work in Greater Aalborg that the farmers are sometimes accompanied by their wives, indicating that many of their trips to this central place have a multiple purpose.⁶ Moreover, many of their purchases in Greater Aalborg may be in answer to needs accumulated over a period of time. Although many of the households in this group selected relatively small central places as preferred

⁶The Aalborg Livestock Exchange holds markets on Tuesdays and Fridays which results in a somewhat larger number of shoppers in the main shopping streets of Greater Aalborg. It can be assumed that households of other occupational groups also make multi-purpose trips to this city. This could not be observed because members of these consumer units have similar appearances as inhabitants of Greater Aalborg.

service centers (Table 9), their proportion of purchases in Greater Aalborg is rather high (Table 8). It may be assumed that some of these households by-pass their local service centers and purchase in Greater Aalborg a variety of the 20 goods used.

Observations about Occupational Group 4

Group 4 (office and government employees) is rather small and thus the data collected may not be fully representative. First places in consumer purchase intensity are noted for (1) movie house attendance, (2) radio and television, (3) legal service, (4) pharmaceuticals, (5) beautician's service, and (6) barber's service (Table 8). Sociologically, this group could be classified as "white collar." In Denmark, persons belonging to this group tend, at times, to emulate and aspire to those things done and obtained by Group 1 (professional and managerial). This is also evident from the choice of a preferred service center (Table 9). Government employment carries a certain degree of status but this is not necessarily reflected in high income. Some government employees often travel to Greater Aalborg on official business and may combine the visit with a purchase.

The diversity in the frequency of travel to Greater Aalborg indicates that the drawing power of this city varies for the different components of this group (Table 10). It is probable that government employees tend to travel more often to Greater Aalborg than those who are among office employees in private businesses.

Conclusion

From the above data it may be concluded that occupational groupings play a significant role in the type and magnitude of purchases made in Greater Aalborg by households in its RSA. The occupation of a head of a household also influences the frequency of trips made to this central place, and in the selection of preferred service centers by the households. Thus, the drawing power of a central place will be greater not only for those households in its immediate vicinity, but also for consumers who have a relatively high social status. Therefore, it is correct to state that the image of the environment and of an individual good varies between occupational groups as well as between the households comprising a group.⁷

The variations in purchase intensities of households as a result of the interrelationships of the above factors and other such as car ownership, the type of population node in which a household is located, the location of the place of employment of a household's head, and the straightline distance to the nearest central place in relation to the household's residence are presented in the chapter that ensues.

⁷Differential shopping behavior on the basis of status was also noted by Gregory P. Stone and William H. Form, The Local Community Clothing Market: A Study of the Social and Social-Psychological Contexts of Shopping (East Lansing, Michigan: Michigan State University Agricultural Experiment Station, Technical Bulletin 262, 1957), p. 4.

CHAPTER V

SELECTED SPATIAL ASPECTS ASSOCIATED WITH
THE USE OF A CENTRAL PLACE FOR
THE PURCHASES OF GOODS

The Hypothesized Statements

The conclusions of the previous two chapters were based on analyses of information derived from aggregate data presented cartographically and tabularly. A multiple correlation and regression analysis was used to test the hypothesized statements made earlier, viz., that the variations in the proportions of a selected group of goods obtained in a specific central place, the dependent variable, Y , is a function of the following independent variables:

- X_1 - the occupation of the head of the household;
- X_2 - the distance in minutes from the place of residence to the central place;
- X_3 - ownership of an automotive vehicle;
- X_4 - the type of population node in which a household is located;
- X_5 - the location of the place of employment of a household's head;

X_6 - the frequency of trips to the central place by a household's purchaser of goods;

X_7 - the central place chosen by a household's members as its preferred service center; and

X_8 - the straightline distance from the household's residence to the nearest major central place.¹

Each of these eight independent variables is hypothesized to be significant in accounting for the spatial variations in the proportion of selected goods purchased in Greater Aalborg by the households in the RSA. The purpose of the multiple correlation and regression analysis is to provide an empirical verification of suspected relationships. The regression equation will estimate and provide information about the average relationship between the variables over all 547 households. Thus the linkage between the consumer unit and a major central place is not only expressed by time-distance, direction of movement, frequency of trips to that location, and purchase intensities but is also related to other factors such as the occupation of the head of a household.

Information on the suspected relationships was primarily obtained from the questionnaires. As described in the following paragraphs, exceptions to this were: (1) the distance in minutes from

¹Cf., p. 11.

the place of residence of a household to Greater Aalborg (X_2); and (2) the straightline distance from the household's residence to the nearest major central place (X_8).

The Dependent Variable

The same 20 goods used previously were utilized in obtaining a quantitative value for the dependent variable.² It was computed for each sampled household by using the following formula:

$$Y = \frac{n}{t}$$

where \underline{Y} is the dependent variable expressed as a percentage, \underline{n} is the total number of the 20 goods obtained in Greater Aalborg by one household, and \underline{t} represents the 20 goods. Thus, the purchase intensity of each household in relation to Greater Aalborg is indicated as a percentage. This value is a measure quantifying the impact of Greater Aalborg on consumers residing in the RSA.

The Independent Variables

The same classification of occupational groups as presented in Table 7 was used to obtain the first independent variable (X_1).³ This variable shows the influence of the occupation of the head of a household as a socio-psychological factor on the linkage between a consumer unit and a major central place. It is expected that the

²Cf., p. 34.

³Cf., p. 57.

higher the status of a household is, the stronger will be its tie-in with Greater Aalborg.

The distance between a household and Greater Aalborg is expressed in 5-minute intervals of bus travel time on weekdays (X_2). This method was used because bus travel time presents a more uniform picture of time-distance than automobile travel time in which individual driving habits cause considerable variations. Moreover, the schedule of bus travel time reflects the types of roads traveled by the bus. The time-distance value for each consumer unit was obtained by locating the household's nearest major bus stop.⁴ It is suspected that the proportion of the 20 goods bought in Greater Aalborg diminishes with an increase in time-distance.

Automobile ownership was considered as another significant factor in a household's relationship to Greater Aalborg (X_3). From the questionnaires it was determined that 347 households, 63.6 per cent of the sample, owned private motor vehicles. The expectation is that ownership of an automobile increases the propensity of a household to shop in Greater Aalborg.

The next variable (X_4) expresses a classification of the type of settlement in which a household resides. The Danish Statistical Office recognizes four kinds of settlements: (1) a chartered town

⁴Køreplaner for Rutebilerne (Aalborg: A/S Aalborg Rutebilstation, 1961), pp. 26-96.

Table 12. --Bus time-distance to Greater Aalborg

Time-Distance in 5-Minute Intervals	Number of Households	Per Cent of Total Sample
05	0	0.0
10	3	0.5
15	38	6.9
20	48	8.8
25	36	6.6
30	87	15.9
35	44	8.0
40	34	6.2
45	51	9.4
50	71	13.1
55	46	8.4
60	56	10.2
65	11	2.0
70	0	0.0
75	6	1.1
80	3	0.5
85	0	0.0
90	11	2.0
95	<u>2</u>	<u>0.4</u>
Total	547	100.0

Table 13. --Number of households in types of population nodes

Type of Population Node	Number of Households	Per Cent of Total Sample
1. Chartered town or city	37	6.8
2. Station-town	235	43.0
3. Hamlet or village	159	29.1
4. Scattered	<u>116</u>	<u>21.1</u>
Totals	547	100.0

or city; (2) a population node with a railroad station; (3) a hamlet or village; and (4) dwellings scattered over the landscape. This classification was used in the construction of Table 13 which is based on information supplied by the households. It is assumed that consumer units residing in large population nodes (chartered towns) will not be as closely linked to Greater Aalborg as those households having their domiciles in smaller settlements.

The location of the place of employment of the head of the household is presented by variable X_5 . The only differentiation made was whether or not the household's head carried out his occupational duties or services in Greater Aalborg. Analysis shows that 32 heads of families or 5.9 per cent of the sample worked in Greater Aalborg. If the head of the household works in this central place, the expectation is that his family will purchase more there than the other consumer units.

Variable X_6 represents the frequency of travel to Greater Aalborg by a household. The number of trips made per year to Greater Aalborg is shown in Table 14. The classifications are similar to those used in Tables 7 and 10. It is suspected that a consumer unit's linkage with the major central place is related to its frequency of trips.

Since each household indicated the central place which it considered as a preferred service center, it was not difficult to

Table 14. --Total annual frequency of trips to Greater Aalborg

Description of Class	Number of Households	Per Cent of Total Sample
1. > 52	76	13.9
2. 26-52	101	18.5
3. 18-25	94	17.2
4. 12-17	81	14.8
5. 6-11	101	18.5
6. 3-5	76	13.9
7. 2	16	2.8
8. 0	2	0.4
Totals	547	100.0

establish variable X_7 . The result was that 338 households or 61.8 per cent of the sample mentioned Greater Aalborg as their preferred service center. If this major central place is a consumer unit's preferred service center, it is anticipated that its tie-in with Greater Aalborg is stronger than that of the other consumer units.

The last variable X_8 deals with the straightline distance of a household to the nearest major central place. The value for this variable was established by determining whether or not a family's residence was within a five kilometer radius from a major central place (Fig. 10).⁵ It is felt that the closer a consumer unit is to a major central place, the weaker its relationship to Greater Aalborg will be.

⁵Cf., pp. 28-29.

In the preceding paragraphs quantitative measures of the sampled households were described. The obtained values were subsequently used in the multiple correlation and regression analysis.⁶

The Results of the Multiple Correlation and Regression Analysis

The first set of results from the multiple correlation and regression analysis pertains to the coefficients of simple correlation (Table 15).⁷ They present only the degree of empirical association between the variables. In two cases certain relationships pertaining to the hypothesized statements could be established, viz., (1) with an increase in time-distance (X_2) the propensity to shop in Greater Aalborg decreases; and (2) the choice of Greater Aalborg as preferred service center (X_7) tends to correspond to the proportion

⁶An average household in the sample could be described as follows: (1) It purchases nine out of the 20 goods in Greater Aalborg; (2) its head is likely to be a farmer; (3) it is located 40 minutes of bus travel time from Greater Aalborg; (4) it has use of an automobile (two out of three households); (5) its location is in a population node, either a station town, village or hamlet, i.e., it is not scattered dwellings; (6) the household's head does not work in Greater Aalborg; (7) the frequency of travel to Greater Aalborg is between once every three weeks and once per month (statistically once in 25 days); (8) the majority of households consider Greater Aalborg their preferred service center (two out of three households); and (9) the location of the household is over five kilometers from the nearest sizable central place (two out of three households). Cf., p. 19.

⁷The design of the presentation of the multiple correlation and regression analysis is based on Arthur H. Robinson et al., "A Correlation and Regression Analysis Applied to Rural Farm Population Densities in the Great Plains," Annals of the Association of American Geographers, Vol. 51, 1961, pp. 211-221.

Table 15. --Coefficients of simple correlation^a

	Y	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈
Y	1.00	-.16	-.56	+.22	+.14	+.11	-.46	+.55	+.43
X ₁		1.00	+.03	-.44	-.07	+.24	+.18	-.09	-.02
X ₂			1.00	-.07	+.07	-.15	+.33	-.28	-.26
X ₃				1.00	-.02	-.07	-.27	+.14	+.04
X ₄					1.00	-.09	+.07	-.04	+.27
X ₅						1.00	-.08	+.07	+.01
X ₆							1.00	-.17	-.16
X ₇								1.00	+.23
X ₈									1.00

^aThe symbolization is the same as used in the hypothetical statement, pp. 71-72.

of goods purchased by a household in that central place. The low coefficients of correlation between the independent variables ($X_1 \dots 8$) show that little or no relationship exists between them. In all other cases the coefficients seem too small to offer valid conclusions.

The coefficients of partial correlation (Table 16) show the degree of association of the dependent variable (Y) with any one of the independent variables ($X_1 \dots 8$) while holding these constant.

It is apparent that still the same variables (X_2 and X_7) are strongly associated with the dependent variable, although the coefficients are less than the coefficients of simple correlation. In addition it is noted that the variable measuring the frequency of trips to Greater Aalborg (X_6) plays a relatively important role in accounting for the variation in the proportion of goods purchased in that central place.

Table 16. --Coefficients of partial correlation

$r_{yx1.2345678} = -.05$	$r_{yx5.1234678} = +.06$
$r_{yx2.1345678} = -.42$	$r_{yx6.1234578} = -.34$
$r_{yx3.1245678} = +.09$	$r_{yx7.1234568} = +.49$
$r_{yx4.1235678} = +.22$	$r_{yx8.1234567} = +.25$

Table 17. --Additional coefficients

Coefficient of Multiple Correlation	$R = .79$
Coefficient of Multiple Determination	$R^2 = .62$
Coefficient of Multiple Determination (Corrected)	$R^2 = .62$

Although only three of the variables are closely associated with variations in the proportions of goods purchased in Greater Aalborg, the coefficients of multiple determination ($R^2 = .62$)

indicate that 62 per cent of the variations between households are explainable by the variables used.

In presenting the results of the statistical estimates cartographically, residuals from regression were used. The formula for this is

$$A = Y - Y_c$$

where A is the residual value for each household, Y is the observed value of the dependent variable of each household, and Y_c is the computed value of the dependent variable derived from the least squares regression equation for all households which is

$$Y = 46.78 - .512X_1 - .515X_2^* + 3.659X_3^{**} + 4.483X_4 + 4.837X_5 - 3.896X_6^* + 20.723X_7^* + 10.166X_8^*.$$

*Significant at the 99 per cent level.

**Significant at the 95 per cent level.

The residual values for the entire sample were grouped into five classes within each township (Table 18). The boundaries between these classes have been selected so as to distinguish between low, moderate and extreme departures from the expected values of purchase intensities. Other means for establishing these boundaries were experimented with, but the final result--a classification into townships with predominately positive residuals or predominately

Table 18. --Residual values by townships

Name of Township	Type of Township		Number of Households				
			Over	-6 to	+5 to	+6 to	Over
	+	-	-16	-15	-5	+15	+16
Aaby-Biersted	x		1	4	12	4	12
Als	x				5	2	1
Astrup-St. Arden	x		1		7	1	2
Brovst	x		3	2	7	4	5
Brønderslev		x	8	4	9	4	2
Buderup-Gravlev		x	5	4	1	5	1
Bælum-Solbjerg	x		1	3	3	1	2
Dronninglund		x	18	9	10	3	2
Ellishøj-Svenstrup	x		1	4	6	4	2
Ferslev-Dal-							
Volsted	x			2	3	2	3
Fræer	x			1	1		1
Gerding-Blenstrup	x			2	3		1
Gudum-Lillevorde		x	1	2	3	2	1
Gunderup-Nøvling	x		2	2	5	6	4
Gøl	x				1	1	2
Hals	x			4	5	3	1
Haverslev-							
Bejstrup	x			1	2	2	
Hellevad-Ørum		x	5	1	1	2	
Horsens-Hammer		x	5	3	5	3	2
Jetsmark		x	2	6	4	4	
Kongerslev		x	4	1	4	2	2
Mou	x			2	2	5	6
Nibe		x	4	5	1		
Ravnskilde		x	2	1		2	
Romdrup-Klarup	x			1	1	4	1
Saltum-Hune	x			1	3	2	3
Sejlflod	x			2	1	1	1
Skibsted-Lyngby		x		2	2	1	
Skørping	x		1	3	2	2	2
Store Brøndum	x			1	2		1
Storvorde		x	1		4	1	
Sulsted-Ajstrup	x		4	4	4	4	6
Sønderholm-							
Frejlev		x	3	4	3	6	2
Sønderup-Suldrup		x	3	6		1	1

Table 18. --Continued

Name of Township	Type of Township		Number of Households				
			Over	-6 to	+5 to	+6 to	Over
	+	-	-16	-15	-5	+15	+16
Ulsted	x			1	1	1	3
Vadum	x		1	2	5	5	7
Vedsted	x				1	3	2
Vester and Øster Hassing		x	8	4	6	7	2
Voer		x	6	2	1	2	1
Vokslev		x	1	2	2	1	1
Øland	x				1		2
Øster Brønderslev Hallund		x	8		1		
Øster Hornum	x			5	7	2	1
Øster Svenstrup	x		1		2	1	1
Total	26	18	100	103	149	109	89
(547)							

^aThe Danish alphabetical order has been used.

negative residuals--remained the same.⁸ Of course, this would also be true of the resultant areal pattern.

The areal pattern of this classification by townships (Fig. 27) reveals that the explanation for the variations of the dependent

⁸A greater degree of correlation between the variables could be achieved by arbitrarily excluding the extreme residual values. This would also permit the computation of standardized values for the residuals. Cf. Edwin N. Thomas, Maps of Residuals from Regression: Their Characteristics and Uses in Geographic Research, Department of Geography Studies, No. 2 (Iowa City, Iowa: State University of Iowa, 1960), p. 21 and p. 36.

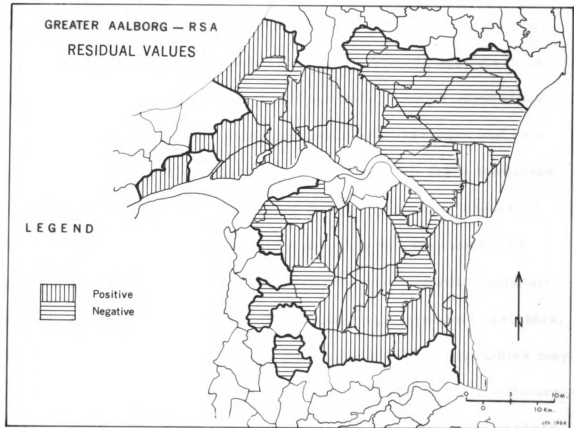


Figure 27

variable is not uniform throughout the RSA. North of the Limfjord is a large contiguous area consistently showing negative values for the residuals. This is also the case south of this body of water at some distance from Greater Aalborg. In those townships, the proportion of the 20 goods purchased in Greater Aalborg appears to be less than would be expected on the basis of the values computed for the independent variables used in this multiple correlation and regression analysis. The opposite could be stated for those townships having predominantly positive values for the residuals. Figure 27 does not suggest any obvious explanations for this distribution of residuals. The pattern in Fig. 27 may have resulted from randomness and perhaps some, at this time unknown, independent variables. The residuals do not present any clues as to what these variables may be. Since the results of the analysis of residuals are not conclusive--keeping the hypothesized statements in mind--the evaluation of these statements has to be made by using some of the conclusions drawn in earlier chapters.

Conclusion

The occupation of a head of a household influences, to a certain degree, the type and quantity of purchases made in Greater Aalborg by residents in the RSA (Chapter IV). The suspected significance of the occupation of a head of a household on its purchase intensity was

not supported by the multiple correlation and regression analysis.

This independent variable is perhaps highly intercorrelated with one or more of the other independent variables. Another reason for this apparent contradiction is that the dependent variable, the variations in the proportions of the 20 goods purchased in Greater Aalborg, does not consider that each of these 20 goods is evaluated differently in the decision-making process of each of the households in the seven occupational groups.⁹

The multiple correlation and regression analysis showed that time-distance and the selection of Greater Aalborg as preferred service center tend to play a role in determining variations in the proportions of these 20 goods bought in Greater Aalborg. The latter means that the perception of the RSA by some of the sampled households matches to some extent their actual performance as consumers. In addition, it was noted that the frequency of trips to Greater Aalborg also has some bearing on the magnitude of purchases made in that central place. The remaining four independent variables, viz., (1) ownership of an automotive vehicle, (2) the type of population node in which a household is located, (3) the location of the place of employment of a household's head, and (4) the straightline distance

⁹An alternative approach would have been to use one good or a number of related goods such as ladies' apparel, shoes, and men's clothing as the dependent variable.

to the nearest major central place in relation to the purchaser's residence, do not seem to play a significant role in determining the variations in the proportions of the 20 goods obtained in Greater Aalborg.

On the basis of observed relationships the earlier hypothesized statement may now be phrased as follows: the variations in the proportions of a selected number of goods or an individual good obtained in a specific central place is primarily a function of the distance in minutes from the place of residence of a consumer unit to the central place, the frequency of trips to the central place by the household's purchaser of goods, the central place chosen by a household's members as its preferred service center, and possibly the occupation of a head of a household.

CHAPTER VI

CONCLUSIONS AND SUMMARY OF FINDINGS

Conclusions

This study was based on the assumption that the behavior of individual households as consuming units results from their decision-making processes. These involve the selection of locations of retail establishments amenable to consumers when purchasing goods and services. The major emphasis was on areal patterns and associated factors related to the use by consumers of a relatively large central place, Greater Aalborg. For the purpose of this research Greater Aalborg was considered a point on a plane.

A sample comprised of 547 questionnaires completed by members of households residing in the environs of Greater Aalborg was used to obtain the basic data. Although this was a non-random sample and did not fully represent all the households in the tributary area of Greater Aalborg, it proved to be valuable because it provided information otherwise not available among conventional sources. Moreover, the data thus obtained could be transformed into written, cartographic, tabular, and statistical presentations. It became clear from the results obtained that geographers interested in the

spatial aspects of human behavior do not need to depend wholly on information gathered for other purposes, i.e. a census, but can utilize this sampling technique and arrive at valid conclusions.

The areal extent of the retail service area (RSA) of Greater Aalborg was determined by the spatial distribution of the households comprising the sample. The resultant RSA consisted of 44 townships. The physical environment was rather uniform and could a priori be ruled out of having much bearing on the geographic relations between the consumers in the RSA and Greater Aalborg, excepting the Limfjord.

Data derived from the questionnaires were first used in establishing the consumer purchase intensities that exist in the RSA for 20 selected goods and services obtainable in Greater Aalborg. These purchase intensities varied for each good and each township. The highest values were generally encountered in those townships bordering on Greater Aalborg. The choice of Greater Aalborg as the preferred service center was also high in these townships. The above two facts led to a division of the RSA into two subregions, viz., the proximal and the peripheral retail service areas. The areal configuration of the proximal retail service area was related to factors associated with transportation. It was found that it takes 15 minutes by automobile or 30 minutes by bus from Greater Aalborg to reach the outer limits of the proximal retail service area.

Further, the frequency of travel to this central place from points in the proximal retail service area also appeared to be greater than the number of trips originating in the peripheral retail service area.

It became clear that (1) consumer purchase intensities are not uniformly distributed in the RSA of a major central place; (2) the drawing power --partially resulting from historical antecedents --of Greater Aalborg diminishes rapidly with an increase in time-distance as exemplified in the proximal retail service area; and (3) the latter is rather small in areal extent.

Subsequently, it was shown that consumer purchase intensities, choices of preferred service centers, and frequencies of travel to Greater Aalborg are related to the occupation of the head of a household which was assumed to be an indicator of the social and economic status of a consumer unit. The greater the education and the income received by a head of a household, the greater is the magnitude of purchasing done in Greater Aalborg for such goods as ladies' apparel, shoes, hosiery, and the more frequent is the choice of Greater Aalborg as a preferred service center. The number of trips to Greater Aalborg also appears to be greater with households of a higher social and economic standing; this, however, does not mean that the number of purchases made in Greater Aalborg increases. Therefore, it was concluded that the occupation of a head of a household influences the degree of the relationship of a consumer unit with

a specific central place.

The above conclusions were reached by analyzing aggregate data. A multiple correlation and regression analysis made it possible to describe the average relationship between each individual observation and the variations in consumer purchase intensities. This relationship was hypothesized to be a function of eight independent variables. The multiple correlation and regression analysis demonstrated that the following variables, viz., (1) time-distance to the major central place; (2) choice of the major central place as the preferred service center; and (3) the frequency of travel to this population node have bearing on the propensity to shop in that place. The remaining five independent variables, viz., (1) occupation of the head of the household; (2) ownership of an automobile; (3) the type of population node in which a household is located; (4) the location of the place of employment of a household's head; and (5) the straightline distance to the nearest major central place in relation to a household's residence did not seem to be significantly related to the magnitude of purchasing done in Greater Aalborg. The reason that the occupation of the head of the household did not appear important in this analysis, even though it was previously stated as significant, is probably due to its intercorrelation with the other independent variables.

The mapping of residual values from the regression analysis shows that the variation of the dependent variable, consumer purchase intensity, is not homogeneous throughout the RSA. The areal pattern of the residuals does not suggest any particular additional independent variables.

More empirical studies dealing with behavioral factors of man in relation to his environment are needed to evaluate properly theoretical frameworks and models which may appear to be true, but when applied to specific problems in specific areas do not, at times, correlate with the actual behavior of man. Studies such as these may lead to new theories. The techniques used, will, under certain conditions and modifications, be applicable to regions other than the one studied.

Summary of Major Findings

The major findings may be summarized as follows:

- (1) Consumer purchase intensities vary from good to good and from place to place and thus they are unevenly distributed in the retail service area of a central place such as Greater Aalborg.
- (2) The proximal retail service area of this major central place is smaller in areal extent than is generally assumed. This is due to the time-distance and accessibility to that population node.

- (3) The occupation of the head of the household per se influences purchase intensities, selection of the preferred service center, and the frequency of travel to a specific central place by a consumer unit. This factor plays a lesser role in determining the proportion of goods purchased in a major central place when it is related with other variables.
- (4) The spatial variations in consumer purchase intensities of individual households are functions of (a) time-distance to a major central place; (b) frequency of travel to that population node; and (c) the selection of this major central place as the preferred service center.
- (5) The spatial variations in consumer purchase intensities of individual households are not significantly related to (a) ownership of an automobile; (b) the type of population node in which a household is located; (c) the location of the place of employment of the head of a household; and (d) the straightline distance to the nearest major central place in relation to a household's residence.

APPENDIX A

THE ORIGINAL QUESTIONNAIRE AND ITS TRANSLATION

Questionnaire for students whose families do not reside within the Greater Aalborg area (Aalborg, Nørresundby, Hasseris, Sundby-Hvorup, and Sønder Tranders townships).

Presently, an American geographer, Charles Hess, M.S., is doing research for his doctoral dissertation which deals with retail service areas in Northern Jutland, viz., where people reside, purchase goods, obtain their education, etc. To obtain data for this project you are asked to fill out this questionnaire. The answers should be as precise as possible as the results of this study depend on the accuracy of your answers. ONLY ONE ANSWER APPLIES TO EACH QUESTION. Place an X in the squares applying to your situation.

1. Township in which your family resides: _____
2. Student's year of birth: _____
3. Student's sex: _____
4. Does your family reside: in a town with a charter ☐ _____
in a town with a railroad station ☐ _____
in a village or hamlet ☐ _____
in the countryside ☐ _____
5. What is your father's occupation? _____
6. Does your mother work? Yes ☐ No ☐ What kind of work? _____
7. In which town/township does your father work? _____
8. In which town/township does your mother work? _____
9. Does your family own an automobile? Yes ☐ No ☐
10. Is this automobile used exclusively for private driving? ☐
for a combination of private and commercial use? ☐
for commercial use only? ☐
11. In which town was this automobile purchased? _____
12. In which town does your family P R E F E R to purchase the following daily needed goods? (If they are produced at home write "self.")

a. milk	_____	e. fruits and vegetables	_____
b. bread	_____	f. meats	_____
c. groceries	_____	g. liquor	_____
d. fuel	_____	h. tobacco	_____
13. In which town does your family P R E F E R to purchase the following consumer goods?

a. men's clothing	_____	e. radio and television	_____
b. ladies' apparel	_____	f. shoes	_____
c. hosiery	_____	g. books	_____
d. hard-, kitchen-, and chinaware	_____	h. furniture	_____

Spørgeskema for studerende, hvis familie ikke bor inden for Aalborgområdet (Aalborg, Nørresundby, Hasseris, Sundby-Hvorup og Sønder Tranders kommuner).

En amerikansk geograf, magister Charles Hess, foretager for tiden til brug ved en doktorafhandling studier over nørrejydske oplandsforhold, d. v.s., hvorledes folk er bosat, foretager indkøb, uddannes o.s.v. I den anledning beder man Dem udfylde dette spørgeskema. Svarene må være så omhyggelige som muligt, da undersøgelsens resultat vil være afhængig af besvarelsernes nøjagtighed. SKEMAET MÅ KUN UDFYLDES MED E E N BESVARELSE AF HVERT SPØRGSMÅL. Sæt X i den pågældende rubrik, som kendetegner Deres forhold.

1. Familiens hjemstedskommune:	2. Studerendes fødselsår:	3. Studerendes køn:
--------------------------------	---------------------------	---------------------

4. Bor Deres familie:

i en købstad,	<input type="checkbox"/>	navn _____
i en stationsby,	<input type="checkbox"/>	navn _____
i en landsby,	<input type="checkbox"/>	navn _____
på landet?	<input type="checkbox"/>	

5. Deres faders erhverv? _____

6. Har Deres moder udearbejde? Ja ☐ nej ☐ hvilket? _____

7. I hvilken by/kommune arbejder Deres fader? _____

8. I hvilken by/kommune arbejder Deres moder? _____

9. Har familien bil? Ja ☐ nej ☐

10. Anvendes den udelukkende til privatkørsel? ☐ udelukkende til erhvervskørsel? ☐
til kombineret privat- og erhvervskørsel? ☐

11. I hvilken by er den købt? _____

12. I hvilken by køber familien F O R T R I N S V I S følgende dagligvarer? (Hvis de produceres hjemme, skrives "selv").

- | | | | |
|------------------|-------|------------------------|-------|
| a. mælk | _____ | e. grøntsager og frugt | _____ |
| b. brød | _____ | f. kød | _____ |
| c. kolonialvarer | _____ | g. vin | _____ |
| d. brændsel | _____ | h. tobaksvarer | _____ |

13. I hvilken by køber familien F O R T R I N S V I S følgende udvalgsvarer?

- | | | | |
|--------------|-------|----------------|-------|
| a. herretøj | _____ | e. radio og TV | _____ |
| b. dametøj | _____ | f. sko | _____ |
| c. trikotage | _____ | g. bøger | _____ |
| d. isenkram | _____ | h. møbler | _____ |

14. I hvilken by bor/ligger familiens:

- | | | | |
|-------------|-------|-----------------|-------|
| a. apotek | _____ | f. herrefrisør | _____ |
| b. læge | _____ | g. damefrisør | _____ |
| c. tandlæge | _____ | h. bank | _____ |
| d. sagfører | _____ | i. sparekasse | _____ |
| e. revisor | _____ | k. bilreparatør | _____ |
| l. vaskeri | _____ | m. renseri | _____ |

15. I hvilken by købes eventuelt landbrugsmaskiner? _____

16. I hvilken by går familions medlemmer
f o r t r i n s v i s i biografen?

17. Hvilken by betragter familien som
sin "indkøbsby"?

18. Hvor ofte tager Deres familie dertil for:

- a. at købe ind (familiens indkøber) ca. _____ gange om året
b. at gå i teater, biograf o.l. (forældrene) ca. _____ gange om året
c. kombineret indkøb og forlystelser (") ca. _____ gange om året

19. Hvilket af følgende transportmidler benytter familiens indkøber of-
test til Deres "indkøbsby"? (se pkt. 17)

- a. tog ☐ b. bus ☐ c. egen bil ☐ d. knallert/cykel ☐

Følgende spørgsmål (pkt. 20, 21, 22 og 23) udfyldes ikke, hvis Aal-
borg er Deres "indkøbsby", (se pkt. 17).

20. Hvor ofte tager Deres forældre til Aalborg? ca. _____ gange om året

21. Rejser Deres forældre hovedsagelig for at:

- a. købe ind ☐ b. more sig ☐
c. gå i bank el. sparekasse ☐ d. besøge familie el. bekendte ☐
e. en kombination af ovennævnte ☐

22. Rejser Deres forældre el. familiens indkøber nu og da til Aalborg for
at købe ind, selv om de samme varer kan fås i Deres "indkøbsby"?

ja ☐ nej ☐

23. Hvilket af følgende transportmidler benytter familiens indkøber el.
forældrene oftest til rejse til Aalborg?

- a. tog ☐ b. bus ☐ c. egen bil ☐ d. knallert/cykel ☐

24. Hvorfor har De valgt Aalborg som studieby?

25. Evt. supplerende oplysninger til de enkelte spørgsmål.
Var venlig at henvide til punkterne.

14. In which town does your family obtain the following services?

- | | |
|---------------------|----------------------------|
| a. pharmacy _____ | f. barber _____ |
| b. physician _____ | g. beautician _____ |
| c. dentist _____ | h. bank _____ |
| d. lawyer _____ | i. savings bank _____ |
| e. accountant _____ | k. automobile repair _____ |
| l. laundry _____ | m. dry cleaner _____ |

15. In which town is agricultural equipment purchased? _____ OVER

16. In which town do the members of your family go to the movies?

17. Which town does your family consider its "service town"?

18. How often does your family go to this place:

- a. to purchase goods and services (the family's purchaser)
appr. _____ times per year
- b. to attend the theater, movie, etc. (parents)
appr. _____ times per year
- c. a combination of purchasing and recreation
appr. _____ times per year

19. Which of the following means of transportation does the family's purchaser use most frequently to travel to your "service town"? (see number 17)

- a. train ☐ b. bus ☐ c. own automobile ☐ d. motorbike/
motorcycle ☐

The following questions (numbers 20, 21, 22 and 23) should not be answered in the case that Aalborg is your "service town" (see no. 17).

20. How often do your parents go to Aalborg? approx. _____ times per year.

21. Do your parents mainly travel to: a. purchase goods and services ☐;
b. recreation ☐; c. to go to banks or savings banks ☐; d. to visit
relatives or friends ☐; e. a combination of the above ☐.

22. Do your parents or your purchasing agent travel to Aalborg from time
to time to purchase goods and services although these may be available
in your "service town"? Yes ☐ No ☐

23. Which of the following means of transportation does your family's
purchasing agent or do your parents use most frequently to travel to
Aalborg?

- a. train ☐ b. bus ☐ c. own automobile ☐ d. motorbike/
motorcycle ☐

24. Why did you select Aalborg as a place of study?

25. Supplementary information to the individual questions. Please in
answering refer to the numbers of the questions.

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