The central place system of the Thessaly region of Greece

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by

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ABSTRACT

The settlement system of Thessaly is examined within the framework provided by central place theory. The adoption of a systems approach to the research determines the organization of the work. Firstly, there is an analysis of the sectoral structure of the Greek economy with particular reference to retail trade. The importance of tertiary activity in the economy is indicated and the traditional nature of most Greek retailing is considered. Next, the physical, historical, economic and demographic background of Thessaly is described. The region consists of a fertile plain surrounded on all sides by mountains. The economy is dominated by agriculture and the secondary and tertiary sectors are strongly oriented to it. In the post-war period the population of the area has stagnated because of heavy rural emigration focussed primarily on Athens. The analysis of the settlement system then falls into three parts. The functional regions of Thessaly are identified by subjecting an interaction matrix of bus traffic flows to factor analysis. These describe the general structure of the settlement system and allow the subsequent detailed analysis of the settlement system of West Thessaly to be placed within a wider context. This detailed analysis is based primarily on data collected in the field. It consists of a study of the hierarchical and spatial structure of the system and the aggregate relationships between its components. A well developed hierarchical structure is found, and its historical evolution is examined. Following this, a study of consumer movements in West Thessaly is made which is based on data collected from questionnaires circulated in the region. The behaviour of the settlement system as revealed by this analysis accords closely with the structure of the system. A composite assessment of the settlement system is then made which relates its structure and behaviour to the theoretical framework of the research, and comparisons are made with other studies of settlement systems in Greece. Finally, the Greek regional problem is examined, one element in which is the nature and role of the provincial settlement system, and the implications of this research for future planning strategies are outlined.

PREFACE

During the work for a Master's dissertation on urbanization in Greece it became apparent to me that there was great scope for original geographical research in the country. This thesis is the outcome of that realization. It is concerned with an analysis of the central place system of the region of Thessaly with some emphasis on retail trade. The topic was chosen partly because of an interest in empirical central place work in general, and partly because it seemed an appropriate starting point for quantitatively oriented research on the urban and economic geography of Greece.

Undertaking the research work and producing the thesis would not have been possible without the aid of many people. In this country, I am very grateful to Michael Drury who supervised the work from initial conception to final draft and whose assistance many times extended beyond that normally expected of a supervisor. My research colleagues at Durham provided a stimulating atmosphere in which to work. Although it may be slightly invidious to single any individuals out, I would like to acknowledge the specific assistance given by Clive Palmer in computing and Leon Adamopoulos in computing and the Greek language. The technical staff at Newcastle University have assisted in the production of the thesis and in particular I wish to thank Doreen Shanks for all the photographic work.

In Greece, I am grateful for material and discussions provided by staff of the following institutions: the National Centre for Social Research, the Centre for Planning and Economic Research, the National Statistical Service, the Ministry of Education and Religion, the Ministry of Co-ordination, the Town Planning departments of the Universities of Athens and Thessaloniki, the Regional Development Service of Thessaly, and the prefectures of Trikala and Kardhitsa. For the academic year 1972/73 I received a state scholarship from the Greek government for residential study in the country.

I am extremely grateful to my parents for

their support during part of the research and I hope the work has sufficient merit to have justified it.

Finally, my thanks must go to all those anonymous people in Thessaly whose generous hospitality made my work there such a pleasant and memorable experience and whose friendly co-operation made it all possible.

NOTE ON TRANSLITERATION

Unless there is a commonly accepted English equivalent, all Greek words and place names in this thesis (except in Appendix A) have been transliterated into Latin letters using the following schema:

Α, α	–	a
Β, β	–	v or b
Γ, γ	–	g or y
Δ, δ	–	dh (pronounced as th in the)
Ε, ε	–	e
Ζ, ζ	–	z
Η, η	–	i
Θ, θ	–	th (prounounced as in thin)
Ι, ι	–	i
Κ, κ	–	k
Λ, λ	–	l
Μ, μ	–	m
Ν, ν	–	n
Ξ, ξ	–	x
Ο, ο	–	o
Π, π	–	p
Ρ, ρ	–	r
Σ, σ, ς	–	s
Τ, τ	–	t
Υ, υ	–	i (f or v after α or ε) or υ
Φ, φ	–	f
Χ, χ	–	ch (pronounced as in Scottish Loch)
Ψ, ψ	–	ps
Ω, ω	–	o

Dipthongs

μπ	–	b or mb
γκ	–	g or ng
γγ	–	ng
ντ	–	d or nd

CHAPTER ONE

THE REGIONAL AND THEORETICAL FRAMEWORK OF THE STUDY

SECTION A INTRODUCTION

The relatively small amount of geographical research that has been done on Greece, a country of similar area to England, is unusual by European standards. This can be attributed in part to the absence of professional Greek geographers and in part to a lack of interest in the country by foreign ones. A contributory factor may be that its location together with its historical and cultural heritage, which has strong indigenous elements, make it impossible to readily group Greece with other countries, and it therefore falls outside the fields of established Area Studies.[1]

The geographical work that has been done to date can be divided broadly into the regional geography which attempts a comprehensive description and analysis of areas, and systematic geography which is concerned with particular themes.

Apart from sections in general texts on Europe or the Mediterranean there has been no detailed regional text on Greece as a whole since the Admiralty Handbooks of World War II (Admiralty 1944/45), although the Social and Economic Atlas of Greece by Kayser and Thompson (1964) did provide a detailed statistical description of many aspects of the population and the economy. Recently, however, two monographs in the French regional tradition have been published, one by Kolodny (1974) on the Aegean Islands and the other by

Sivignon (1975) on Thessaly. Both are very detailed collections of information on the physical and human geography of their areas from which attempts are made to assess the unique character of the respective regions. Sivignon's work is the most comprehensive in the topics it covers while Kolodny places a strong emphasis on population. In addition, the Regional Development Services in Greece produce fairly detailed descriptions of their particular areas, and two regional studies have been produced by the Town Planning School of the National Polytechnic (National Polytechnic 1971, 1973). As well as these, there have been a number of smaller scale studies such as those by de Vooys (1959) on West Thessaly and Vouras (1960) on northern Greece. At a more local level still, several village studies have been published (for example Kayser 1964a, Burgel 1965).

The only aspect of systematic geography that has been covered in any depth is population and migration, and in this field other social scientists have been at least as productive as geographers. Studies have been made both at the national scale (for example, Kayser 1964b, Wagstaff 1968, Bennison 1976) and at the regional and sub-regional scales (for example, Kayser et al 1971, Baxevanis 1972). Apart from this, geographical work on other social, economic and cultural topics has been at best piecemeal, at worst non-existent. Moreover, little of it has adopted a generalizing nomothetic approach.

Economic and social studies are better developed in Greece. Here the work published by the Centre for Planning and Economic Research (K.E.P.E.) and the

National Centre for Social Research (E.K.K.E.) form the most important contributions although there are others as well, especially in Economics. Some of these studies incorporate a spatial perspective but it rarely goes below the level of the ten statistical regions of Greece (Fig. 1:1). One reason for this, and perhaps the most important, is that much of the statistical data published by the National Statistical Service of Greece or by government departments is rarely disaggregated below that level. Any detailed economic or social study below the regional scale is therefore severely restricted and must rely either on personal ad hoc data collection in the field or, if available and accessible, unpublished information from local authorities and organisations.

The paucity of geographical work on Greece, together with the strong emphasis on the idiographic approach in that which has been done, means that there is considerable scope for geographical research within the country, and especially for research which aims to generalize about the nature of particular phenomena and the processes that are operating to produce them. Neither need such research only be of academic interest. It has potential practical value as well since some of the most pressing problems in Greece have an important spatial dimension and planning is unlikely to be effective so long as there is insufficient knowledge on which to base programmes of action.

This thesis is an investigation of the settlement system of the Thessaly region of Greece and is made within the framework provided by central place theory. It aim is to provide a description of the structure and

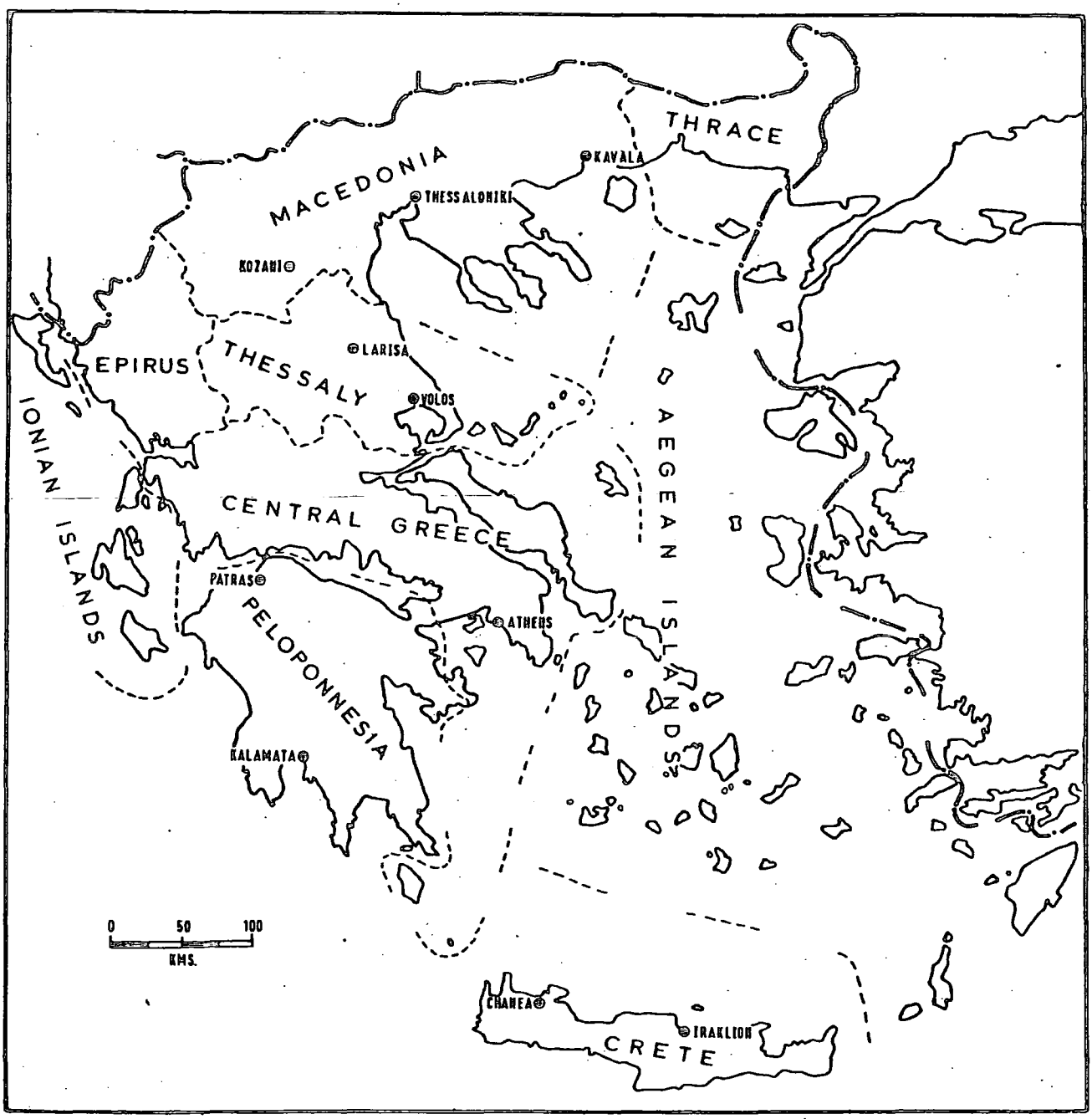


Figure 1:1 Statistical regions and industrial centres of Greece.

and functioning of the settlement systems of provincial Greece with some emphasis on the role of retailing although it is also hoped that the research will provide a contribution to the methodology of empirical central place studies.

As with other topics, there has not been a great deal of work done on the settlement systems of Greece. The Centre for Planning and Economic Research produced a report in 1967 on the national network of urban centres (K.E.P.E. 1967). This has been complemented by some consideration of settlement systems in the regional studies mentioned above as well as some studies on the dominating role that Athens plays in the country (for example, Dicks 1967, Evangelinides 1975). Most of these are referred to in the final two chapters although the part of Sivignon's work that deals with the urban network of Thessaly is clearly of significance in this study and is therefore considered in more detail at an earlier stage. It can be noted here, however, that its methodology and conceptual framework are not rigorously defined and it has not obviated the need for additional and more detailed effort in this field.[2] Substantive work on retail trade in Greece is confined to a monograph by Preston (1968) which is mainly an analysis of census data and so here, too, there is much scope for further research.

The particular reason for choosing to do a central place study was that it was considered an appropriate starting point for urban research in Greece. It provides a basis for understanding the structure and dynamics of the urban system, and this has significant implications in the fields of regional and sub-regional planning. The emphasis

on retail trade derives partly from personal preference but also partly because of data constraints on examining non-retail activity (although it is by no means excluded).

The region of Thessaly was chosen for the detailed case study because, firstly, it is an area of considerable contrasts with, on the one hand, a potentially very productive plain and, on the other, extensive mountain areas which are rapidly losing their population. Secondly, it is located mid-way between Athens and Thessaloniki on an axis which, it is envisaged, will become the major growth zone of the country; and, thirdly, it is an area where neither large scale industry nor tourist developments have distorted the settlement pattern. It also had the fortuitous advantage of being the location of field trips by students from the Durham Geography Department in 1970 and 1971.

Central place theory is one of the best developed of geographical theories and its testing and modification have been the subject of a very large body of literature: bibliographies are provided by Berry and Pred (1961), Barnum et al (1965) and Andrews (1970). It forms an appropriate framework to the study of settlement systems, especially in non-industrial areas where tertiary activity is the dominant sector in urban economies. Despite the volume of work, however, the replicability of central place studies remains a problem (W. K. D. Davies 1968): it is not a great exaggeration to state that there are almost as many methodologies as there are central place studies. Any new central place research must therefore assess the various techniques and approaches that have been used. If they are considered wanting then it may be necessary to develop more suitable

ones. Interaction theory is another body of theory and is concerned primarily with movements, complementing the structural emphasis of central place theory. The principal elements of both central place theory and interaction theory are described in the following section. In the third section an attempt is made to integrate them through adopting a systems approach: this provides the conceptual framework for the study and the structure of research which it implies has determined the organization of the thesis.

SECTION B CENTRAL PLACE SYSTEMS: THEORETICAL FORMULATION AND EMPIRICAL VERIFICATION

The fundamental feature of the geography of tertiary economic activity is the clustering of establishments within centres. Settlements which contain such establishments act as foci of movement for consumers who visit to buy the goods and services they supply, and are termed central places. Because there are differences in the frequencies and sizes of purchase of different goods or use of services, in the costs of providing them, and in the distances people are willing to travel to buy or use them, central place functions do not all have the same location requirements regarding access to consumers. A variety of central places therefore exists in any area.

Central place theory is concerned with the location, size, nature and spacing of these service centres. Although its initial formulation was intended as an explanation of the hierarchical and spatial distribution of settlements it has subsequently developed as a major theoretical framework

for the study of the geography of tertiary activity at both the inter-urban and intra-urban scales.

Classical central place theory is complemented by interaction theory, a less rigidly structured set of statements which attempts to describe and explain patterns of movement by using the gravity concept. While interaction theory has wide application, a number of specific models and laws relating to consumer movements have been postulated.

1. Central Place Theory

Although theories of settlement location and size go back some time (Dawson 1969), the work of Christaller, first published in 1933, is considered the starting point for modern research on this subject. Lösch produced an alternative formulation in 1954, since when there have been attempts to modify both models by authors who have considered the original ones too restrictive and divorced from reality.

(a) Christaller's Model

Christaller developed his model to explain the sizes, number and distribution of towns since he considered that these could not be accounted for 'by their location in respect to the geographical conditions of nature' (Christaller 1966, p.2). The principal modification to the original model was by Berry and Garrison (1958b) who developed the threshold concept and made the model more applicable to tertiary economic activity at both inter-urban and intra-urban levels of enquiry. It is this modified version as interpreted by Marshall (1969, Ch.2) which is outlined below.

Equilibrium of a single supplier: the initial assumptions of Christaller's model are (i) an isotropic plain over which there is an evenly distributed farm population with constant disposable income and over which movement is unrestricted in all directions, and (ii) perfect competition.

If a good is made available for sale at a point on the plain, a consumer who buys the good must pay not only the constant purchase price but also the cost of travelling from his farm to the supplier and back. This will vary with his distance from the supplier, and so the actual cost of the good from the consumer's viewpoint increases with distance from the point of supply. Following classical economic theory, as the cost of a good rises the quantity demanded will decline: in spatial terms, the quantity demanded declines as distance from the supplier increases. A point will be reached where farmers are not willing to pay the transportation costs necessary to reach the supplier and demand for the good will be zero. The supplier's market area will have a circular perimeter beyond which there is no demand for the good, and the radius of this market area is the range of the good.

It will not be possible for the supplier to stay in business unless he is patronised by a certain minimum number of consumers. If the number of consumers falls below this critical level the supplier will not be able to meet his own costs (including normal profits) and his enterprise will fail. The minimum number of customers necessary to support the supply of a particular good is the good's threshold. It follows from this that the threshold of a good sets a minimum value on the range of that good. The supply of the good is

therefore economically feasible only when the maximum distance that consumers are willing to travel to buy it is equal to or greater than the radius of a circle containing the threshold population appropriate to that good.

The range of a good therefore has an upper and lower limit. The upper limit is determined by the maximum distances consumers will travel to obtain the good while the lower limit is determined by the good's threshold. The actual limit of the range, however, will be determined by spatial competition among several suppliers of the same good.

Equilibrium of many suppliers: let it be assumed that as many suppliers as possible locate on the plain. This means that the size of the market areas will be minimized: that is, the range of the good will be at its lower limit, set by the threshold required to make the suppliers economically viable. The spatial arrangement of centres will be as in Fig. 1:2, the centres located on a triangular lattice and each market area tangential to six others.

Development of a hierarchical pattern: different goods have different thresholds. Suppose the isotropic plain is to be supplied with n different goods which are ranked from 1 to n in ascending order of threshold requirements. Let supply points for good n be called A centres and let these centres locate on the plain in accordance with the assumptions made earlier. The A centres will thus form a triangular lattice of points on the plain.

Consider now good (n-1), the one with the second highest threshold requirement. The suppliers of this good will maximise their accessibility to their customers if

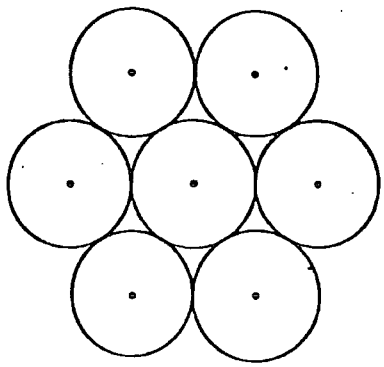


Figure 1:2 Ideal arrangement of suppliers with circular market areas.

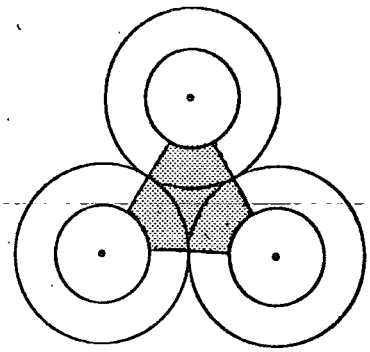


Figure 1:3 The location of excess profits.

Large circles are threshold market areas for suppliers of the good with the highest threshold. Small circles are threshold market areas for suppliers of good G, a good with a lower threshold. The shaded area provides excess profits to suppliers of good G.

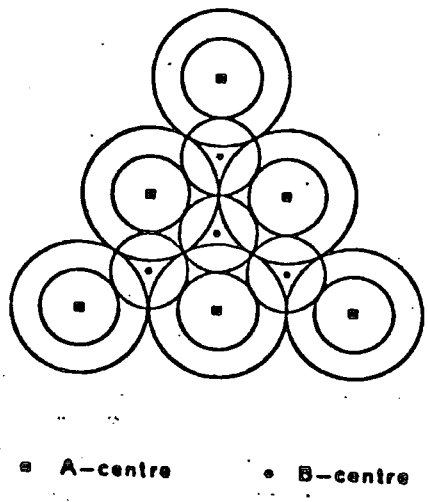


Figure 1:4 The viability of interstitial locations.

Large circles are threshold market areas for suppliers of the good with the highest threshold. Small circles are threshold market areas for suppliers of the hierarchical marginal good of the B order.

they locate in the A centres which have already been established. In this way no new supply points are added to the plain and the aggregate mileage travelled by consumers to obtain either or both goods is not increased.

Since good (n-1) has a lower threshold than good n, spatial competition will determine its range from each centre and the suppliers of good (n-1) will be in a position to earn excess profits.

The same reasoning applies to succeeding goods with progressively lower thresholds. The suppliers will continue to locate in the A centres and as threshold requirements decrease so the aggregate volume of excess profits earned will rise. For the suppliers of a given good, the excess profits represent simply the purchasing power of consumers living between the A centres, but outside imaginary circles centred on the A centres with radii defined by the threshold of the good in question (Fig. 1:3).

As goods with successively lower thresholds are added, a good will be reached - say, good (n-p) - for which the interstitial buying power available as excess profits will in fact be large enough to permit suppliers of good (n-p) to establish themselves not only in the A centres but also in the interstices between these centres. In other words, the purchasing power located in the interstices between suppliers of good (n-p) in the A centres will be equal to the threshold requirement of good (n-p). A second set of centres - B centres - will thus appear. Each B centre will be located at the centre of the triangle formed by three adjacent A centres (Fig. 1:4).

Good (n-p), which marks the entry of the B centres, has been termed a hierarchical marginal good by Berry and Garrison (1958b). The B centres cannot supply any good having a higher threshold than good (n-p), and with the entry of this good, excess profits accruing to suppliers drop back to a minimum.

Each A centre on the plain is surrounded by six other A centres and each is the apex of six equilateral triangles having other A centres at their other apexes. Each A centre is also surrounded by six B centres, one located at the centre of each of the equilateral triangles just described. Each of the B centres is therefore equidistant from three A centres and so for every A centre on the plain there are ($6 \times \frac{1}{3}$) or two B centres.

Each A centre can supply all goods from n to good (n-p) and below while no B centre can supply any good with a higher threshold than good (n-p). In other words, there is a clear distinction between A and B centres in regard to their degree of complexity as service centres. In fact, all A centres are alike, and all B centres are alike. The difference in complexity between the A and B groups is greater than the difference within either group.

Without affecting the logic of the argument, Fig. 1:4 may be redrawn in a less cluttered form by eliminating the quasi-triangular interstices between the sets of tangent circles and replacing each circle with its circumscribed hexagon (Fig. 1:5). No areas on the plain are then unserved or served by more than one supplier, and the hexagon is the space filling polygon which departs least from the circular ideal.

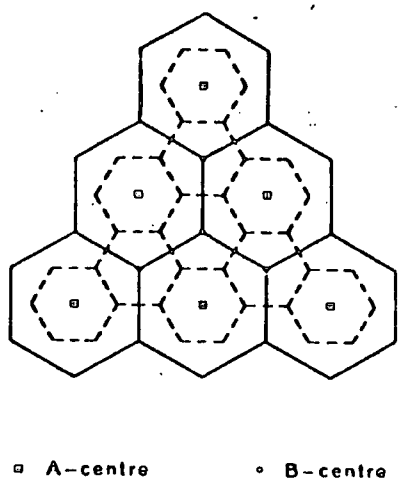


Figure 1:5 The arrangement of A and B centres with hexagonal market areas.

The market areas in this figure are the circumscribed hexagons of the circular market areas in Figure 1.4.

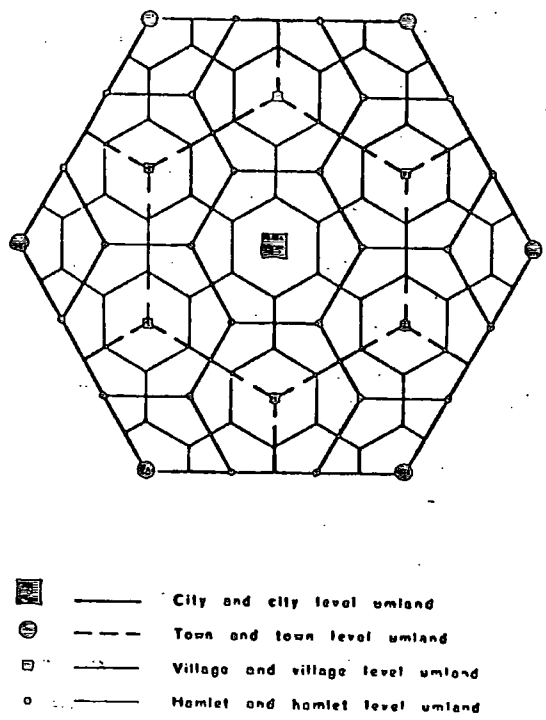


Figure 1:6 Christaller's marketing principle (k=3) model.

The same logic which has been used to account for the appearance on the plain of B centres can be used to justify the appearance of lower orders of C centres, D centres and so on. Each time a new set of centres is added to the plain, the members of that set will be located at the centres of all triangles formed by adjacent pre-existing supply points. The arrangement of several ranks relative to one another is shown in Fig. 1:6.

Counting each centre not only at its highest level but also at lower levels, the ratios of numbers of centres in successive orders is as follows:-

A:B:C:D - 1:3:9:27

This is known as a K=3 hierarchy because each settlement has the equivalent of three of the next lowest order beneath it. Christaller terms this the 'marketing principle' model.

Alternative Christaller Models: an important characteristic of the isotropic plain is that movement was equally unrestricted in all directions. This is clearly an assumption that has no validity in the real world and so Christaller described a model based on a 'traffic principle' which relaxes this assumption.

The logic of the model was not given in detail by Christaller but must have been similar to that of the 'marketing principle' model upto the point at which the A centres were located evenly spaced across the plain. It was then postulated that these A centres would be connected by major transport routes which would influence the position of subsequent centres. The most rational location for the B centres was considered to be at the mid-points of the

routes connecting the A centres. The C centres were then located at the mid-points of the routes between every pair of pre-existing centres, and so on (Fig. 1:7). The ratio of the numbers of places in successive order is

A:B:C:D - 1:4:16:64

and the hierarchy is described as K=4.

Christaller also considered a third model based on a 'separation' or 'administrative' principle. The two previous models contain centres which are located on the boundaries between higher centres of competing rank. This divided economic allegiance did not accord well with the ideals of effective political administration and control. He therefore introduced some evidence to indicate that local and regional seats of government in general hold sway over whole numbers of lesser centres, with the boundaries of administrative areas lying between centres rather than through them. On an empirical basis he suggested a K=7 hierarchy but he was unable to draw a suitable model without distorting the regular arrangement of centres and market areas which was a feature of the previous models. Marshall, however, succeeds in doing this (Fig. 1:8).

Use of the threshold concept allows a relaxation of Chritaller's initial assumption of a uniformly distributed farm population. Given a situation where population density varies, A centres will not necessarily locate equidistant from each other, but they will be located so that each is equally accessible to an identical amount of consumer purchasing power. This implies that the A centres will be close together where the population is dense and

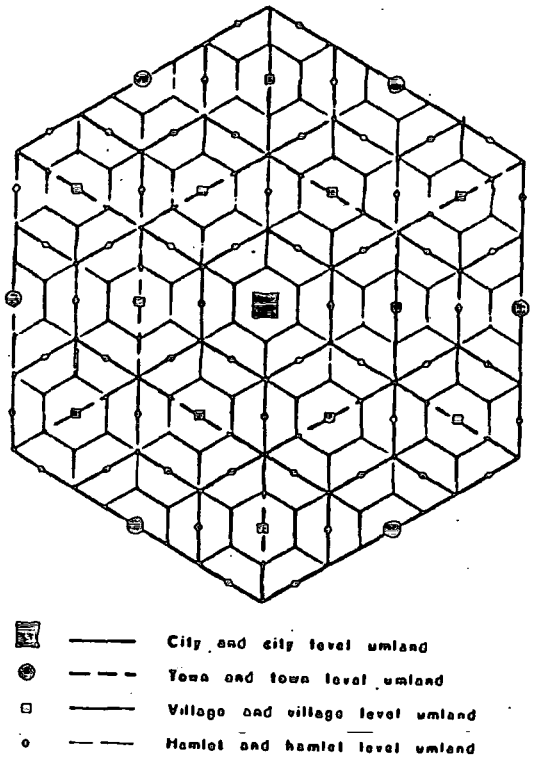


Figure 1:7 Christaller's transport principle (k=4) model.

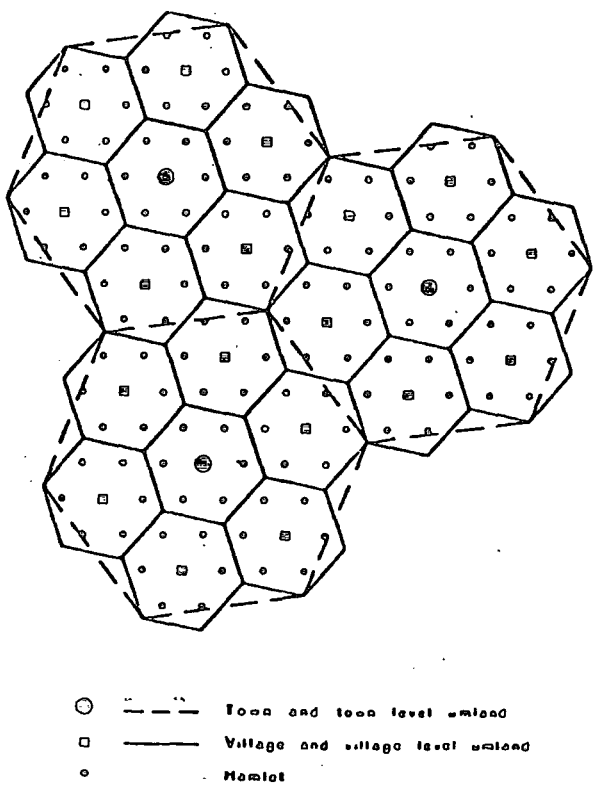


Figure 1:8 A model satisfying Christaller's administrative principle (k=7) conditions.

further apart where it is sparse (Fig. 1:9). The B and lower centres locate relative to the A centres following the arguments of the original model. Although Berry and Garrison (1958a) were concerned only with the K=3 model, Marshall (1969) p.37 considers that the modification can be extended to the K=4 and K=7 hierarchies.

(b) Lösch's Model

An alternative model based on the isotropic plain and hexagonal market areas was formulated by Lösch in 1954. The difference with Christaller is that Lösch placed the emphasis on the location of individual suppliers rather than the relationships between whole centres. The requirement was that the suppliers of any good would locate on the plain in such a way that no excess profits would be earned and the agglomerative tendencies of suppliers are ignored. This contrasts with Christaller's stipulation that the number of central places should be minimized in order to minimize aggregate consumer travel.

The suppliers of any one good therefore locate independently of the location of suppliers of other goods. The network of market areas for the suppliers of any one good has been likened by Marshall (1969) p.38 to a fishnet, the size of the mesh being determined by the threshold of the good in question. Since different goods have different thresholds the complete landscape consists of many such fishnets, each with its own distinctive size of mesh. Lösch postulated that one point on the plain would be a supply centre for all goods. The model was then constructed by superimposing all possible market area nets on the plain

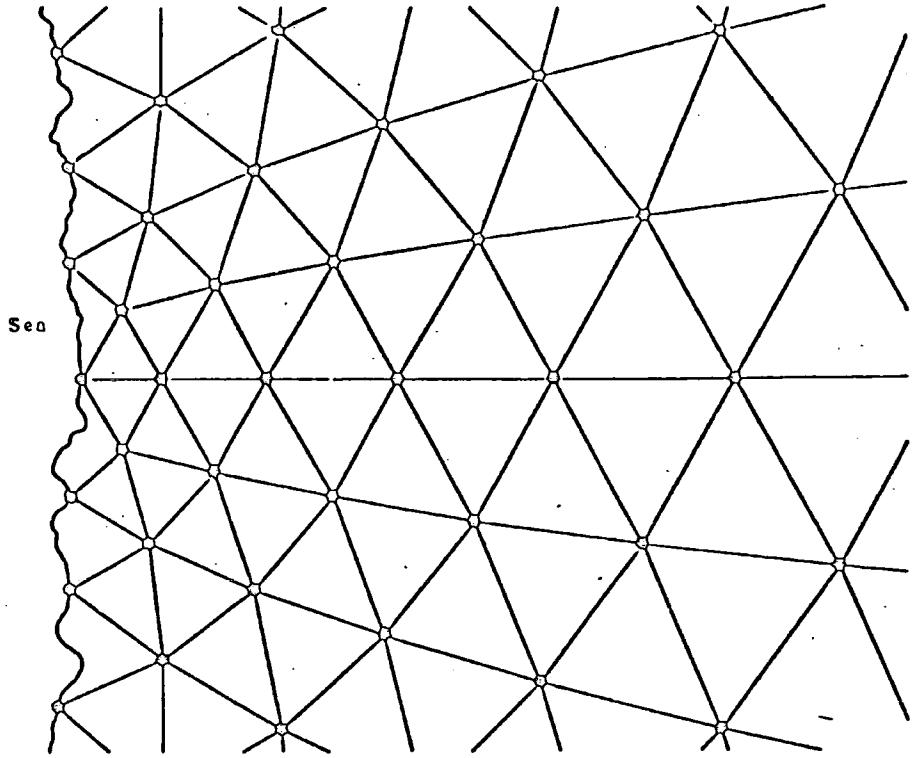


Figure 1:9 Distribution of A centres on an anisotropic plain.

Population density decreases with distance from the coast. Each triangle formed by three A-centres contains the same amount of purchasing power.

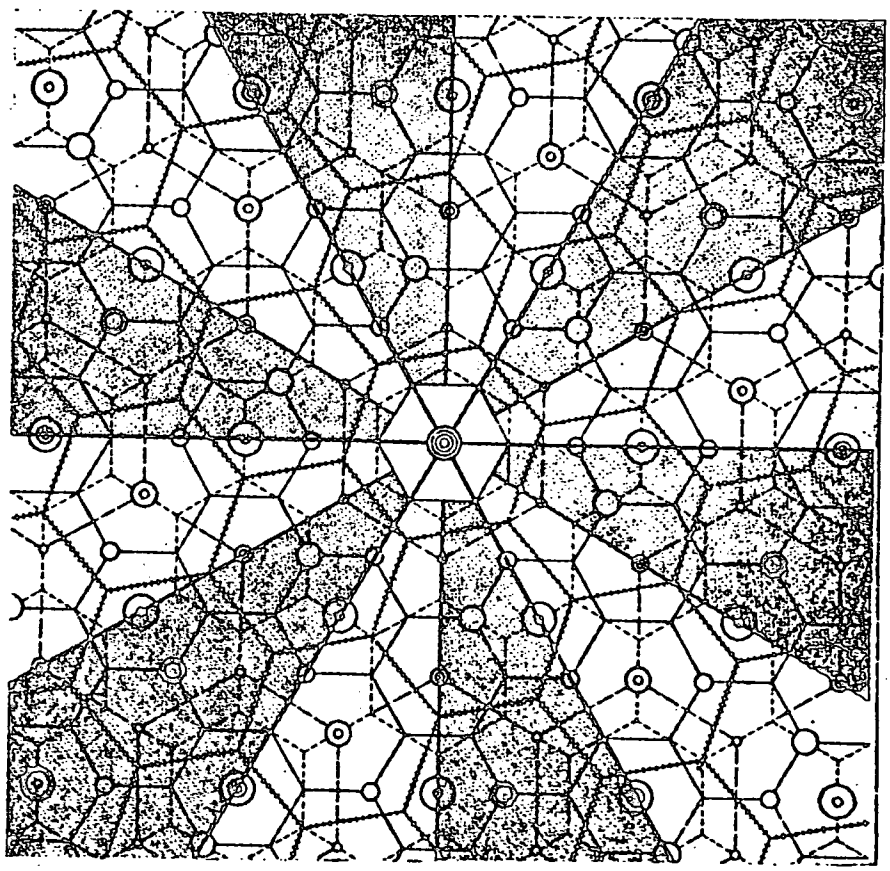


Figure 1:10 Lösch's economic landscape.

and rotating them about the defined central point so that the suppliers of different goods occupied the same location wherever possible. This results in a very complex pattern of centres (Fig. 1:10) which has three significant features:

1 There are six sectors which contain a dense distribution of centres and six with a lower density.

2 The hierarchical structure of Christaller is not well defined and the size distribution of centres forms more of a continuum.

3 The functional structures of the centres are such that those of similar size will not necessarily offer the same types of goods as each other and larger centres will not necessarily provide all the goods that may occur in smaller centres.

An important extension of this model to intra-metropolitan tertiary activity has recently been made by Beavon (1977).

(c) Subsequent Developments of Central Place Theory

Developments of central place theory have taken two principal avenues. The first has been the attempts by some workers (for example, Dacey 1965) to express the theory in mathematical terms and demonstrate that given the assumptions and processes, a pattern and hierarchy of central places can be logically deduced from them. The second have been attempts to develop the theory by replacing some of the rigid behavioural and environmental assumptions of classical economies by ones that are more valid in the real world. Here the work of Rushton (1971), Mitchell et al (1974)

and Parr (1977) are good examples.

Rushton proposes a more realistic spatial behavioural postulate, namely that consumer spatial behaviour in a central place system results from the application of subjective preference functions to the set of spatial alternatives with which all consumers are confronted. This allows a number of aspects of consumer behaviour to be taken into account: for example, the fact that a consumer is more likely to satisfy his requirement for several goods at a large centre than a smaller one which in turn may allow economies of scale in the large centres, lower prices and therefore a larger trade area. The cumulative effect of this and other forces such as the introduction of a non-uniform purchasing surface is to distort the hierarchy of centres so that, although in any local area a hierarchy of centres will be present, over a larger area a continuum will be found.

Mitchell et al attempt a reformulation by shifting the focus from an outlet's demand cone (in the Lösch model) to household demand which is summed over space to create an aggregate demand surface. This means that the assumption of an evenly distributed population with equal disposable incomes and tastes can be eliminated and the model is inherently dynamic since changes in the distribution of population or changes in income or tastes produce changes in the aggregate demand surface. The retail structure of an area can therefore be seen to unfold as population density increases and/or incomes and tastes change. Given the basic structural equations of the model, the geometry of central places depends entirely on the spatial distribution of popu-

lation and its income characteristics. No attempt is made to generate a hierarchy since its existence and form would depend upon both the spatial distribution of demand and the operating characteristics of retail establishments.

An interesting recent development has been Parr's formulation of a General Hierarchical (GH) model. This is an attempt to overcome some of the limitations of the Christaller and Lösch models in describing and analysing actual central place systems. The general setting of the GH model is similar to that of the Christaller and Lösch models. As with these, the model's geometry is characterised by two principal features. The first is that market area sizes increase from the smallest size through to the largest at a rate which is not necessarily constant. The second feature is that the market area nets are capable of being arranged in such a way that the centre of a market area of a given size is also the centre of a market area of each smaller size. Insofar as the GH model possesses a hierarchical functional structure it is similar to the Christaller system. The crucial difference, however, is that K values are not necessarily constant and may vary with hierarchical level. Preliminary empirical testing suggests that the model may provide a more satisfactory description of urban systems than the Christaller model. C.A. Smith (1976) has provided a conceptual model based on a study in Guatemala which is similar in form to Parr's model.

(d) Central Place Theory and Low Income Economies

Central place theory was originally formulated with regard to conditions in Western Europe and North America.

Although subsequently used as the basis for many studies in developing countries (where, indeed, central place hierarchies tend to be more easily identified), it does not, in its original form, readily incorporate some of the features of tertiary activity found in these places. In particular, the significant role that periodic markets and fairs play in commercial life requires separate consideration, as does the effect of low incomes on the hierarchical and spatial provision of goods from fixed establishments.

Periodic markets: there is a dichotomy in the literature between those authors who treat these primarily as social phenomena and those who regard them primarily as economic ones. The concern here is with the latter.

The principal element of the economic approach is that periodic markets are regarded as a response to low spatial demand resulting from low disposable incomes and/or low population densities. The strength of demand regulates the frequency of trader visits instead of dictating a single fixed location for the trader.

Stine (1962) was the first to introduce these concepts. His basic thesis was that mobile traders can enlarge the physical area that encompasses their thresholds by moving from place to place. He suggested that suppliers are mobile when the range of a good is smaller than the supplier's threshold. With increasing incomes demand will rise and the trader will become sedentary: at this point central places come into existence. Until this stage, however, markets are periodic so that demand builds up sufficiently for the mobile trader and 'the consumer, by submitting to the discipline of

time, is able to free himself from the discipline of space.'

Skinner (1964), on the basis of empirical findings in China, extended this analysis to the question of market periodicity. He suggested that the timing of periodicity was governed by demand density (as measured by population density): smaller centres were periodic while larger ones were permanent. As markets grew in size they simply added days to their schedule. In systems of central places that were periodic, scheduling was arranged so that smaller centres never met on days that were in conflict with major days of major centres so that traders could move between market levels with ease. Subsequent work in other parts of the world has led to some refinements in this model (see, for example, C. A. Smith 1976).

An alternative economic analysis based on the Lösch model was proposed by Hay (1971) who utilized the concept of a spatial demand curve. If the long-run-average-cost curve is higher than the spatial demand curve, no scale of permanent retailing activity will be viable and some form of periodic marketing is the solution. This formulation dispenses with references to market areas and the range of a good, and was subsequently developed by Webber and Symanski (1973, 1974).

In a later paper, however, Hay (1974) suggested that previous conceptualisations were inadequate to explain the existence of a demand which is sufficient to support twenty or thirty traders one day in six but incapable of supporting a single permanent trader. He proposed that future attention should be concentrated on three alternative

methods of analysis:

(1) an alternative economic rationale for part-time marketing;

(2) the question of time costs and

(3) the treatment of overhead costs.

Low incomes and permanent retail establishments: Funnell (1973) has raised some theoretical problems which relate to central place systems in a low income economy. Three aspects were examined:

(1) the significance of low income buying behaviour;

(2) seasonality, or the effect of the agricultural cycle;

(3) the relationship between permanent business stores and periodic markets.

The first of these is the most significant from the viewpoint of this study.

In low income economies consumer spatial behaviour has sometimes been considered to be spatially restricted (c.f. Stine 1962) whereas the classical models assume that consumers are mobile. Funnell resolved this contradiction by adopting an alternative strategy which involves the percolation of goods through the system to a much lower level than allowed within the formal structure of traditional theory. High order goods are then available at low-order centres. To achieve this margins on these goods are high and the quantities stocked are small. The kind of shop that characterizes the pattern of service centres is therefore the general store with a product mix that is likely to be much wider than that of a general store in Britain or North America. This implies that

there is likely to be relatively little difference between the number of types of goods sold at centres of different hierarchic levels but that the distinguishing feature may well be stock size. It was argued that this is, in effect, a redistribution of resources within the spatial structure rather than a fundamental alteration of the spatial structure itself. Thus, if the hierarchical organisation is built upon the stock size of enterprises, then the spatial pattern of centres will remain broadly similar.

2 Interaction Theory

Classical central place theory regards consumer spatial behaviour in deterministic terms: a consumer will patronize the nearest centre to himself and the trade area boundaries between centres are rigid. The modifications of classical central place theory which relax some of the behavioural and environmental assumptions do not change the compartmentalized structure of nested trade areas, yet empirical studies of consumer movements (especially in developed economies) show much more fluid spatial patterns. As a general description rather than explanation of these patterns, interaction theory based on the gravity concept has been developed as a more appropriate means of examining these movements.

Interaction theory is much less rigidly formulated than central place theory, consisting of a collection of equations based on Newton's law of gravity. It has been applied to all kinds of movements. The models which have been developed are essentially descriptive although they have been used for predictive purposes.

Reilly (1931) was the first to apply a gravity

model to consumer movement studies. His law of retail gravitation states that 'two cities attract trade from an intermediate town in the vicinity of the breaking point approximately in direct proportion to the populations of the two cities and in inverse proportion to the squares of the distances from these two cities to the intermediate town'. Converse (1949) reformulated the law to determine the exact position within an intermediate area where trade becomes split between two competing centres (the break point model):

$$Db = \frac{d\ a\ b}{1 + \sqrt{\frac{Pa}{Pb}}}$$

where, Db = break point distance of trade to centre b

d a b = distance between centres a and b

Pa, Pb = sizes of centres a and b

If the break points are calculated for several neighbouring centres they can be joined together to construct a set of trade area boundaries. Calculated for Christaller's pattern of central places this model would produce the hexagonal trade areas of the model. As such its usefulness is limited because it does not take into account the different ranges of different goods and it gives no indication of the distance decay effect. Moreover, by having a single break point line it fails to depict the overlapping of trade areas which exists under many circumstances

A model developed by Huff (1967) gives greater scope to these considerations. It is formulated as a series of probablities of consumers choosing to visit one centre from a set of competing centres:

$$Pij = \frac{Fj\ /\ dij^{\alpha}}{\sum_{j=1}^{m} Fj/dij^{\alpha}} \qquad \text{subject to} \quad \sum_{j=1}^{m} Pij = 1.0$$

where, Pij = the probability of a trip from area i to centre j

Fj = the attractiveness of centre j (measured by floor-space)

dij = the deterrence factor (measured by travelling times)

α = an exponent calibrated for different trip purposes.

When the probability values for a series of areas are calculated they can be plotted on a map and contours interpolated to indicate the relative use made of any centre by consumers.

Market potential models are another development of interaction theory and have been used to indicate the growth prospects or accessibility conditions of large areas or cities. The most important aspect has been the attempt to forecast in absolute terms the growth capacities of shopping centres. The Lakshmann and Hansen (1965) model has been the most significant. It takes the form:

$$Sj = \sum_{i=1}^{n} Ci \frac{Fj / dij^{\alpha}}{\sum_{j=1}^{m} Fj/dij^{\alpha}}$$

where, Sj = total sales in centre j

Ci = total consumer expenditures available in area i

Fj = the attractiveness of centre j (measured by floor-space)

dij = the deterrence factor (measured by travelling times)

α = an exponent

This model has been used quite extensively for planning purposes and variations on it have been developed for particular problems (N.E.D.O. 1970).

3 Problems of Empirical Verification

Because of its nature interaction theory poses no problems of empirical verification: it provides a

description and not an explanation of patterns of movement.

In contrast, central place theory is normative and attempts to provide an explanation of the hierarchical and spatial distribution of settlements and/or tertiary economic activity. As such the verification of central place theory must proceed from two points: (1) a determination of the extent to which regularities in hierarchical and spatial organisation exist in reality, and (2) an assessment of the value of central place theory in providing an explanation of these regularities if they do exist.

The fact that a large number of central place studies has been made has already been referred to and it is not intended to provide a comprehensive review of them at this point. It can be noted here, however, that structural regularities in settlement systems would appear from these studies to be a widespread phenomenon. Consumer movement studies done either independently or in conjunction with them appear very generally to show close relationships between the form of the systems and the functional relationships of their component settlements. On the other hand, the lack of scientific rigour in many of these studies together with the large number of different techniques that have been used make comparisons between studies very difficult (W. K. D. Davies 1968a). Moreover, Beavon (1977) has suggested that the intellectual attraction of central place theory at the time when geography was experiencing its 'quantitative revolution' led many people to identify hierarchies when their data did not indicate such a conclusion: 'it was simply a case of recognising the only finding for which there was any theoretical justification'. The need to develop objective common procedures that will allow effective cross-spatial and cross-temporal comparisons is there-

fore still a real one. Only Marshall (1969) has made an attempt to set out a series of basic criteria which can be translated into operational terms for use in empirical work.

The value of central place theory in providing an explanation of these regularities has been seriously questioned by Webber (1971) who outlines the empirical problems that arise in attempting to test its predictions. He states that to accept or reject a theory in a social science context implies three distinct enquiries: 'First, one must ask whether the theory is logically correct; then it must be decided whether the theory actually holds in practice; and finally the theory is evaluated according to its 'importance' ...: Some of these enquiries are simpler to answer than others.'

Regarding the first criterion, it must be shown that, given the assumptions of the theory, the predicted patterns can be logically deduced from them. Although Dacey (1965) has demonstrated that Christaller's model comprises a logical geometric system, Lösch's model has still to be shown to follow logically from the initial premises. Parr (1973) has suggested that there are some internal inconsistencies in the model although he considered that it may be more appropriate at the intra-metropolitan scale at which Beavon (1977) subsequently applied it.

The problem of determining whether or not a theory holds in practice is a difficult one. This does not refer to whether the predicted result is found but rather to whether the behavioural and environmental assumptions from which the result is deduced are observable. Webber considers the possibilities of verifying the behavioural assumptions and concludes that for most it is impossible to observe them in

reality. Similarly, environmental assumptions, particularly that of homogeneity, cannot be found in reality, and transformations are difficult.

As a result of these problems Webber considers central place theory not to have been confirmed and nor will it ever be so. The theory is still of use, however, since it helps in an understanding of the economic processes which determine location patterns even if this understanding is independent of verifiability.

SECTION C THE ORGANIZATION OF THE RESEARCH: A SYSTEMS APPROACH

A systems approach emphasizes the study of phenomena as inter-related components. There are two readily discerned essentials of the approach:

(1) although each part of a system may play an individual role in the system's operation, no part is entirely independent of the others; and

(2) a change in the operation of one part will have significant repurcussions throughout the system (Eliot Hurst 1974, p.33).

The adoption of systems analysis in geography has met with some resistance (Chisholm 1967) but it has become increasingly common as an approach to the analysis of problems since the concept of a system is 'one of the most powerful devices yet invented for deriving satisfactory answers to questions that we pose regarding the complex world that surrounds us' (Harvey 1969, p.479).

The structure of a system consists of three features (Harvey 1969, p.451):

(1) a set of elements identified with some variable

attribute of objects;

(2) a set of relationships between the attributes of objects;

(3) a set of relationships between these attributes of objects and the environment.

System behaviour refers to the flows, stimuli and responses that occur within the structure.

A systems approach can provide a unifying framework for central place studies and it 'could bring.... a welcome note of comparability which has hitherto largely been absent, and without which the formulation of significant generalizations will remain difficult. The lack of any concept of a central place system has been to date one of the major stumbling blocks in empirical work' (Marshall 1969). In examining central place systems, the individuals are the settlements and the principal elements of the system are retail and non-retail service establishments within the settlements, their central functions, and the population of the settlements and their hinterlands. The relationships between these elements and between the elements and their economic environment is the subject of classical central place theory. In aggregate terms the relationships can be expressed as a series of equations such as Berry (1964) provides on the basis of empirical studies in the U.S.A.

The behaviour of a central place system is most commonly regarded as referring to the movements of consumers to establishments/central places, and this is the subject of interaction theory. A wider interpretation could be made, however, and the examination of the way in which systems elements respond to changes in the social and economic environment might be considered here although a dynamic perspective

has rarely been to the fore in central place studies.

The empirical analysis of any type of system produces the problem of boundary identification. The boundaries of a system are given by defining certain elements as being in the system and others as belonging to the environment, but there still remains the operational need to define exactly which elements are to be included and which to be excluded. In a central place system the elements can be readily identified as above, but as a spatial perspective is inherent within the whole central place concept, the spatial limits of the system must also be defined, and this is a more complex matter.

The environment of a system can be thought of in general terms as everything there is. It is useful, however, to use a more restricted definition of an environment as a higher order system of which the system being examined is part and changes in whose elements will bring about direct changes in the values of the elements contained in the system under examination. For a central place system the environment can be considered the total economy of the area being studied: the service sector can be considered as forming a sub-system that acts as the link between the sub-systems of production and consumption, and a central place system is the spatial and hierarchical expression of this sector.

It is not intended to approach this study of central places in Thessaly as a piece of specialised systems analysis. Rather, simply couching a study of the geography of tertiary activity and settlement inter-relations in systems terms helps the formulation of the structure of the research

because it specifies the particular topics which should be investigated and provides a strong unifying framework to the study. The investigation of the central place system of Thessaly has therefore been organised as follows:

1 An examination of the tertiary sector of the Greek economy with particular reference to retail trade with the aim of describing the economic environment of the central place system and the nature of its basic elements.

2 An analysis of the social and economic geography of Thessaly, taking an historical perspective. This describes the wider environment of the system within the region of Thessaly itself and the historical element provides a basis for the interpretation of its temporal dynamics.

3 The delimitation of functional regions within Thessaly. This gives a broad picture of the structure of the settlement system of all Thessaly and defines the spatial limits of the sub-system of West Thessaly.

4 An analysis of the hierarchical and spatial structure of the central place system of West Thessaly.

5 An analysis of the behaviour of the central place system of West Thessaly through an examination of consumer movements within the region.

6 A composite and comparative assessment of the central place system of Thessaly is then attempted, relating the empirical results of the study to other studies and to its theoretical framework.

7 In conclusion the relationship between the settlement system and regional and sub-regional planning is

considered.

It will be obvious from this research framework that the study is based on both data collected in the field and from secondary sources. The timetable for the collection of the various data in Greece was as follows:

1 April-July 1971: fieldwork for data for the analysis of (a) functional regions and (b) the structure of the central place system of West Thessaly.

2 September 1972-June 1973: additional fieldwork for data for the analysis of the structure of the central place system; data collection on consumer movements in West Thessaly; and collection of most of the statistical and background information for the thesis.

3 April 1975 - additional statistical and background information.

4 September/October 1976 - updated statistical data and discussions on the implications of the research.

Because of time and resource constraints the detailed fieldwork based study was confined to West Thessaly. This sub-region was chosen rather than the eastern since it is perhaps more representative of most of provincial Greece. Within this area the study of the structure of the settlement system that is based on data collected in the field was confined to the plain because the problems of terrain and accessibility did not make it feasible to survey the mountain villages in detail.

All the fieldwork was done during the time of the military dictatorship. This did produce some problems in Thessaly involving over-zealous policemen and unhelpful

bureaucrats while there were also delays in Athens in obtaining official clearance to do aspects of the work, but these difficulties were all eventually resolved.

FOOTNOTES

1 Greece does not normally fall into the field of either East European studies (which are concerned with the Communist countries) or Middle Eastern studies (which are confined primarily to the Islamic world although including Cyprus and Israel). In France, however, Mediterranean studies is an established subject division and it is therefore perhaps not surprising that French geographers have been the most active in Greece. The Modern Greek Studies Association in the U.S.A. is a relatively recent foundation (1969) and it is only now that there is a movement to establish a similar group in Europe.

2 I was aware of the existence of this work at an early stage in my research and the first part of my fieldwork is, in fact, referred to by Sivignon (1975) in a footnote on page 500.

CHAPTER TWO

THE SECTORAL STRUCTURE OF THE GREEK ECONOMY WITH PARTICULAR REFERENCE TO RETAIL TRADE

In order to place the study of the central place system of Thessaly within a wider national context the characteristics of the tertiary sector[1] of the Greek economy will be outlined. This chapter will firstly consider, through an examination of employment and national accounts data, the general characteristics of the sectoral structure of the Greek economy as a whole. Secondly, a more detailed analysis of the nature of the distributive trades in the country with particular emphasis on retailing will be made since this aspect is the principal focus of the rest of this research.

Not a great deal of work has been done in Greece on these subjects. Comprehensive studies of the Greek economy such as those by Candilis (1968) or Kayser (1965a) tend to lay emphasis on the primary and secondary sectors. Of work done more specifically on the distributive trades, by far the most important is a substantial monograph by Preston (1968). Related to this field are a small number of econometric studies such as Crockett's (1967) study of consumer expenditure and incomes and that by Kevork et al (1964) on the estimation of future consumer demand. There are also a few books on retailing written specifically for shopkeepers (for example, Michaelidhis and Pavlidhis 1962) but they are not of relevance to the present study.

SECTION A SECTORAL EMPLOYMENT AND OUTPUTS IN GREECE

1 Data Sources

The use of employment and national accounts data to study the sectoral structure of the Greek economy poses some problems, the most important of which is that different classification systems are used.

Data on employment are given in the population censuses. These are available from the 19th century although the analysis here will be confined to the post-war period. The 1951 and 1961 censuses use the same classification system. The regional breakdown in the 1961 census (to *nomoi*) is not as great as that in the 1951 (to *eparchy*[2]). The classification system is as follows (major groupings only):

Agriculture, stock rearing, forestry, hunting and fishing

Extractive industries

Manufacturing industries

Building and construction

Electricity, gas, water and sanitary services

Commerce, banking, insurance and property business

Transport, warehousing and communications

Services

Not declared

The 1971 census results which were available at the time of writing were only those of a 5 per cent sample elaboration. The classification used is the same as that of the two preceeding censuses, although the data are only given at this degree of disaggregation for the national totals and

for Greater Athens, Thessaloniki and Patras. Data at the regional and nomos levels are given only in four groupings:

Agriculture, livestock etc.
Extraction, manufacturing, construction
Trade, Transport, services
Not declared

The 1951 data need to be treated with some caution since it was collected only two years after a decade of highly destructive and disruptive conflict. Unfortunately, no indication of any possibility of unreliability is made in the introduction of this or, indeed, of any of the other censuses.

Data on sector outputs are available from the National Accounts from 1948 to 1974. Twelve major groupings are identified, and there is no further disaggregation. These are as follows:

Agriculture
Mining and quarrying
Manufacturing
Electricity, gas and water works
Construction
Transportation and communications
Wholesale and retail trade
Banking, insurance and real estate
Ownership of dwellings
Public administration and defence
Health and educational services
Miscellaneous services

Generally, there is no spatial disaggregation of the data,

although a breakdown to the level of the region can be found in other publications for particular years (for example, Ministry of Co-ordination, 1968).

2 Sectoral Employment

As Table 2:1 shows, in terms of employment Agriculture was the most important sector in 1971 although it had shown both an absolute and relative decline since 1951. In contrast, both the Manufacturing (including Extractive industries and Construction) and the Services sectors (inc. Trade, Banks and Transport) showed absolute and relative increases in employment, particularly the latter whose share of economically active population rose from 26 per cent in 1951 to 32 per cent in 1971. Within the broad Manufacturing category Construction showed the greatest relative increase, while within the Service sector both Trade and Transport showed similar relative increases. Care must be exercised, however, regarding the accuracy of these data, especially for the 1951-61 period. As noted above, the 1951 census may be unreliable and the relative rise in Agriculture and the decline in both Manufacturing and Services 1951-61 run contrary to the trend in sector outputs (see below) and also the large scale rural-urban migration that was occurring (see Ch. 3D). The decline of 9.7 per cent in total economically active population 1961-71 is also difficult to account for as total population rose by about 4.5 per cent in the same period, although foreign emigration may be the principal factor here.

The aggregate totals do, of course, hide important spatial variations in the relative positions of each sector, and while the most obvious distinction is that between

TABLE 2:1

Sectoral Employment in Greece, 1951, 1961 & 1971

	1951		1961		1971	
	Emp.	% Total	Emp.	% Total	Emp.	% Total
Agriculture, etc.	1,367,271	48.2	1,960,446	53.9	1,330,320	40.5
Extractive ind.	13,627	0.5	21,510	0.6	20,980	0.6
Manufacturing	450,424	15.7	488,577	13.4	539,880	16.4
Electricity/Gas	11,212	0.4	19,804	0.5	24,960	0.7
Construction	74,959	2.6	167,364	4.6	255,020	7.8
Trade	219,903	7.7	266,070	7.3	350,420	10.7
Banks, Insurance					78,140	2.4
Transport	138,025	4.9	153,867	4.2	213,140	6.5
Services	387,622	13.6	439,471	12.1	409,220	12.5
Not declared	176,442	6.2	121,492	3.3	61,800	1.9
TOTAL	2,839,481	100.0	3,638,601	100.0	3,283,880	100.0

SOURCE: 1951, 1961, 1971 Population Censuses.

town and country, regional differences also occur. Table 2:2 shows the sectoral breakdown of employment by regions in 1971 with a division into urban, semi-urban and rural areas.[3]

Greater Athens clearly stands out from the rest with a minimum number of people employed in Agriculture and employment mainly divided between Manufacturing (40 per cent) and Services (55 per cent), reflecting the dominant position which the city holds in both of these sectors. The high percentage of employment in Manufacturing in Central Greece is probably due mainly to the location around Athens of many factories which do not lie within the administrative area of the city. While the relatively low proportion in Services in urban and semi-urban areas undoubtedly reflects the proximity of Athens to much of this region's population. Elsewhere Services are the main source of employment in urban areas with the proportion varying from 59.0 per cent in the Aegean Islands to 43.4 per cent in Thrace. Manufacturing comes second with proportions varying from 41.4 per cent in Macedonia to 25.9 per cent in Thrace. The regional differences in Service employment may partly reflect variations in population densities and distribution: the highest percentage are in the islands where population is relatively dispersed, and the lowest are in Thrace, Macedonia and Thessaly where population densities are higher. The regional variations may also reflect differences in local economic history: the islands have long been trading centres while the mainland regions' economies were for a long time based on subsistence or semi-commercial agriculture. The figures for industrial employment tend to indicate the uniform small and locally oriented nature of much of Greek manufacturing. The higher figure for Macedonia is

TABLE 2:2

Sectoral Employment by Regions (percentage breakdown by urban, semi-urban and rural areas), 1971

	GREATER ATHENS			REST OF CENT. GREECE			PELOPONNESIA		
	U	S-U	R	U	S-U	R	U	S-U	R
Agriculture	0.9	-	-	17.0	37.7	72.5	14.5	40.3	81.4
Manufacturing	40.5	-	-	42.1	31.9	14.0	37.4	24.2	7.6
Services	55.1	-	-	38.2	28.4	12.2	45.8	33.7	10.4
N.D.	3.5	-	-	2.7	2.0	1.3	2.3	1.8	0.6

	IONIAN ISLANDS			EPIRUS			THESSALY		
	U	S-U	R	U	S-U	R	U	S-U	R
Agriculture	6.9	24.2	78.4	13.8	25.5	73.9	11.3	58.4	84.2
Manufacturing	35.1	23.1	8.9	30.3	35.8	14.2	37.5	19.7	7.6
Services	53.7	51.9	12.6	54.9	38.2	10.9	48.2	20.7	7.8
N.D.	4.3	0.8	0.3	1.0	0.5	1.0	3.0	1.2	0.4

	MACEDONIA			THRACE			AEGEAN ISLANDS		
	U	S-U	R	U	S-U	R	U	S-U	R
Agriculture	8.0	57.5	80.9	27.8	63.5	89.1	7.5	36.0	64.0
Manufacturing	41.4	19.9	9.9	25.9	13.7	4.0	30.2	24.4	15.0
Services	48.8	21.4	8.4	43.4	21.2	6.2	59.0	38.4	20.3
N.D.	1.8	1.2	0.8	2.9	1.6	0.7	3.3	1.2	0.7

	CRETE		
	U	S-U	R
Agriculture	9.1	49.1	85.8
Manufacturing	38.8	19.9	6.1
Services	49.4	30.5	2.5
N.D.	2.7	0.5	0.4

SOURCE: 1971 Population Census

probably a measure of larger scale industry in Thessaloniki although a number of smaller towns in this region have old established textile and tobacco industries.

The 'semi-urban' classification is one of dubious value because it incorporates both large settlements which are overwhelmingly rural in character and smaller settlements of dominantly urban character. The variations between regions in the employment structure of these semi-urban areas may be related in part to the consideration of population density made above. In regions like the Aegean Islands and Epirus where rural population is dispersed, settlements falling into this category may usually have urban functions, whereas the extensive plains in Thessaly and Macedonia do contain a number of large villages with populations of more than 2,000 as well as urban centres of a similar size.

The employment structure in rural settlements is naturally strongly oriented to Agriculture with no great regional variations apart from the rather low percentage in the Aegean Islands which may be related to the factors noted above.

Regional changes in employment structure 1951-71 are shown in Table 2:3. A common feature in most regions is the relative decline of agriculture although the degree of decline varies, being greatest in Central Greece (including Greater Athens) and Macedonia. In the Ionian Islands, Thrace and Crete, however, there were small rises over the 1951-71 period although these might for the most part be related to improvements in census coverage: the Not Declared category is the one which declines, and one might intuitively expect this to refer primarily to rural dwellers. In all regions

TABLE 2:3

Percentage Breakdown of Sectoral Employment 1951, 1961 and 1971, by regions

	CENTRAL GREECE			PELOPONNESIA			IONIAN ISLANDS		
	1951	1961	1971	1951	1961	1971	1951	1961	1971
Agriculture	2[illegible].9	25.3	15.7	64.0	68.1	60.1	59.4	68.2	61.2
Manufacturing	28.5	30.1	35.9	12.1	12.3	16.9	12.8	11.6	14.3
Services	39.8	39.3	45.4	18.7	16.8	21.8	22.3	17.7	23.6
N.D.	7.7	5.0	3.0	5.3	2.7	1.2	5.6	2.6	0.9

	EPIRUS			THESSALY			MACEDONIA		
	1951	1961	1971	1951	1961	1971	1951	1961	1971
Agriculture	59.8	69.7	58.6	59.5	65.7	57.7	57.6	64.6	49.0
Manufacturing	15.1	12.6	18.9	16.5	15.0	18.7	16.7	16.3	23.7
Services	19.4	14.7	21.5	18.5	16.4	22.2	20.0	16.6	26.1
N.D.	5.7	3.0	1.0	5.6	3.3	1.4	5.7	2.6	1.3

	THRACE			AEGEAN ISLANDS			CRETE		
	1951	1961	1971	1951	1961	1971	1951	1961	1971
Agriculture	72.0	79.6	72.8	47.9	54.1	46.1	59.7	70.9	62.6
Manufacturing	9.8	8.6	9.9	18.8	18.6	20.2	12.3	11.4	15.8
Services	13.5	10.4	16.0	27.0	24.5	32.4	21.0	16.3	20.6
N.D.	4.7	1.4	1.3	6.3	3.0	1.4	4.8	1.5	1.0

SOURCE: 1951, 1961, 1971 Population Censuses.

Manufacturing showed a relative increase, and this was greatest in Central Greece and Macedonia. Similarly, Services showed a relative increase in all of the regions except Crete.

3 Sectoral Outputs

Fig. 2:1 shows the National Accounts data for 1948 to 1974 with sectoral outputs expressed as percentages of total G.D.P. Broadly, the changes noted in employment in various sectors are reflected in the trends in sectoral output: most notably, a steady decline in the relative contribution of Agriculture to G.D.P. and a corresponding rise in the share of Manufacturing, Extractive industries and Construction. Up to 1969 Retail and Wholesale Trade showed a slight decline, which constrasts with the relative rise in employment in this sector from 1951 to 1971.

Regional differences in G.D.P. are rather greater than the differences that exist in employment structure (Table 2:4). The dominance of Athens is very apparent as the difference between Athens and the second ranking region (Central Greece) is rather greater than the maximum of other inter-regional differences. It is this dichotomy between Athens and the rest of Greece which forms one of the most serious social and economic problems of the country, and it will be a recurrent theme in this thesis.

Papageorgiou (1973), in his examination of the structure of regional economies, included a previously unpublished table of the sectoral structure of regional G.D.P. in 1958 (Table 2:5). In four of the regions - Attica (i.e. Athens), Macedonia, Aegean Islands and Ionian Islands - Services

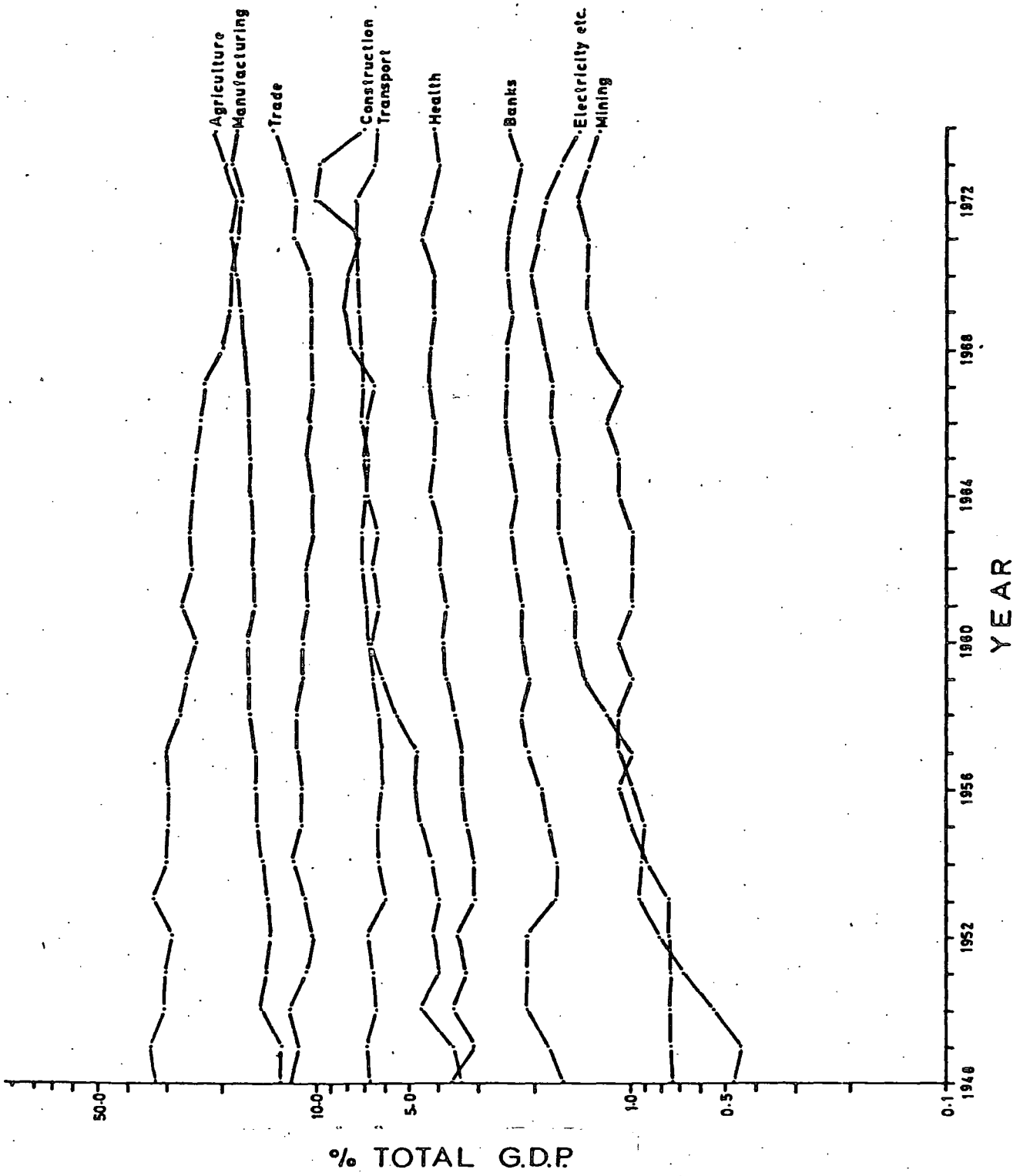


Figure 2:1 Selected sectoral outputs as a proportion of Gross Domestic Product 1948-1974.

TABLE 2:4

Gross Domestic Product by Region, 1965

REGION	Gross per capita product (drachmas)	REGIONAL INDICES Total Greece = 100	Gt. Athens = 100
Greater Athens	27,050	152.6	100.0
Rest Central Greece	17,330	97.7	64.1
Peloponnesia	15,760	88.9	58.3
Ionian Islands	12,990	73.3	48.0
Epirus	10,930	61.7	40.4
Thessaly	12,940	73.0	47.8
Macedonia	15,410	86.9	57.0
Thrace	11,540	65.1	42.7
Aegean Islands	14,110	79.6	52.1
Crete	13,350	75.3	49.4
ALL GREECE	17,730	100.0	65.5

SOURCE: Ministry of Co-ordination (1968)

TABLE 2:5

Percentage of Income Produced by Broad Sectors, by Region 1958

	Agriculture	Manufacturing	Services
Rest Central Greece	50.0	20.6	29.4
Peloponnesia	48.4	21.4	30.2
Ionian Islands	34.6	23.8	41.6
Epirus	45.9	15.8	38.3
Thessaly	50.7	20.7	28.6
Macedonia	37.4	24.6	38.0
Thrace	57.5	14.2	28.3
Aegean Islands	37.4	22.6	40.0
Crete	41.9	21.5	36.6
Attica	2.7	28.2	69.1
ALL GREECE	27.7	24.4	47.9

SOURCE: Table 5.3, Papageorgiou (1973)

is the largest sector, and although this table cannot be directly compared to Table 2:2, the regional variations in employment structure may be correlated with the G.D.P. data.

SECTION B RETAIL TRADE IN GREECE

It was shown in the preceding section that tertiary activity accounts for about one third of employment in Greece, and for a higher proportion of G.D.P. It therefore forms a substantial element of the Greek economy, and more particularly of the urban economies of Greece. Within this sector retail trade plays a significant role. From the viewpoint of central place systems it is of special importance, and most central place studies consequently place emphasis on it.

Data on retail trade are available from censuses of commercial and industrial establishments and form the source for the following analysis of the spatial and sectoral structure of retail trade in the country. The intention is to provide a basis for understanding more fully the characteristics of the central place system of Thessaly, but the analysis does have broader implications in the areas of economic development and planning.

1 Data Sources

Data on the number of retail establishments and employment within them are available from four post-war censuses or surveys. The first was conducted in 1951, at the same time as the population census, and covered commercial establishments (Wholesale, retail and hotels). The results appear in a statistical yearbook (N.S.S.G. 1954). The first detailed census was in 1958 and covered both industrial and

commercial establishments, the former in greatest detail (N.S.S.G. 1961). In 1962 a sample survey of commercial establishments was made to provide a basis for an index of retail sales: it was only conducted in places with a population in 1961 of more than 5,000 and since the published results are minimal (N.S.S.G. 1963) they have not been used in this study. The most recent census was in 1969 and was of both industrial and commercial establishments (N.S.S.G. 1971).

An analysis of retail trade in isolation from the other sections of distributive channels is in a sense incomplete. However, although all the Greek censuses do have data on Wholesale trade, their validity has been open to serious questioning: Preston (1968), p.50 for instance, has commented that the wholesale trade data 'are little more than isolated facts of unknown significance'. No data on sales are collected by the N.S.S.G., and one must rely on crude estimates from National Accounts data and consumer expenditure surveys for any indications at all. In particular this hampers the investigation of productivity in this sector. Any enquiry into this must therefore generally be content with attempting to identify trends rather than with precisely quantifying them. Similarly, no information is available on either the corporate or organisational structure of retail establishments.

Problems of comparability arise in using the 1951, 1958 and 1969 censuses. The classification of retail activity in the 1951 census is as follows:

Food, drink and tobacco

Clothing

Furniture and home furnishings

Personal goods

Raw materials, machinery etc.

Other goods

The geographical coverage extends down to the level of the nomos.

The 1958 census gives more detailed coverage by providing data on numbers of establishments and numbers employed, with a breakdown of the latter into employers-owners, family helpers and paid employees. Retail trade (code 612) is divided into eight categories as follows:

6121 Food, wine and drinks

6122 Chemists, cosmetic and personal hygeine products

6123 Textiles, clothing, footwear and leather products

6124 Furniture and fixtures

6125 Hardware

6126 Cars, motor-cycles and bicycles

6127 Petrol and diesel

6129 Not classified

The geographical coverage of the various categories of retailing is more limited than in 1951. Data in kind-of-business detail are only provided for Greece as a whole, and for eight industrial centres (Greater Athens, Thessaloniki, Patras, Volos, Iraklion, Larissa, Chania and Kavala). Otherwise the only other data are the aggregate totals for retail trade, down to eparchy level.

The 1969 census has the greatest division of activities, although there is no classification of employment as in 1958. Retail trade (code 62) is divided into nine principal categories, most of which are further subdivided.

The main categories with number of subdivisions in each are as follows:

621 Food, wine and drinks (9)

622 Chemists, beauty and toilet products (2)

623 Textiles, fabrics, clothes, footwear and leather products (7)

624 Furniture and home furnishings (7)

625 Hardware (4)

626 Cars, motor-cycles and bicycles (4)

627 Petrol and diesel

628 Large stores[4]

629 Not classified (9)

These are broadly similar to those of the 1958 census with the one addition of Large Stores. The geographical coverage is much greater than in the other censuses, although the breakdown of activities by geographical unit is not consistent. A full breakdown of activities is given for the regions (which include here Greater Athens), and for nine Industrial Centres. These latter include Kalamata and Kozani as well as those listed in the 1958 census. At the level of the nomos, however, only the aggregate total for retail trade is given, and the data for one subdivision (621). Below the nomos, data at the commune level are given for total establishments and employment in Wholesale trade (code 61), the Food, wine and drinks category of retail trade (621), and other establishments in the Commerce category (code 6).

2 The Sectoral Structure of Retail Trade

The total recorded number of establishments in Greece increased from 81,965 in 1951 to 104,700 in 1958, a

rise of 27.7 per cent, and then to 134,898 in 1969, a further rise of 28.8 per cent. Similarly, employment rose by 30.5 per cent from 138,168 to 180,237, and then by 31.8 per cent to 237,635 in 1969. Over the whole period 1951-69 the increases are of 64.6 per cent and 72.0 per cent in establishments and employment respectively.

Although the problems of intercensal comparability preclude a detailed analysis of changes within each sub-sector of retail trade, the most significant trend to emerge clearly is the declining importance of food and drink establishments relative to other establishment types (Table 2:6). This is the change that would in any case be expected in the light of the steady growth of real incomes since 1951. As incomes grow an increasing amount becomes available for the purchase of manufactured goods, and this is reflected in the improved provision of such goods through the establishment of new shops. The extent to which a change occurred in consumption patterns in the period 1951-65 is indicated by Preston's (1968) estimates of retail sales which were based on National Accounts data and adjusted by information from urban and rural household surveys. Table 2:7 shows these values expressed as percentages of total retail sales for five selected years. Although it is difficult to compare directly most categories with those of the censuses, it is apparent that in the period 1951-65 there was a significant decline in the relative importance of sales in the food, drink and tobacco category, and a rise in the importance of the clothing and household goods categories. Moreover, with the continual growth of approximately 7 per cent per year that characterised the Greek economy up to 1973 there can be little doubt that such trends in consumption have continued.

TABLE 2:6

Retail establishments and employment in Greece 1951, 1958 and 1969

1951

Sector	Establishments Nos.	%	Employment Nos.	%
Retail total	81,965	100	138,168	100
Food, drinks, tobacco	57,175	69.8	84,859	61.4
Clothing	10,186	12.4	23,116	16.7
Furniture	2,999	3.7	6,646	4.8
Fuel	1,961	2.4	3,444	2.5
Personal goods	2,452	3.0	5,711	4.2
Raw materials	4,872	5.9	10,346	7.5
Other goods	2,320	2.8	4,041	2.9

1958

Sector	Establishments Nos.	%	Employment Nos.	%
Retail total	104,700	100	180,237	100
Food, drink, wine	64,232	61.3	100,977	56.0
Chemists	1,593	1.5	3,804	2.1
Textiles, clothing	8,922	8.5	22,968	12.7
Furniture	2,815	2.7	6,976	3.9
Hardware	3,196	3.1	6,538	3.6
Cars, Cycles	808	0.8	2,034	1.1
Petrol, diesel	1,805	1.7	3,878	2.2
Not classified	21,329	20.4	33,062	11.9

1969

Sector	Establishments Nos.	%	Employment Nos.	%
Retail total	134,898	100	237,635	100
Food, drink, wine	71,721	53.2	113,960	48.0
Chemists	2,189	1.6	5,453	2.2
Textiles, clothing	13,389	9.9	33,281	14.0
Furniture	8,495	6.3	17,311	7.3
Hardware	5,353	4.0	10,464	4.4
Cars, Cycles	1,837	1.4	3,765	1.6
Petrol, diesel	3,223	2.4	7,490	3.2
Large Stores	26	0.02	2,075	0.9
Not classified	28,665	21.2	43,836	18.4

TABLE 2:7

Retail Sales Estimates 1951-1965 (percentages)

	Food, beverages, tobacco	Clothing, footwear	Household furnishings & equipment	Personal care and health	Other
1951	59.2	22.3	9.6	1.4	7.5
1955	59.6	22.0	9.4	1.6	7.4
1959	57.5	23.2	10.3	1.8	7.2
1962	55.7	23.9	11.6	1.6	7.2
1965	51.5	25.5	14.3	1.7	7.0

Source: Table 4:1, Preston (1968)

The availability of data with which to estimate retail sales allowed Preston to make a tentative examination of productivity changes in Greek retailing by relating changes in sales to changes in establishment and employment numbers. He estimated that in the period 1951-62 sales per establishment or worker increased 25 per cent (at constant prices), an increase of about 2 per cent a year if no substantial changes in average margins are assumed. This is low when compared to changes in productivity in manufacturing (6.5 per cent per year 1951-61) or agriculture (4.6 per cent per year 1951-61), but productivity improvements in distribution are in any case invariably less than those in manufacturing and agriculture because of small capital investment, the relative absence of technological innovation, and the uneven use of the labour input. Even so, however, the changes in Greece compare favourably with those in the distributive sectors of other economies.

While the experience of other countries confirms the tendency for the productivity of distribution to

increase as economic growth progresses, there are many views on what constitute the causes of this phenomenon. Ward (1973) has classified these into three groups, which he considers are mutually exclusive. They are as follows:

1 Those views which emphasize technical advancement and improvements in efficiency made at the shop level. This may simply be the internal re-organization of a shop or the conversion of existing shops to self-service or self-selection methods of selling. The rate of technical advance is regarded either as being largely autonomous, or is seen as being greatly influenced by certain factors, especially conditions in the labour market, and the market for goods.

2 Those views which stress the gains accruing from the concentration of sales on fewer shops. The supposition is that excess capacity exists in the retail sector and a reduction in the number of shops would improve overall productivity. The mechanism leading to the elimination of excess capacity is a rise in the overhead costs of retail outlets (for example, labour costs, taxes) which reduces profits and forces the least profitable shops out of business.

3 Those views which suggest that productivity has increased because of a concomitant reduction in the activities performed by the retail sector. In a study of retail trade in the United States, Schwartzman (1971) suggests productivity has been raised in two ways: (a) the increase in per capita incomes led consumers to buy more when they shopped, and the consequent increase in average transaction size was not associated with a

proportional increase in service per transaction; and (b) the growth of productivity in retail trade may have lagged behind that in the economy as a whole, and the resulting increase in the price of retail service may have reduced the demand for service per transaction. A further aspect of this tendency is a decrease in the functions that need to be performed at the retail level as a result of such factors as the standardisation and pre-packaging of products.

Of these three groups of views, the third is the one that can be considered the most probable explanation of the improvements in the productivity of Greek retailing. In the first place, there is considerable support for the idea that productivity is related to establishment size. Among the economies most relevant are those concerned with the imperfect divisibility of labour, management and capital. Thus, for instance, larger shops are more likely to be able to adjust their labour force to the prevailing level of demand. Greek shops are virtually all organised on traditional lines: privately owned small businesses with low turnover and profit margins (Plate 1A). The 1969 census recorded only twenty six Large Stores in all of Greece, twenty two of which were in Athens (Plate 1B), three in Thessaloniki, and one in Larissa. No count of self-service or self-selection shops was made, but these are not very common, and most are small (Plate 1C). Large multiple or co-operative retail organisations do not exist, and it seems that only a very small number of shop owners possess more than one establishment. The dominance of this traditional structure and its lack of change is well

illustrated by data on average establishment size. As Table 2:8 shows, in 1951 the average size of all shop types was 1.7 persons per establishment, and in 1969 1.8 persons. Taken by business categories, there are likewise only marginal changes, the only significant development being the emergence in 1969 of the Large Store category with an average of 79.8 persons per establishment. The breakdown of retail employment in the 1958 census also provides a strong indicator of the organisational structure of retail trade: 61.8 per cent were owners, 19.2 per cent were paid family helpers and only 19.0 per cent were salaried employees.

The small size of shops can be attributed to a number of factors:

1 Low per capita incomes which lead to small turnover, and low savings which limit the capital available for investment.

2 A low level of entrepreneurial activity in this sector by corporate organisations.

3 A shortage of alternative employment opportunities for the rural emigrant together with a low capital requirement making entry easy into retail trade. The attraction of retail trade for the investment of savings earned during temporary emigration or by the sale of land may also be related to various socio-cultural factors as well as to the lack of a well developed system of equity financing for investment in other enterprises.

4 Factors connected with the purchasing habits of consumers: for example, the willingness of consumers to make several types of purchase in the same shop, or their

TABLE 2;8

Average Size of Retail Establishments

(persons per establishment)

1951

SECTOR	1951
Retail total	1.7
Food, drinks, tobacco	1.5
Clothing	2.2
Furniture	1.8
Fuel	2.3
Personal Goods	2.1
Raw Materials	1.7
Other goods	2.3

1958,1969

SECTOR	1958	1969
Retail total	1.7	1.8
Food, drinks, wine	1.6	1.6
Chemists, etc.	2.4	2.5
Textiles, clothing	2.6	2.5
Furniture	2.5	2.0
Hardware	2.0	2.0
Cars, Cycles	2.5	2.0
Petrol, diesel	2.1	2.3
Large Stores	-	79.8
Not classified	1.6	1.5

preference for being served by a series of specialised outlets. Credit ties may be a significant influence here.

5 In the food trade, government regulations fix high profit margins: for example, in the fruit and vegetable trade retailers are allowed a net profit margin of 35 per cent on cabbages and 30 per cent on bananas (Sikianakis 1976). Even these may be exceeded by the addition of an illegal 'cap' to the maximum permitted prices.

Just as the first group of views regarding productivity increases in retailing cannot be said to apply in any degree to the Greek case, so the second group would not appear to be valid either. Rather than a decline in the relative provision of shops, there has been, as Table 2:9 shows, a considerable increase. While a small part of this increase could possibly be attributed to improvements in census coverage, the trend of increasing provision in unmistakeable. This trend may be related primarily to the increasing demand for non-food items such as clothing, furniture and hardware since, in contrast, food shops are only marginally more common in 1969 than they were in 1951. Together with the lack of increase in average establishment size, this shows that the increasing demand for goods has been met by an expansion of the number of outlets rather than by any changes in the scale or organisation of pre-existing shops. Another factor here is that in the countryside especially, many shops are operated as a supplementary source of income rather than the sole source.

The cause of the rise in productivity of Greek

TABLE 2:9

Retail Establishments Per Thousand People

1951

SECTOR	1951
Retail total	10.8
Food, drinks, tobacco	7.6
Clothing	1.3
Furniture	0.4
Fuel	0.3
Personal goods	0.3
Raw materials	0.6
Other goods	0.3

1958,1969

SECTOR	1958	1969
Retail total	12.5	15.5
Food, drinks, wine	7.7	8.2
Chemists, etc.	0.2	0.3
Textiles, clothing	1.1	1.5
Furniture	0.3	1.0
Hardware	0.4	0.6
Cars, Cycles	0.1	0.2
Petrol, diesel	0.2	0.4
Large Stores	-	0.003
Not classified	2.5	3.3

retailing must therefore be attributed to the third group of views. The rise in real incomes has resulted in transactions of a larger size, which is not necessarily associated with a proportional increase in service per transaction since under the traditional structure this was already maximised. Standardisation and pre-packaging of products is developing in Greece, but is by no means as universal as in Western Europe or North America. For example, many goods such as hardware items are sold from small shops which are also the place of production. In food shops many basic commodities are still sold 'loose', and many of the packaged foods are items which are not traditionally part of the Greek diet. Hence the possibility of increasing productivity through corporate and organisational change is potentially very large: this is a theme which will be returned to in the concluding part of this section.

3 The Spatial Structure of Retail Trade

As expected, there is a close logarithmic relationship between the population of nomoi and the amount of retail activity, whether the latter is measured by establishment numbers or employment (Fig. 2:2). This relationship is strong for all three dates for which data are available. Correlations are all very high and are significant at the 0.001 level:

1951	Log Es = -2.34 + 1.07 Log P	r = 0.95
	Log Em = -2.75 + 1.18 Log p	r = 0.95
1958	Log Es = -1.94 + 1.00 Log P	r = 0.94
	Log Em = -2.27 + 1.01 Log P	r = 0.95

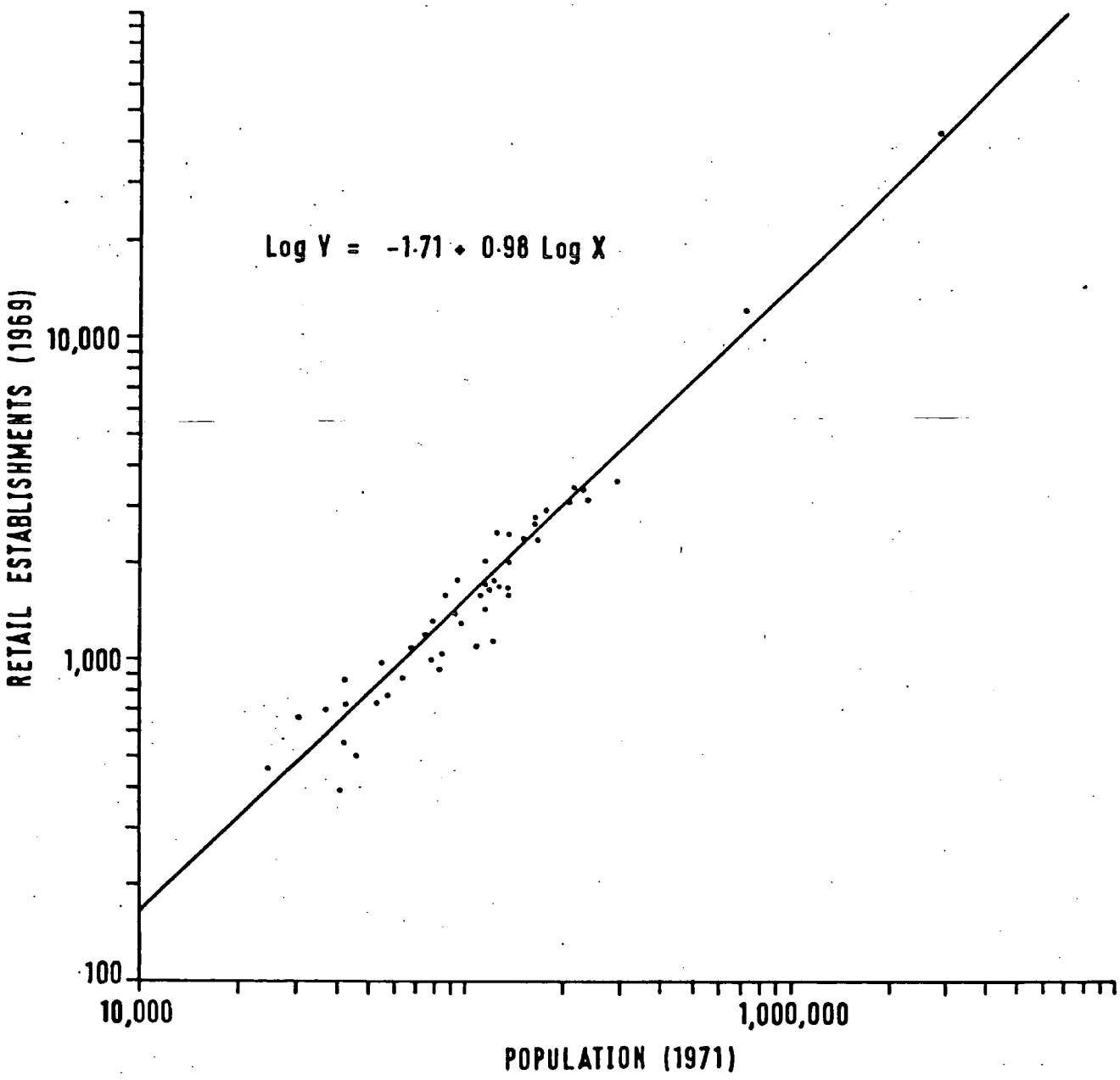


Figure 2:2 Population (1971) and retail establishments (1969) of nomoi.

1969 Log Es = -1.71 + 0.98 Log P r = 0.98
Log Em = -1.87 + 1.05 Log P r = 0.98

where, Es = number of retail establishments in nomos
Em = retail employment in nomos
P = population of nomos[5]

Two points may be noted from these equations. Firstly, the small decrease in regression coefficients from 1951 to 1969 may be interpreted as indicating an increase in retail activity in places with smaller populations relative to those with larger. With economic development this trend is to be expected, and might reflect the increase in retailing outside the main towns. Secondly, the regression coefficients in the employment equations are slightly higher than those in the establishment ones, which indicates a tendency towards larger establishments in the larger places. Investigation of the average size of establishments might confirm this, but the difference is small: for example, in 1969 Attica had the largest average establishment size (2.08) while the smallest average sizes were found in the islands.

Despite the expected close relationship between population size and retail activity, changes in these variables do not display such high correlations. For instance, the correlation coefficient between percentage change in population 1951-71 and percentage change in establishment numbers 1951-69 is 0.66. In this period the largest population increase was in Attica, both in absolute and relative terms, while other nomoi registered only moderate increases or, in most, actual decreases of up to 33 per cent. Generally, the

greatest decreases were in the islands and in the marginal areas of the mainland, and increases tend to be confined to the Athens/Thessaloniki axis (see Ch.3D).

The pattern of change in retail establishments is somewhat different (Fig. 2:3). All but one nomos showed increases in the number of establishments: the exception is Chios (Aegean Islands) which experienced a negligible decrease of -0.1 per cent. The increases range up to a maximum of 120.5 per cent (Pierias), with a mean rate of change of 51.1 per cent. All nomoi showed similar increases in retail employment, ranging from 6.4 per cent in Chios to 140.5 per cent in Trikala (Thessaly), with a mean rate of 62.6 per cent. A number of factors underlie this pattern. Firstly, there is the very important influence of population increases associated with economic development: the nomoi of Attica and Thessaloniki, for example, experienced population growth in this period, and retail establishments increased in parallel with this. However, some of the largest increases in retail provision did not occur in areas of rapid population growth. It may be that these can be accounted for by relatively large improvements in local economies even though these may not be particularly significant at the national scale. Improvements in both the techniques and organisation of agriculture, and the introduction and expansion of commercial crops like sugar beet which need local processing, may be sufficient to account for the rapid increase in establishment numbers in Thessaly, for example, despite relatively modest population increases. Similarly, in order to support an increased number of retail establishments, some increase in economic output must have occurred even in those areas which had a net decline in their populations.

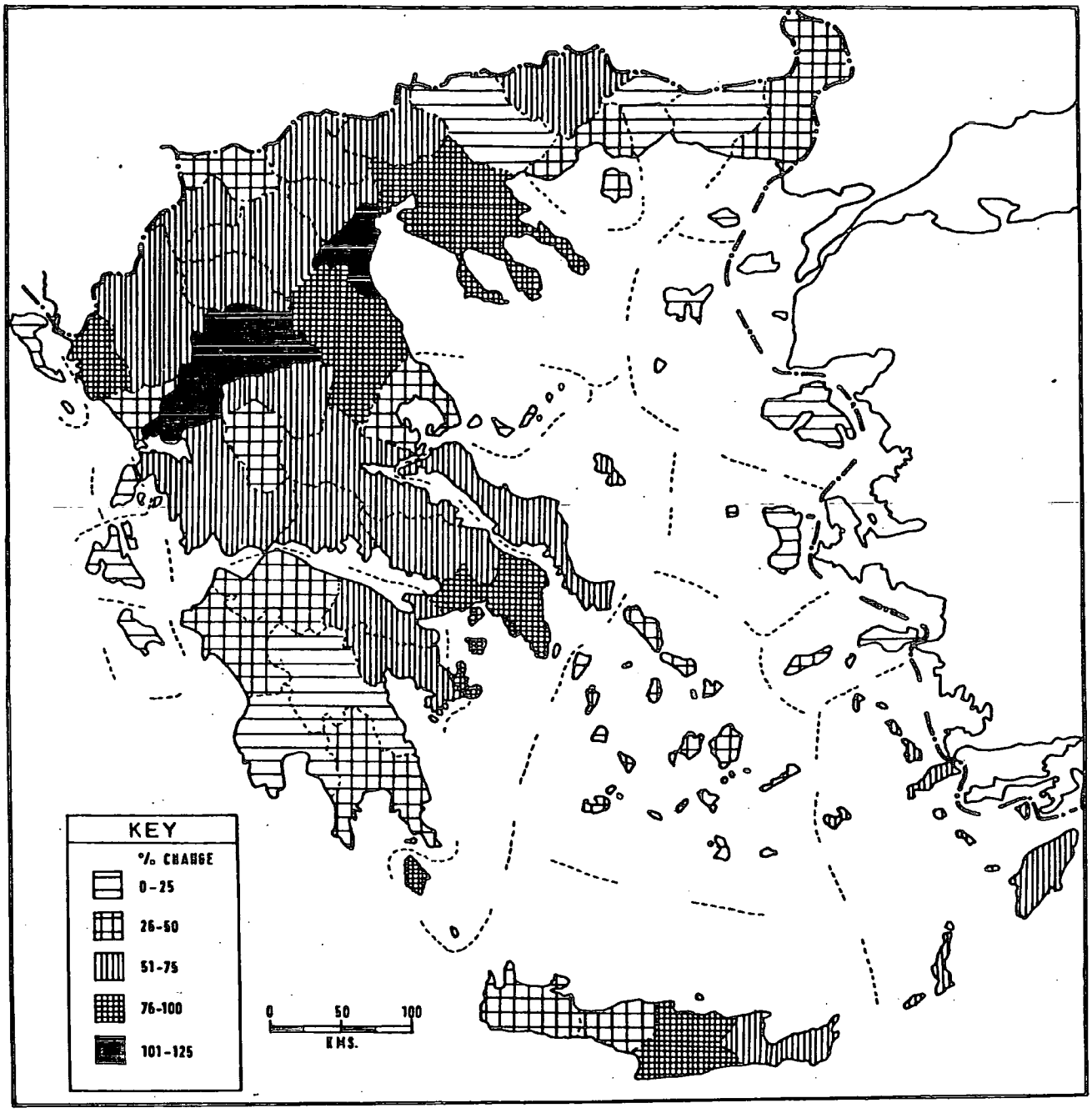


Figure 2:3 Percentage change in numbers of retail establishments 1951-1969, by nomoi.

Another influence on the increase in retail activity in some nomoi may be the action of rural emigrants. Most rural areas have experienced large scale migration either to places within Greece or abroad. Since 1950 much of the foreign emigration in particular has tended to be of a temporary nature, and a common source for the investment of savings made while working abroad is in a shop, which may often be in the emigrant's home village or town.

Variations in the degree of census coverage should also be remembered, and the very large increases in establishment numbers and employment in some of the less accessible parts of the country may be attributable in part to this. Alternatively, it should also be noted that the base year, 1951, was only two years after the end of a nine year period of hostilities which saw widespread devastation. It is therefore possible that some of the increases in retail activity may reflect only the reattainment of levels existing prior to this period rather than significant increases beyond these.

Figure 2:4 shows the level of retail provision, measured as number of shops per 1,000 people, by nomoi in 1969. There are considerable differences between nomoi, ranging from 10.2 in Rodhopi (Thrace) to 22.7 in Zante (Ionian Islands), but generally the highest levels are found in the islands, and the lowest in the poor, mountainous areas of the mainland. Retail provision has increased in all nomoi since 1951. In marginal areas this can in part be related to a declining population, but even in these places, as shown above, the

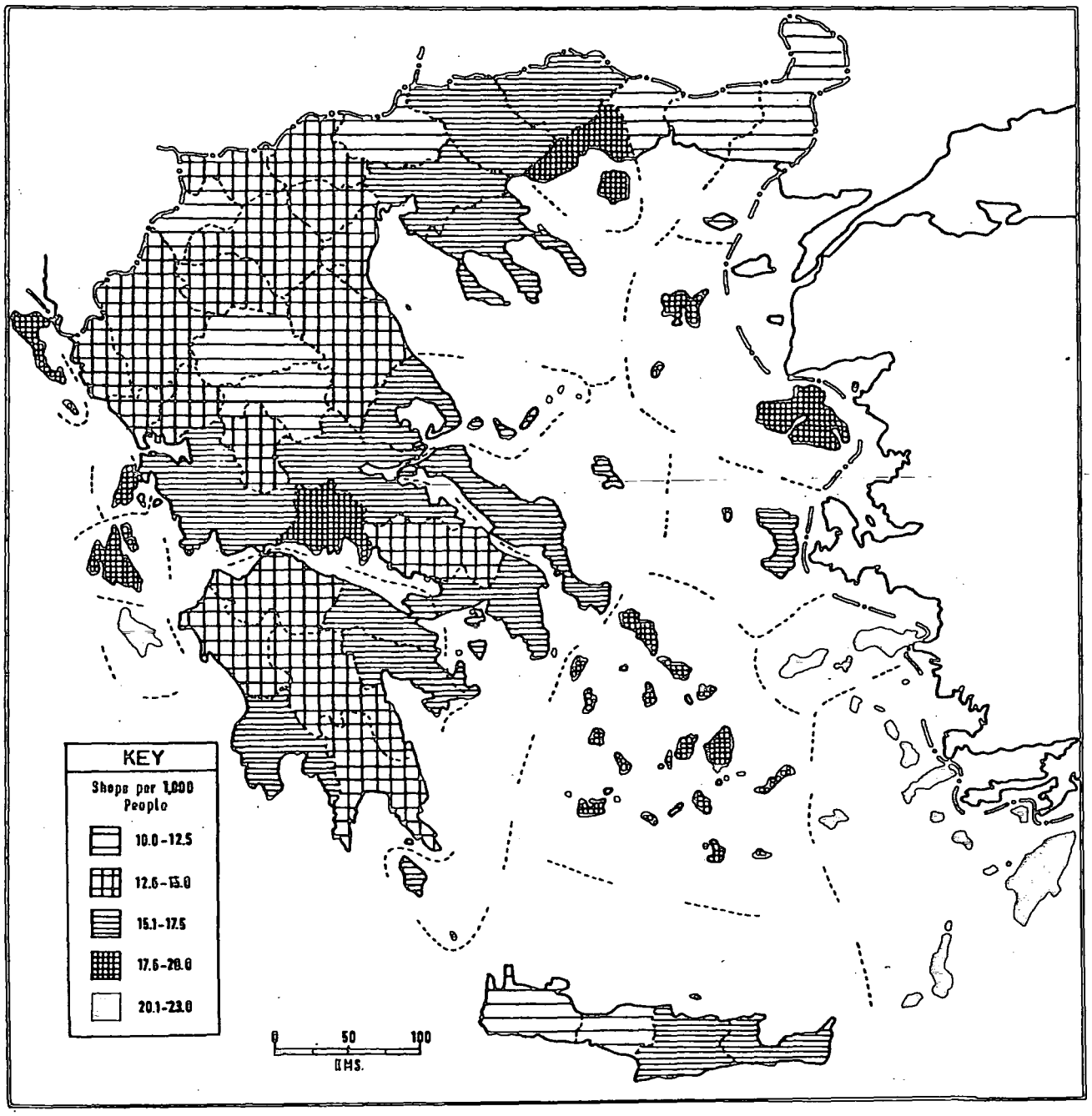


Figure 2:4 Number of retail establishments per 1,000 people 1969, by nomoi.

numbers of retail establishments did increase absolutely even if only by a small amount, leading to an increase in the number of shops relative to population. Even in Chios, the decline of 0.1 per cent in establishments was far exceeded by a decline of 19.3 per cent in population, resulting in an increase in retail provision from 14.7 shops per 1,000 people in 1951 to 18.2 in 1969. Where population has increased the increase in establishment numbers and employment has always been greater, so that in these areas too retail provision has improved. However, the degree of change in retail provision shows considerable variations: in Trikala, for example, there were 6.1 shops per 1,000 people in 1951, and 12.6 in 1969; in Thessaloniki there were 13.5 shops in 1951, and 17.3 in 1969. Most interestingly, the change in Attica is relatively small: from 14.3 shops in 1951 to 15.7 in 1969. Since this is the region where the greatest amount of economic development has taken place, this would suggest that the productivity of retailing in the Athens area has increased to a much greater extent than in other parts of the country. Indeed for some areas it must be doubted whether any positive change has occurred, but the data available do not allow confirmation of this hypothesis.

A more detailed analysis of the spatial structure of retail trade can only be made by using the larger regions as the statistical unit. Examination of the breakdown of establishments and employment by type of activity in 1969 (Table 2:10) shows that the characteristics of retail structure noted at the national scale are present when disaggregated into the nine regions. The relative importance of each group is the same in all the regions: Food/drink is the most

TABLE 2:10

Percentage Breakdown of Retail Establishments and Employment by Sectors and Regions, 1969

	CEN.GREECE*		PELOPON.		IONIAN IS.		EPIRUS	
	Est.	Emp.	Est.	Emp.	Est.	Emp.	Est.	Emp.
Retail total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Food, drinks, wine	46.4	40.9	61.8	58.9	69.5	65.7	63.8	60.1
Chemists, etc.	2.1	2.8	1.4	1.7	1.1	1.5	1.0	1.6
Textiles, clothing	9.9	14.5	10.1	12.7	8.1	10.3	9.2	12.0
Furniture	7.6	8.5	4.5	4.8	3.3	4.2	4.3	5.4
Hardware	4.8	5.3	3.3	3.7	3.0	3.3	2.7	3.2
Cars, Cycles	1.6	1.8	0.9	1.1	1.1	1.1	1.1	1.2
Petrol, diesel	2.0	3.1	2.6	3.0	1.7	1.8	1.6	2.0
Large Stores	0.04	1.7	-	-	-	-	-	-
Not classified	25.6	21.2	15.4	14.1	12.0	12.1	16.3	14.6

	THESSALY		MACEDONIA		THRACE		AEGEAN IS.	
	Est.	Emp.	Est.	Emp.	Est.	Emp.	Est.	Emp.
Retail total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Food, drinks, wine	56.7	51.7	52.8	48.2	56.3	53.0	60.2	58.0
Chemists, etc.	1.4	2.1	1.4	2.0	1.3	1.8	1.2	1.9
Textiles, clothing	9.5	13.8	9.5	14.0	12.3	15.1	11.3	13.5
Furniture	5.6	6.4	6.5	7.7	5.2	5.7	4.4	5.0
Hardware	3.3	3.8	3.5	3.7	3.8	4.2	3.4	3.8
Cars, Cycles	1.4	1.7	1.5	1.7	1.3	1.5	0.6	0.6
Petrol, diesel	2.7	3.3	3.2	3.9	2.9	3.6	1.5	1.7
Large Stores	0.01	0.2	0.01	0.3	-	-	-	-
Not classified	19.4	17.0	21.7	18.5	16.9	15.1	17.4	15.5

	CRETE	
	Est.	Emp.
Retail total	100.0	100.0
Food, drinks, wine	60.1	55.0
Chemists, etc.	1.2	2.1
Textiles, clothing	10.4	14.2
Furniture	6.0	6.6
Hardware	3.2	3.8
Cars, Cycles	1.1	1.4
Petrol, diesel	2.7	2.9
Large Stores	-	-
Not classified	15.3	14.0

* including Greater Athens.

SOURCE: 1969 Industrial and Commercial Establishments Census.

important, followed by the Unclassified group and then Clothing and Furniture. Compared with 1951, the considerable increase in the importance of all non-food retailing relative to Food/drink occurs in all the regions, although variations do exist between regions regarding the precise ratio between the two. These variations may be attributable to inter-regional variations in the level of economic activity. It has already been shown that the rise in real incomes has led on the national scale to an increase in the importance of non-food retailing, and so it follows that the proportion of regional retailing activity accounted for by non-food functions, and changes in this, should be related directly to the level of regional economic development. Table 2:4 shows that Central Greece (with Athens) is, by a considerable margin, the wealthiest area of the country and has consequently the highest proportion of non-food retailing. The relationship is, however, less precise for the other regions, and the Spearman rank correlation coefficient between per capita G.D.P. in 1965 and non-food establishments as a percentage of the total in 1969 is only 0.39, which is not significant. This low correlation may in part be accounted for by the relatively small range of regional per capita G.D.P. excluding Central Greece, and such differences that do exist may not be sufficient to lead to significant differences in retail structure. It is also possible that some other factors are involved: for example, the distribution of income among the population may be important, or the degree of spatial concentration of the population. Both of these suggestions may be tentatively tested by calculating the correlation coefficient between the retail ratios and the proportion of

population classified as urban in the regions, assuming that urban population is wealthier than rural, and that a concentrated population is needed to fulfil minimum threshold requirements for some non-food functions. Between the 1969 retail data and 1971 population data the rank correlation coefficient is 0.93 (significant at the 0.01 level) which might confirm either one, or both, of the hypotheses. Again, however, the absence of more suitable data precludes a deeper examination.

The variations in retail provision noted above at the scale of the nomos for aggregate totals are revealed at the regional scale. The Ionian and Aegean Islands have the greatest retail provision in both 1951 and 1969, and Thessaly, Epirus and Thrace the least. The data confirm the increasing degree of retail provision in all areas and, where they are comparable, among all types of retail trade. A breakdown by type of activity shows clearly that the inter-regional differences are due primarily to differences in the number of Food shops rather than other types where provision is fairly similar: in 1969, for instance, Thrace had 6.3 Food shops per 1,000 people, while the Ionian Islands had 13.7, but it is difficult to account for this considerable variation.

4 Retail Trade in Urban Areas

An examination of the structure of retail trade in the largest towns and cities of the country can be made using data from the 1958 and 1969 censuses. In 1958 eight Industrial Centres were identified, ranging from the Athens agglomeration (1961 population, 1,852,709) to Kavala (44,978). In the 1969 census the Athens agglomeration was

tabulated separately as a Region (1971 population 2,540,241), and nine Industrial Centres were identified, Kozani (23,240) being the smallest.

There are very close relationships between the number of retail establishments and retail employment and the population of the cities. The following regression equations were obtained:

1958 Log Es = -1.52 + 0.95 Log P r = 0.950
Log Em = -1.40 + 0.98 Log P r = 0.997

1969 Log Es = -1.38 + 0.93 Log P r = 0.998
Log Em = -1.38 + 0.99 Log P r = 0.995

where, Es = number of retail establishments in the city
Em = retail employment in city
P = 1961 or 1971 population of city

The very high correlations of almost 1.0 are notable and indicate a very consistent relationship between the variables among all sizes of town over the whole country: Athens is more than a hundred times larger than Kozani and has a more prosperous and a greatly more complex economy. It is perhaps even more surprising since the population data are for the cities alone and not for their hinterlands, which implies a close relationship between the size of city regions and the size of the central city.

The relative importance of each type of retail activity is the same in each city in both 1958 and 1969, and is the same as that found at the regional scale (Table 2:11). The main difference is that non-food retailing is, not unexpectedl more important in every town compared to its position at the regional scale where the data for urban and rural areas are

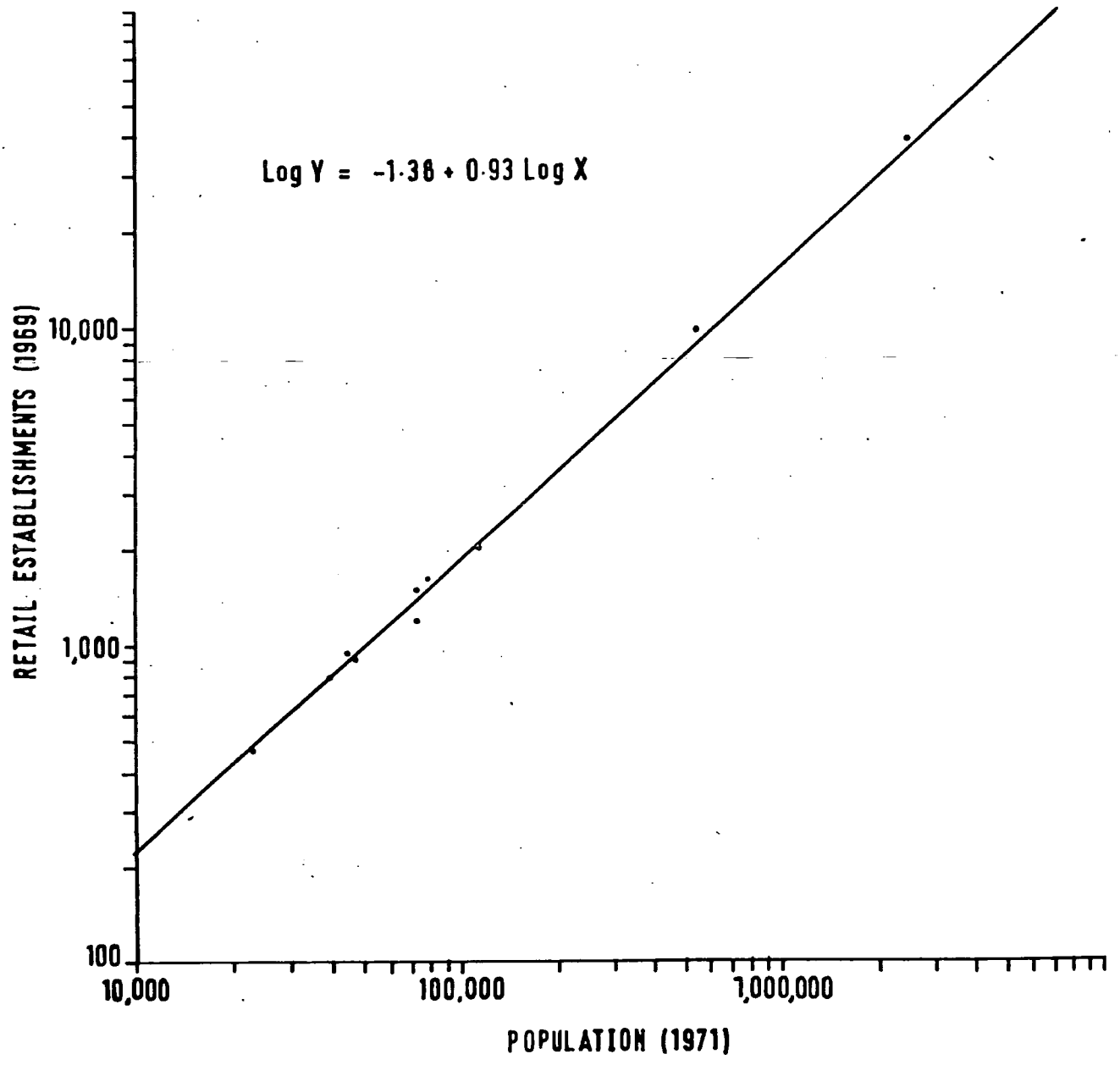


Figure 2:5 Population (1971) and retail establishments (1969) of Industrial Centres.

TABLE 2:11

Percentage Breakdown of Retail Establishments and Employment by Type of Activity in Ten Industrial Centres*, 1969

	ATHENS*		THESSALONIKI		PATRAS		VOLOS	
	Est.	Emp.	Est.	Emp.	Est.	Emp.	Est.	Emp.
Retail total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Food, drinks, wine	39.9	35.0	47.3	38.4	46.4	39.6	43.5	37.7
Chemists, etc.	2.4	3.1	2.1	2.8	2.2	2.9	2.4	3.2
Textiles, clothing	10.8	16.3	8.3	16.9	12.6	18.7	11.4	18.5
Furniture	8.7	9.5	8.4	10.4	7.5	8.6	9.1	8.7
Hardware	5.6	5.8	4.1	4.2	4.6	5.2	5.1	5.1
Cars, Cycles	1.8	2.0	2.8	3.1	1.2	1.3	1.8	2.1
Petrol, diesel	1.4	2.8	1.6	2.5	1.8	2.8	2.3	2.9
Large stores	0.06	2.3	0.03	0.9	-	-	-	-
Not classified	29.4	23.2	25.4	20.8	23.7	20.9	24.4	21.8

	IRAKLION		LARISSA		CHANIA		KAVALA	
	Est.	Emp.	Est.	Emp.	Est.	Emp.	Est.	Emp.
Retail total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Food, drinks, wine	39.5	32.2	41.1	33.3	42.6	36.2	45.1	38.9
Chemists, etc.	2.3	3.9	2.7	3.2	2.0	3.3	2.7	3.1
Textiles, clothing	14.2	20.9	13.2	21.6	15.2	20.7	14.7	18.2
Furniture	11.3	11.6	11.0	12.2	9.0	9.7	9.3	13.2
Hardware	4.5	5.4	5.1	4.8	5.4	7.1	3.6	4.1
Cars, Cycles	2.6	2.9	4.1	3.7	2.5	2.8	2.3	2.3
Petrol, diesel	2.5	2.9	2.9	4.0	2.4	2.5	2.1	3.5
Large Stores	-	-	0.1	1.4	-	-	-	-
Not classified	24.3	20.2	19.8	15.8	20.9	17.7	20.2	16.7

	KALAMATA		KOZANI	
	Est.	Emp.	Est.	Emp.
Retail total	100.0	100.0	100.0	100.0
Food, drinks, wine	47.1	40.6	51.8	43.9
Chemists, etc.	2.5	3.5	0.8	2.0
Textiles, clothing	13.7	19.8	17.7	18.1
Furniture	8.2	7.9	7.1	9.1
Hardware	4.5	6.0	5.0	5.8
Cars, Cycles	2.3	3.1	1.0	1.0
Petrol, diesel	1.6	1.9	1.8	3.0
Large Stores	-	-	-	-
Not classified	20.1	17.2	14.8	17.1

SOURCE: 1969 Industrial and Commercial Establishment Census

*Athens is classified as a region in the 1969 census rather than as an Industrial Centre.

combined, although the difference between Kozani and the regional data for Macedonia in 1969 is very small which suggests that the importance of the larger urban centres (those above 40,000) in non-food retailing is greater compared to the smaller towns. Consideration of population thresholds would obviously be significant here, but even so the relationship between non-food shops as a percentage of the total is not precise. The rank correlation coefficient between the 1958 retail data and the 1961 population is -0.12, which is not significant. Between the 1969 retail data and the 1971 population the coefficient is 0.38, which is also not significant. Stronger relationships have been found in studies of Britain as a whole, and of central Scotland (Thorpe 1968, Walker 1972). As well as reflecting differences in the threshold sizes of different goods, such relationships may also indicate the degree of dispersion of retail outlets and the extent people are prepared to travel to purchase different types of goods. It may therefore be that in a less developed economy such as Greece's these factors do not have such a strong impact on retail structures. The small average size of establishments may mean that even quite small towns may be above the threshold population for what are considered high order goods in more developed economies.

Most urban retail establishments are small although the average size (1.9 employees per shop) is generally greater than that at the regional scale. Only marginal changes in average size occurred over the period 1958-69 and the uniformity in the nature of retail structure among towns of all sizes is emphasized. Athens tends to have slightly larger shops than the other towns (average size 2.1 employees per

shop), but rank correlation coefficients between average establishment size and population are 0.22 for 1958 and 0.49 for 1969, neither of which is significant. Thus there is no real strong confirmation of H. Smith's (1937) hypothesis that there is not one 'normal' size of shop in each trade, but rather a series of sizes adapted to the varying sizes of settlements. Since there would seem to be a fairly close link between establishment size and productivity, it may be suggested tentatively that there are no great spatial variations in retail efficiency in Greece beyond saying that, overall, shops in urban areas may have slightly higher productivity than those in rural, and that those in Athens probably have higher productivity than those in the rest of the country. Additional support for this may come from consideration of the relationship between per capita income and productivity since, as already suggested at the national scale, higher per capita incomes lead to higher levels of expenditure and a lower labour input per unit of sales. Greater Athens, with the highest per capita incomes, would therefore be expected to have the highest retail productivity.

There are considerable variations in the level of retail provision among the various towns in 1958 and 1969, and, as at the regional scale, this is due primarily to variations in the number of food shops. For instance, Athens has 15.2 shops per 1,000 people, of which 6.1 are Food, while Kozani has 20.8 shops per 1,000 people, of which 10.7 are food. There is a negative relationship to size, although it is not very close. The rank correlation coefficient

between the two variables is -0.55 for 1958 and -0.53 for 1969, neither of which is significant. There is a stronger negative relationship, however, between the level of retail provision in 1969 and percentage change in the population of the towns 1961-71. The rank correlation coefficient is -0.67, which is significant at the 0.05 level. This might indicate that the higher level of retail provision in some towns is due to people in retail trade being less likely to move from the place of residence than others, although it may alternatively indicate that the level of retail provision lags behind population growth: the market must first exist before a shop is set up. In support of this, Jeffreys and Knee (1962) have noted that the number of inhabitants per retail establishment in new residential areas tends to be higher than in older areas.

5 Future Trends in Greek Retailing

The most significant feature to emerge from the above analysis has been the lack of change in the size and organisational structure of shops. A rising demand for goods has only been met through the continual increase of establishment numbers and employment, and such evidence that exists on the productivity of retail trade suggests that the modest rises that have taken place can be attributed primarily to higher sales per transaction rather than to any underlying changes in the organisational and corporate structure of shops. Despite some notable spatial variations in shop provision and sectoral structure, the overall picture is one of considerable uniformity with only Greater Athens showing some limited signs of development.

In view of the very substantial rises in real disposable income since 1951, this apparent lack of change in the retail sector might appear unusual. Certainly, the experience of Greece appears to contrast markedly with that of North America and most of Western Europe where developments in the organisational and corporate structure of retailing which have been revolutionary in their size and scope have been going on since the latter half of the last century (Stacey and Wilson 1965, Davis 1966). Basically, these changes have involved increases in the size of outlets and a concentration of activity in multiple organisations. Initially the development was in department and variety stores, then food retailing was changed by the introduction of self-service supermarkets, and now large out-of-town shopping centres, hypermarkets and discount warehouses are of growing significance.

Filop (1964) has listed the advantages of the large scale firm in distribution as follows, the basic stimulus to which is the requirement to improve the productivity of labour and capital:

1 Integration of wholesale-retail functions, which leads to a reduction or elimination of some wholesaling costs.

2 Greater control over selling costs and methods.

3 The concentration of services: independent wholesalers have tended to cater for too many diverse types of customers and to distribute merchandise over a wide area in order to build up trade.

4 The employment of specialists: once an organisation reaches a certain size it becomes economic to employ specialists in the form of buyers, accountants, etc. whereas the small shopkeeper must perform all these tasks himself.

5 Large organisations can obtain quantity discounts and enlist the support of manufacturers for the supply of exclusive lines.

6 A large firm can more readily pass on market intelligence to suppliers.

A seventh advantage may be that, perhaps paradoxically, there is greater competition between large firms than small: in America Hollander (1965) noted that small town dealers practise oligopolistic pricing policies and are not in effective competition with each other.

Over the eighteen year period of the statistical analysis there have been few signs that Greek retailers are attempting to derive these advantages. It may be suggested that this is too short a time to show any changes, but it is the same period that in the United Kingdom saw the rise of the supermarket to its dominant position in food retailing, and more generally the expansion of multiples at the expense of independent retailers. In his study Preston (1968, p. 214) did note the beginnings of some change in Greece (mainly in the Athens region) and he concluded by stating that 'it seems very unlikely that the traditional structure of retail trade in Greece can or should remain stable in the midst of a changing economic environment .... Widening consumption opportunities will alter buying habits, and the

living available in traditional outlets will be eroded in the process'. Since then, and the 1969 census, further changes have been occurring: several small department stores have opened in central Athens and in Thessaloniki, and some medium sized supermarkets have appeared in the suburbs of Athens. In the provinces there appear now to be few of the larger market towns which do not have at least one self-service grocers (invariably called 'supermarkets', but in size rarely larger than the traditional shop - Plate 1C). Although these limited changes in organisational structure and size of shops have been occurring, changes in corporate structure are less apparent. Individuals rather than incorporated firms are still overwhelmingly the main type of retail entrepreneur, and so the advantages of the large firm in improving the economic performance and efficiency of retail trade are still not being gained.

There are certain factors in Greece which suggest that the future pace of change is likely to continue to be much slower than in Western Europe or North America. As real incomes rise an expanding demand for durables should be reflected in a continuing shift in sectoral structure, but the growth of real incomes is unlikely to be sufficient in itself to lead to significant organisational or corporate changes. A more important factor here is the demand for labour in other sectors of the economy: George (1966) found that towns in the United Kingdom with high retailing productivity were those with tight labour market conditions where retailers had to introduce new methods to make more profitable use of labour. As the analysis in Section A suggested, the majority of Greek towns are strongly service-oriented, and their

economies are rather stagnant depending very much on the state of agriculture in their hinterland. In any case, because retail businesses are predominantly family owned and operated any expansion in local output is likely to mean some taking up of what might be considered excess capacity rather than the transference of labour to other activities. Even then, such localised economic growth might lead to the establishment of further small shops, and any major retail innovation would involve much risk in such a context, especially where the whole question of consumer preference is little understood. Only in Athens, and perhaps in Thessaloniki, where some tentative signs of change have been noted may there be any further advance, but even here the continuing dominance of the traditional structure and the tenacity of small shopkeepers in the face of adverse economic circumstances lends support to the view that any change will not be rapid.

6 Conclusion

That the data which exist for the study of retail trade in Greece are confined primarily to establishment and employment numbers, and that precise statistical information on turnovers or corporate and organisational structure is not available, has inevitably limited the depth and scope of the preceding analysis. Nevertheless, there has been sufficient to indicate that the structural characteristics of retail trade in Greece are somewhat different from those in the developed Western economies, and that the pace and direction of change appears to differ in some respects as well. This has implications for the type of settlement system to be found in provincial Greece, and is of significance in the

more general fields of sectoral, regional and land use planning. These are subjects which will be examined more fully in subsequent chapters.

FOOTNOTES

1 The distinction between 'tertiary' and 'quaternary' activity will not be made in this study.

2 The nomos is the principal administrative unit below the central government, and is equivalent to the French département. Most are divided into eparchies, usually two or three, which have little administrative significance now but are used as units for the collection and presentation of statistics. Below the eparchy are the smallest units, the koinotis (commune) which is centred on individual villages, and the dhimos (municipality) which is centred on a town.

3 The National Statistical Service of Greece (N.S.S.G.) classifies settlements as follows: (a) urban - those with a population of more than 10,000; (b) semi-urban - those with a population of between 2,000 and 10,000- and (c) rural - those with a population of less than 2,000. The classification is solely on the basis of settlement size.

4 This is the literal English translation of the Greek, and no clarification in terms of either the organisational or corporate structure of these establishments is made in the census.

5 Population data for 1951, 1961 and 1971 are used respectively.

Plate 1A

Shops on the main square, Komotini (Thrace)

Plate 1B

Lambropoulos Department Store, Athens

Plate 1C

Supermarket, Alexandroupolis (Thrace)

C H A P T E R T H R E E

THE REGION OF THESSALY

The region of Thessaly is located in east-central Greece. For official statistical purposes it incorporates the Sporadhes Islands, but these shall largely be excluded from the study as geographically they may be considered to belong more properly to the Aegean Islands. The current Administrative region of Thessaly (see Chapter 8B) also includes the nomoi of Fthiotis, Evritania and Grevena but these again are geographically separate areas, and do not appear to have any strong functional relationships with the rest of the region (Chapter 4). They have therefore likewise been excluded from consideration. As defined for this study, Thessaly is approximately rectangular in shape, with a maximum east-west length of about 150 kms., and a maximum north-south length of about 100 kms. The total area of the mainland is 13,795 sq. kms. (Fig. 3:1).

In 1971 the population of the region was 659,913, 7.5 per cent of the population of Greece. It contains four of the fifty two nomoi of the country, and these are subdivided into eleven eparchies as follows:

Nomos	Eparchies
Kardhitsa	Kardhitsa
Larissa	Aghia, Elasson, Farsala, Larissa, Tirnavos
Magnisia	Almiros, Volos, Skopelos
Trikala	Kalambaka, Trikala

The analysis of the settlement system of Thessaly needs to be placed against the physical, historical,

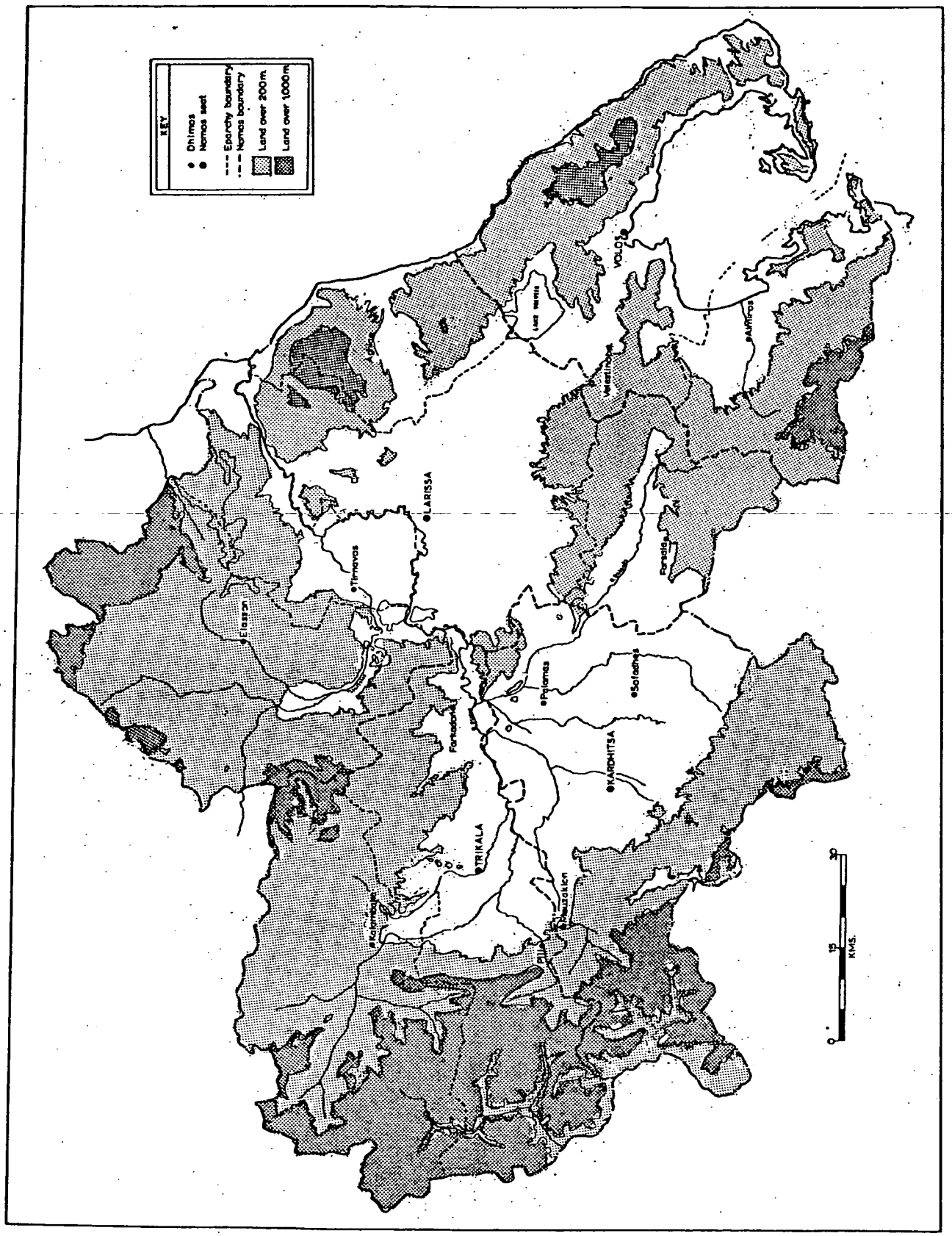


Figure 3:1 The region of Thessaly: relief and main settlements.

economic and demographic background of the region, and this chapter will consider these four elements.

Writing in 1934, Sion remarked that more was known about Central Africa than Thessaly. As Chasiotis' (1971) bibliography on Thessaly indicates, however, much had already been published by 1934, and there has been no subsequent decline in the volume of work published on the region. Admittedly, apart from traveller's accounts, very little has had a distinct geographical orientation, but this gap has now been filled by Sivignon's (1975) monograph on the geography of the area. In the French tradition and more than 550 pages long, it is a comprehensive compendium of facts on the social and economic geography of the area since 1881.

SECTION A THE PHYSICAL ENVIRONMENT

1 Topography and Geology

As Fig. 3:1 shows, Thessaly consists basically of two physically distinct areas: a large central plain and a mountainous surround with a clear-cut division between the two. The plain is divided by a low range of hills (the Revenia) into a lower eastern and an upper western part. They occupy areas in which crustal subsidence occured during the Tertiary period, and the bedrock is covered by a considerable depth of marine and lacustrine deposits. The impression given by the two plains, especially the upper one, is of an almost completely flat landscape (Plate 2A and 2B), although there is a micro-relief which is of considerable importance to agriculture (de Vooys 1959). Because the upper plain receives most of the rivers from the mountains, its surface features

are composed of a number of convergent fans with gravel slopes near their heads and gradually finer material further out. The upper plain is drained by the river Pinios alone, but this only takes fine silt down to the plain, and the Titarisios is the only river with a large fan in the lower plain (Admiralty, 1945). Only the Pinios flows out from the lower plain, reaching the sea via the Tembi gorge. In both plains the finest alluvial deposits occur where semi-permanent lakes were found. Although the area has now been drained artificially, both of the plains have high water tables which can still result in flooding during the winter.

The plains are almost completely surrounded by high land. In the west the Pindos mountains, composed of limestone and chert, form an imposing barrier, rising in most cases to over 2,000 m. and in some instances up to 2,400 m. They are broken by deep valleys, the most important being those of the Pinios, Portaikos and the Parnisos rivers (Plate 2C). To the north lie the Khasia mountains which are composed of sandstone, limestone and crystalline schists. These mountains extend south in a series of spurs between which lie bays of the plain. To the north-east Mt. Olympos (2,917m) rises, while in the east Mounts Pelion (1,978m) and Ossa (1,651m) lie between the lower plain and the Aegean, and to the south the plains are bounded by the Plateau of Othrys which reaches to 1,000m in places.

2 Climate

Most of the region has a climate which is more continental than Mediterranean in the degree of temperature variation. Enclosed by high land on all sides, the plains

are cut off from the ameliorating effect of the sea, and temperatures in summer are among the highest in Europe. The mean July temperatures in Trikala and Larissa, for example, are almost 28°C, and a temperature as high as 47°C was recorded in Larissa in 1958 (de Vooys 1959). In contrast, the mean January temperature in Larissa and Trikala is about 5°C, although it can be much colder than this: -19°C was recorded in Trikala in 1907. Along the Aegean littoral mean temperatures tend to be a couple of degrees higher in the winter than in the plains, and similarly lower in summer, and extremes are not so great (Admiralty 1944). In the mountains, summers are cooler than in the plains, and the winters much more harsh: snow lies in the upper Pindos mountains until May, and is an almost permanent feature of the summit of Mt. Olympos.

The rainfall regimes are typically Mediterranean with most rain in the winter months, falling to a minimum in August. Rainfall can be quite variable, but arid summers where evapotranspiration exceeds precipitation by a large margin is an unvarying phenomenon. The Pindos and other mountain areas receive the highest amounts of rainfall, while in the plains rainfall decreases from west to east: Trikala has 740 mm per year, Larissa 527 mm and Volos 416 mm (Y.P.A.T. 1968).

The river regimes follow the seasonal rainfall patterns, and, for example, the flow of the Pinios in February is more than fifteen times greater than in August (Sivignon 1975).

3 Ecological Zones

A number of distinct ecological environments are the result of these variations in relief, soils and climate. The Regional Planning Service of Thessaly (Y.P.A.T. 1968) have recognised five ecological zones in the region. These are shown in Fig. 3:2, but the distinction between some of them might appear rather vague. A simpler division would be a threefold one between the coastlands, characterised by Mediterranean trees and shrubs, the plains, characterised by a steppe-like landscape where most of the natural vegetation of deciduous forest has been removed, and the mountains with fir trees above about 600m, while on the limestone foothills and lower mountain slopes, sparse, thorny scrub is characteristic. Sivignon (1975 p. 72) recognizes the vegetation along water courses as a fourth major group.

SECTION B THE EVOLUTION OF THE CULTURAL LANDSCAPE

The historical background of the region might best be outlined through the perspective of the cultural landscape, and can be conveniently divided into three periods:

(1) the Classical and Byzantine;

(2) the Ottoman and

(3) Post-Independence

1. The Classical and Byzantine Periods

Despite the antiquity of human occupance - remains of settlements of the Palaeolithic and Neolithic eras have been discovered in the region - the major features of the cultural landscape of Thessaly are, as in the rest of

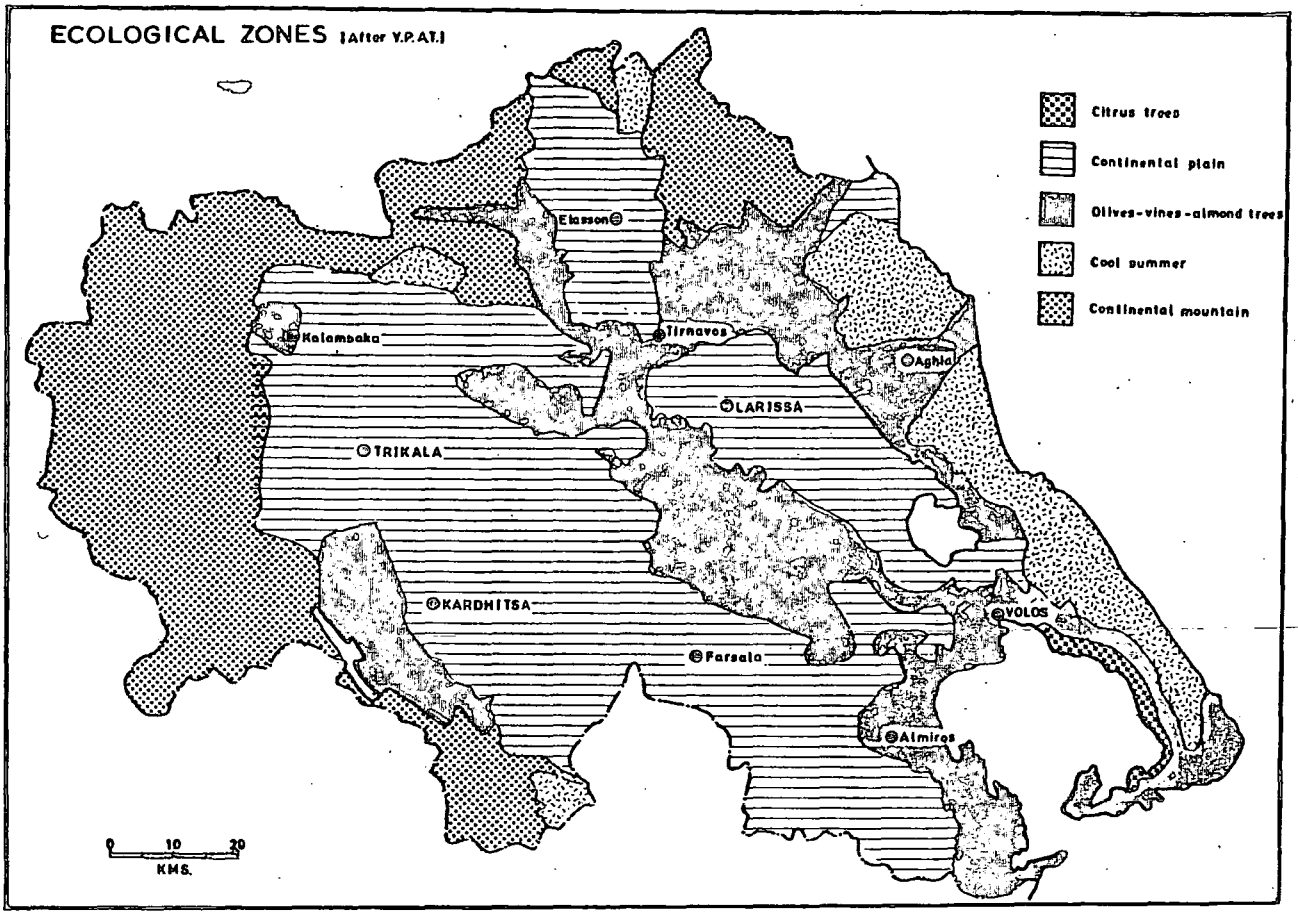


Figure 3:2 The region of Thessaly: ecological zones (after Y.P.A.T. 1968).

Greece, of relatively recent origin. From Classical times the area has always found itself on the periphery of the centres of power and influence in, firstly, Attica and Peloponnesia and later in Macedonia, Rome and Constantinople. Up to the time of the Peloponnesian War (431-404 BC) Thessaly was divided into four districts (tetrarchies): Hestaeotis, Thessaliotis, Pelasgiotis and Fthiotis. Thessaly was governed by kings until the kingship was abolished and replaced by oligarchic rule in the separate cities. There was, however, a kind of political confederation for military purposes headed by a chief magistrate (Tagos). In the first part of the fourth century B.C., after two tyrannical Tagoi, the Thessalians rebelled with the assistance of Thebes. Twenty years later the region was annexed by Philip of Macedonia. In 197 A.D. it became part of the Roman Empire, and in 269 it was made a separate province.

In this early pre-Classical and Classical period, the locations of most of the main towns of the region, and some of the smaller ones, seem to have already been established. The most important present day settlements which were in existence at that time are Larissa, Trikala, Volos (ancient Iolkos), Farsala, Elasson and Kalambaka; other urban centres such as Gomphoi and Krannon have not survived (although a modern village bears the former's name). Some at least of these locations are on defensive sites, and evidence of very early fortifications have been found at Trikala and Larissa, for example. Trikala is mentioned by Homer (Trikki), and is the site of the most ancient of the sanctuaries of the god Asklepios, although now only a few

stones of the temple remain (Papasotirios 1964). Economically, the region was noted for its crops and livestock despite the environmental problems noted earlier, and in particular its horses had a high reputation: Alexander's Bucephalas was of Thessalian stock. Beyond this it is not easy to delve readily into the geography of this period, although by the end of Classical times it might fairly be said that the basic outline of the settlement and economic geography had been established, but an outline within which much adaption and infilling was subsequently to take place.

Under the Byzantine Empire Thessaly was made part of the province of Hellas, but peace and stability were rare. Along with the rest of northern and central Greece, the region suffered a series of invasions by, among others, Goths, Huns, Ostrogoths, Bulgars and Serbs, resulting in the regular devastation of settlements and farmland. By the twelfthcentury the population of Thessaly was composed of a number of differing elements: as well as Greeks there were Albanians, Bulgars, Serbs and, most importantly, Vlachs after whom the region was called Great Valachia. In succeeding centuries most of these people were to become Hellenized although even now there remains a distinctive semi-nomadic Vlach minority in the area. In 1204 the Fourth Crusade conquered Constantinople and marked the beginning of the end of Byzantine power. Inevitably with a weakening of central control, the provinces began to challenge the Empire. By the middle of the fourteenth century Serbian power had also disintegrated, and this removed the only obstacle to the expansion of the Ottoman Empire. By 1400 Thessaly had become a sandjak (province) of Roumelia, Turkish Europe, and remained

under Turkish rule until its unification with the modern independent Greek state in 1881.

The legacy of the Byzantine era on the cultural landscape of Thessaly is limited. Most important, perhaps, are the monasteries, churches and fortresses which remain impressive, if localized features. Amongst the former, the group of monasteries and convents on the rock pinnacles of Meteora are the best known, although other individual monasteries and churches are of note. Many of these are found in modern rural and urban settlements, while in Larissa and Trikala the fortresses are mainly Byzantine in origin although both have subsequent modifications. Apart from the identification of particular buildings with a known date of construction, it is difficult to be more specific regarding the residual influence of the Byzantine period on the present landscape: to what extent, for example, were some of the older 'organic' village and town plans established by the fourteenth century?

2 The Ottoman Period

Lawless (1977) has examined in some detail the impact of the Ottoman occupations on Thessaly. In his study, he divides the era of Turkish rule into an early period (up to about 1600) characterised by strong central government, and a later period (up to 1881) when control from the centre gradually weakened.

In the early period there were considerable changes in both the distribution and composition of the population. In the first place, there was a significant movement

of Christian people to the mountains. This may well have begun during the closing period of the Byzantine Empire in response to the various invasions noted earlier, and it certainly continued during the initial years of the Ottoman occupation as Christians sought refuge from Turkish authority. The volume of this movement, although it cannot be precisely quantified, was probably considerable, and it had significant consequences in the resulting clearances of forest, the creation of new villages, and the intensive exploitation of the limited natural resources of the mountains.

An increase in urban population also occurred which can be related to changes in the ethnic composition of the population. Throughout their empire the Ottomans embarked on a programme of planned colonisation by Turks. In Thessaly some of these were settled as farmers in new villages, often on land abandoned by Christians, but the majority were urban dwellers: it is estimated, for example, that the population of Larissa and Trikala increased by 68 per cent between 1525 and 1575 (Barkan 1970). As well as the majority Turkish population in the towns, there were small communities of other peoples, especially Jews who sought refuge in the religious tolerance of the Ottoman Empire from persecution in Christian Europe.

In the countryside there was an improvement in the conditions of most people. During the period prior to Ottoman rule, the large landowners had been able to act very much as they had wished but with the imposition of a strong central government with an efficient administrative system the peasants were freed from seignorial jurisdiction and from

many of the feudal services which were required from their counterparts in Western Europe. Some land was kept by the ruler and the imperial family, some was designated as waqf (the revenues supported religious, educational and social institutions) and other lands were granted as non-heriditary fiefs to Ottoman soldiers and officials (timars). Relationships between the fief holders and the villagers were governed by laws which were supervised by generally sympathetic officials. In areas not divided into fiefs, and particularly in the mountains, each village was allowed to be semi-autonomous so long as taxes were paid regularly.

From the end of the sixteenth century the strong, centralised system of government began to break down, with consequences as important for the people of Thessaly as for the rest of Europe. The impact of this was most detrimental on the peasants, who found their protective legislative cloak gradually removed from them. The timar system of non-heriditary land holdings began to break down and was replaced by private properties (ciftliks) whose owners increasingly ignored the legal limitations which had been set on the obligations of their tenants. The expansion of these estates continued up to the closing years of Turkish rule when it has been estimated that 460 out of 658 villages in Thessaly formed estates. Peasants on the ciftliks lost their heriditary rights to cultivate the land and were reduced to the status of share-croppers who could be evicted if they refused to accept the landowner's invariably harsh terms. Only in a few villages owned by the church or state were conditions more bearable for the peasantry (Sivignon 1975). The imposition of crippling

taxation and rents drove the peasants into debt and, forced to borrow from the landowner, they were bound to the land. Such conditions were to last for at least two centuries until during the nineteenth century several reforms were introduced. A law of 1856 prohibited the transformation of villages of small private cultivators to ciftliks, while another of 1860 sought to reimpose a legal framework for owner-tenant relationships.

The rise of the ciftliks resulted in a new form of rural settlement characterising the plains: the estate village. Planned as units, these villages typically consisted of a large central square surrounded by lines of small mud-brick and thatch cottages occupied by the sharecroppers. In the centre of the village stood the konak (manor house) of the landowner, a square stone tower usually three storeys high, and often surrounded by a stone wall. Most of the konaks have long been demolished, and only a very few examples can still be found (for example, at Anavra). None of the old peasant houses of the ciftliks remain, although it may be that some modern houses follow their alignment. More solid, stone built houses of the Ottoman period have, however, remained. These 'traditional' houses have pitched roofs and usually two stories (Wagstaff 1965), but generally modern houses are by far the most numerous type in rural settlements.

Although the peasants of the region were impoverished throughout this second period of Ottoman rule, the landowners enjoyed great prosperity. The reason was the increasing demands of a Western Europe undergoing rapid industrialization and urbanization for the agricultural

products of the Balkans, and a rapid rise in the prices of these goods, There were three main effects of this. Firstly, a great stimulus was given to the cultivation of cotton, maize and tobacco resulting overall in an intensification of agriculture in the region which was associated with an extension of irrigation and the reclamation of new land in low lying parts of the plain.

Secondly, the increased volume of trade saw the emergence of a class of native merchants who were able to take a dominant position in this field. Mainly people from the Pindos, the poverty of mountain life, their migratory habits and their freedom from governmental control encouraged them to participate in trade. Until the overland trade began to decline in the nineteenth century these people prospered, and the visible signs of this wealth can still be seen in the larger stone houses and churches which they built to replace poorer buildings.

The third effect of the West's expansion was a growing demand for handicraft products. Industrial output rose sharply during the eighteenth century, and Thessaly became the most industrialised area of Greece. Most activity was in cotton and silk textiles and the most important export was red cotton yarn. The most important production centres were Ambelakia and Tirnavos (Larissa nomos). The villages of Mount Pelion were the major silk producing centres. By the early nineteenth century, however, the effects of severe competition from the cheaper products of Britain and, later, other countries were being felt, and the Ottoman government failed to give any active encouragement or protection to its home industries: by 1830 Ambelakia was deserted.

The growing prosperity of the landowners in the second period of Ottoman rule had an impact on the main towns of the region. In the earlier period houses were similar to those of the villages (mainly single storey cottages of mud brick), but during the eighteenth and nineteenth centuries larger timber framed houses of two or three storeys became important. Although these buildings are relatively frail, some examples survive and contrast markedly with the Greek colonial and modern styles of architecture that dominate today. Because of the scarcity of stone and a shortage of skilled stonemasons, only official buildings such as mosques and public baths were made of stone or brick, and these often survive in some form. The street plans of Ottoman towns showed all the characteristics of gradual, organic growth in an era of unmechanised transport : narrow, winding and often unpaved streets with no signs of central planning.

The main urban functions were administrative, military and religious, while the commercial and industrial sectors of the urban economies were not well developed. Rather than having a symbiotic relationship with their hinterlands, the towns were parasitic. Because they were the permanent home of the landowning class much of the wealth from agriculture was concentrated there, while the impoverished state of the majority of the rural population meant demand for marketable commodities was low and confined primarily to the ruling class. The importance of non-economic functions in Thessaly at this time is indicated par excellence by the establishment of Kardhitsa by the Ottomans in the first part of the nineteenth century as a military and administrative centre to prevent

incursions by Greek rebels into the Thessalian plain; only much later did commercial activities become significant in the town (Samaropoulos 1901).

3 The Post-Independence Period

In 1881 Thessaly gained its freedom from the Turks[1] and was united with the Greek kingdom which had been founded about fifty years earlier. This was to lead eventually to great changes in Thessaly since what had been a marginal province of a large and decadent empire, became one of the potentially richest regions of a new country.

The post-independence period may be divided into two parts by the war with Turkey in 1922 when Greece's ambition to extend her territory into Asia Minor failed disastrously. The subsequent impact of the influx of over one million refugees was felt deeply in all spheres of Greek life, and had important ramifications in the social and economic geography of the country (Pentzopoulos 1962). Changes in the cultural landscape of Thessaly are most notable in the townscapes during the first period, and in the countryside during the second.

By 1900 the main towns of Thessaly had been completely transformed; the old patterns of narrow, winding streets had been replaced by spacious systems of streets and squares laid out on a grid plan. Apart from at Volos, maps are available in either the prefecture or town hall of the various nomos capitals which all show elements of the Ottoman town plans and superimposed the new plans, the dates of which are as follows: Kardhitsa (1890), Larissa (1883) and Trikala

(1885). Only in Trikala, near the fortress, is there an area where the original Turkish layout is preserved (Plate 3). This complete renewal of towns after liberation appears to have happened in other regions of Greece as well, and is all the more remarkable considering the backward nature of the Greek economy at that time and the demands being placed on it during the struggle for the liberation of the rest of Turkish occupied Greece. As there were no pressing economic or social reasons for new towns, it may be that they were built primarily to obliterate the memories of the Ottomans, and to symbolize the birth and dynamism of the new state. The disappearance of the mainly urbanized Turkish population may have left many properties vacant and so made the new foundations that much easier to establish, although Sivignon (1975) says that there was still an important Turkish population until 1897.[2]

It is difficult to investigate the detailed morphology of the towns of Thessaly at past times because of a lack of readily available information, but the general structure that was established after independence has probably not changed a great deal. Certainly, the town plans have not evolved, although with population growth there has naturally been some extension of suburbs, either planned or otherwise. In Larissa and Volos the housing of refugees after the 1922 disaster resulted in the building of fairly large suburbs, but compared to some other parts of Greece, the region received only a relatively small number of refugees. Changing architectural styles obviously influence the townscape, and the contrast in the townscapes of Larissa and Kardhitsa, for

example, inevitably reflects the differences in the recent growth of these towns and the dynamism of their economies. There is a general similarity in the land use patterns of all the towns, and any differences reflect variations in economic structure; for example, Larissa has more land under industrial use than Trikala or Kardhitsa while Volos's seaside location and port function have an obvious influence on its morphology.

The period immediately after independence saw little change in the countryside and in the impoverished conditions of much of its population. After 1881 Greek landlords simply replaced the Turkish and the ciftliks remained intact. However, the Ottoman attempts to regulate landlord/tenant relationships, even if ineffective, were abolished and so, if anything, the state of the peasantry deteriorated. At this time the average size of the estates was about 750 ha. in West Thessaly although there were some properties of several thousand hectares (de Vooys 1959). As before, the dominant form of tenure was sharecropping; in the upper plain the main form was the system whereby the peasant cultivated the land by his own means and gave the owner one third of the crop, whereas in the lower plain the most important system was one whereby the owner gave the seed and other materials and took half the crop in return (Sivignon 1965). This kind of tenancy agreement does not provide a stimulus to the improvement of the land and the lack of interest expressed by absentee landlords in their holdings meant little investment in agriculture. The farming system was dominantly arable and only grain was cultivated: mainly wheat with some barley, maize and sesame.

A large part of the land was left fallow; in 1899 167,000 ha. were cultivated in Thessaly, and 101,000 ha. were fallow (de Vooys 1959). Laws were passed in 1866 and 1890 to allow the cultivator to buy his land but they had little effect. The most significant new development was a law of 1909 which foresaw the expropriation of land for public use, although it was another fifteen years before action to institute radical land reforms took place.

The impact of the influx of refugees from the 1922 war, followed by the exchange of the remaining minority populations under the Treaty of Lausanne, was not as severe on Thessaly as on some other parts of Greece. Most of the newcomers settled in northern Greece, the Aegean Islands and in Athens. Thessaly was unable to absorb a large number of people and so only a small number of refugee settlements were founded in this region (Pentzopoulos 1962). However, the whole national problem of assimilating all these people forced the government to introduce land reform in 1925, a measure which had very important implications for Greek rural society and for agriculture, and which had a significant influence on the cultural landscape of the countryside. The large estates were divided up among the cultivators and the areas of permanent pasture were maintained and made the communal possession of the villages. Greece became a country of small peasant landowners.

Initially there was not much change in the overall economic position and Sion (1934) noted a deterioration as drainage was neglected and malaria spread. With no money for investment, the farming system did not change and fallow

continued to be dominant. One important development did, however, occur in settlement morphology. As the existing peasant houses of mud bricks and straw roofs could not be improved, advantage was taken of the situation to found completely new villages. At the time of the land reform large areas were set aside for the villages, all of which were planned on a basic grid pattern focussed on a central square with variations related to local topography and/or previous settlements. Within the village, each farmer was given a plot of two stremmata (½ acre) to build his house and outbuildings on (de Vooys 1959), and this still gives most plain villages a characteristically open appearance despite some subsequent subdivision of the plots (Plate 4A and 8B). The modern houses are all of a fairly uniform design; one storey square buildings with walls of fired bricks and roofs of red tiles. The most dominating buildings in the villages today are usually the church, the primary school and the co-operative warehouse. The commune office and shops are generally located around or near the village square.

The greatest hindrance to agricultural development was the poor drainage of the plains, and water control was a necessary pre-condition to progress. An attempt to control the drainage system was started in 1936, and in a relatively short time a great improvement was made. The chief rivers were embanked, tributaries deepened and straightened, and new drainage canals were dug. All these now form a prominent element in the landscape although localised drainage problems do remain, and in winter some areas can still be under water.

During the sixty year period from 1881 substantial changes therefore took place in the cultural landscape of Thessaly and in the nature of the society which occupied it, changes which were a revolutionary departure from the past. From 1940 a decade of military conflict followed first against the Germans and Italians and subsequently in the civil war. Inevitably, the effect on the region was severe; much material damage was wrought, and economically the region reverted to a subsistence basis. Many of the mountain villages were abandoned, especially those of the semi-nomads, and people were resettled in the plains where the ruling power could more effectively control them. It was not until after 1950 that Thessaly began to experience the beginnings of the social and economic changes that have been the dominant theme of post-war Greece, and which form the backcloth to Sections C and D.

SECTION C THE ECONOMY OF THESSALY SINCE 1951

It was shown in Chapter 2A that during the post-war period the sectoral structure of the Greek economy has undergone some changes as G.D.P. has risen, the dominant characteristic being the decline in the relative importance of Agriculture and a corresponding rise in that of Industry and Services. Some regional differences in sectoral structure were also noted. The economy of the region of Thessaly has followed the trends observed at the national level, while within the region itself differences in sectoral structure can similarly be detected. Although output data are not available at the sub-regional scale, the employment data from the 1951 and 1971 population censuses illustrate these features

TABLE 3:1

Sectoral Employment in Thessaly 1951 and 1971, by Nomos with a Breakdown into Urban, Semi-urban and Rural areas

NOMOS	ALL AREAS		URBAN		SEMI-URBAN		RURAL	
	N	%	N	%	N	%	N	%
1951								
Kardhitsa - Agric.	32,209	74.3	1,062	16.5	3,772	65.4	27,375	87.8
Industry	4,572	10.5	1,995	31.0	792	13.7	1,785	5.7
Services	4,944	11.4	2,693	41.9	895	15.5	1,356	4.5
N.D.	1,627	3.8	678	10.6	308	5.4	641	2.0
TOTAL	43,352	100.0	6,428	100.0	5,767	100.0	31,157	100.0
Larissa - Agric.	48,351	61.3	5,584	23.2	10,720	64.2	32,047	84.0
Industry	12,149	15.4	6,882	28.6	2,398	14.4	2,869	7.5
Services	14,210	18.0	9,732	40.5	2,497	14.9	1,981	5.2
N.D.	4,184	5.3	1,844	7.7	1,080	6.5	1,260	3.3
TOTAL	78,894	100.0	24,042	100.0	16,695	100.0	38,157	100.0
Magnisia - Agric.	20,845	36.8	1,918	7.2	5,855	55.3	13,072	66.7
Industry	14,779	26.1	10,540	39.9	1,715	16.2	2,524	12.9
Services	16,156	28.5	11,261	42.6	2,203	20.8	2,692	13.7
N.D.	4,850	8.6	2,710	10.3	818	7.7	1,322	6.7
TOTAL	56,630	100.0	26,429	100.0	10,591	100.0	19,610	100.0
Trikala - Agric.	31,999	70.3	2,631	25.4	4,453	64.2	24,915	88.3
Industry	5,430	11.9	2,996	28.9	922	13.3	1,512	5.3
Services	6,279	13.8	3,822	36.8	1,310	18.9	1,147	4.1
N.D.	1,821	4.0	923	8.9	255	3.6	643	2.3
TOTAL	45,529	100.0	10,372	100.0	6,940	100.0	28,217	100.0
1971								
Kardhitsa - Agric.	40,540	71.3	580	7.5	4,280	58.6	35,680	85.4
Industry	5,760	10.2	2,440	31.4	1,240	17.0	2,080	5.0
Services	8,360	14.7	4,320	55.5	1,480	20.3	2,560	6.1
N.D.	2,180	3.8	440	5.6	300	4.1	1,440	3.5
TOTAL	56,840	100.0	7,780	100.0	7,300	100.0	41,760	100.0
Larissa - Agric.	41,460	49.6	3,240	11.5	8,860	53.8	29,360	75.4
Industry	16,320	19.5	9,380	33.2	3,400	20.7	3,540	9.1
Services	20,780	24.9	13,640	48.3	3,440	20.9	3,700	9.5
N.D.	5,040	6.0	1,960	7.0	760	4.6	2,320	6.0
TOTAL	83,600	100.0	28,220	100.0	16,460	100.0	38,920	100.0
Magnisia - Agric.	17,260	32.6	2,060	7.5	3,960	47.1	11,240	66.4
Industry	14,800	28.0	10,620	38.5	1,900	22.6	2,280	13.5
Services	16,540	31.3	12,260	44.5	1,960	23.3	2,320	13.7
N.D.	4,280	8.1	2,620	9.5	580	7.0	1,080	6.4
TOTAL	52,880	100.0	27,560	100.0	8,400	100.0	16,920	100.0
Trikala - Agric.	31,140	62.2	2,180	17.8	3,400	55.4	28,560	82.3
Industry	7,320	14.6	4,020	32.8	1,000	16.3	2,300	6.6
Services	8,980	17.9	5,580	45.6	1,300	21.2	2,100	6.1
N.D.	2,640	5.3	460	3.8	440	7.1	1,740	5.0
TOTAL	50,080	100.0	12,240	100.0	6,140	100.0	34,700	100.0

SOURCE: 1951 and 1971 Population Censuses

(Table 3:1).

While all nomoi show changes in the relative importance of sectors, inter-nomos differences do not change greatly between 1951 and 1971. The two nomoi of the upper plain, Kardhitsa and Trikala, have a higher proportion of their workforce in Agriculture than Larissa and Magnisia, and a consequent lower proportion in Industry and Services. Basically, such differences can be accounted for by the larger industrial base of the two towns of Volos and Larissa, the former the port and traditional industrial centre of the region, and the latter the more rapidly growing regional capital. The Services sector is of similar size in all the main towns, and has shown substantial increases in most. The Agriculture sector shows larger differences between the towns, but rather than being a reflection of differences in the urban economies this can be accounted for by variations in the areal extent of the dhimoi (the statistical unit); the dhimos of Trikala, for example, includes a number of wholly agricultural villages, whereas that of Kardhitsa does not. In the case of the nomos of Larissa, Urban Areas include the small town of Tirnavos as well as the dhimos of Larissa.

The inter-nomos differences are not so pronounced in either semi-urban or rural areas, although Magnisia does stand slightly apart from the other three in the lower proportion of employment in Agriculture. Semi-urban and rural areas both show signs of shifts in sectoral structure 1951-71 in all the nomoi, these being most pronounced in the former compared to the latter where Agriculture is still overwhelmingly dominant.

Data on sectoral employment are only useful in giving some general indications of the relative importance of the different sectors of the regional economy. The data cannot give a full picture of the character and dynamism of particular sectors, and so a fuller consideration of individual sectors based on more specific data is necessary. This follows below, where the principal characteristics of Agriculture and Industry in Thessaly are outlined. Since the Service sector forms the main basis for the rest of the thesis (and has already been partly examined) no further consideration will be given to it at this point.

1 Agriculture

Although the proportion of the population employed in agriculture in Thessaly fell from 60 per cent in 1951 to 54 per cent in 1971, the sector has seen some considerable developments in the post-war period, and the region is now one of the most productive agricultural areas of Greece. Overall, the theme has been that of increasing commercialization which has been associated with the introduction of new types of crops and improved livestock breeds. Changes in techniques and the organization of farming have also taken place, but much remains to be done in this field, and problems related to such factors as the physical environment, land tenure and marketing still arise here if to a lesser degree than in some other parts of the country (see Pepelasis and Thompson 1960, Burgel 1972).

Changes in produce have been most marked in arable crops. In 1951 wheat was the most important crop, and was to become increasingly dominant up to 1965 because the government established a guaranteed minimum price for the

crop. Since 1965 the area under wheat has declined although total output has continued to increase. The traditional commercial crop of tobacco has stagnated, and the most significant new developments since 1951 have been the tenfold increase in the area under cotton and the introduction and expansion of sugar beet to its present levels. In both instances the extension of the irrigated area and/or new farming techniques have been the crucial contributory factors.

Considering the division of cultivated land into major categories in 1971 (Table 3:2), the rank order of these categories in Thessaly is the same as for Greece as a whole, but there are differences of emphasis at this scale as well as within the region itself. In particular, arable crops (including grain, fodder and industrial crops) are by far the most important, occupying as much as 93.5 per cent of cultivated land in Kardhitsa, but in Magnisia the area is slightly under the national average. Conversely, the area under tree plantations in Thessaly is proportionately less than for Greece as a whole although this masks a very striking contrast between Magnisia (including the Sporadhes) and the other three nomoi, reflecting the climatic contrasts between the coast and the interior.

The importance of grains and industrial crops in the agriculture of Thessaly can be seen from Table 3:3. Of the grain crops, wheat (mainly soft) is the most important, occupying about 70 per cent of the land devoted to grains. Barley comes second, and maize third. Cotton is the most important of the industrial crops, occupying about 75 per cent of the land under these in 1971. Second in importance is sugar beet (about 13 per cent), and third is tobacco (10.5 per

TABLE 3:2

Crop Areas and Fallow Land as a Percentage of Total Cultivated Land, 1971

	Total cultivated area (strem.)	Arable crops	Garden area	Vines	Tree plantations	Fallow
Greece	40,885,121	61.9	2.6	5.4	17.1	13.0
Thessaly	5,068,525	84.7	1.3	2.1	7.7	4.2
Kardhitsa	1,142,986	93.5	1.4	1.9	0.2	3.0
Larissa	2,381,518	89.6	0.8	2.2	5.1	2.3
Magnisia	834,536	60.0	1.8	1.9	31.4	4.9
Trikala	709,485	83.5	2.1	2.1	0.8	11.7

SOURCE: 1971 Agriculture Census (Part 1)

TABLE 3:3

Arable Crops and Garden Area (percentage breakdown by categories), 1971

	Area (Strem.)	Grains	Edible pulses	Fodder seeds	Ind. plants	Plants for hay	Plants for grazing	Melons, potatoes	Vegetables	Garden area
Greece	27,481,399	59.3	3.0	1.8	10.5	11.9	2.4	3.1	4.2	3.8
Thessaly	4,427,518	67.4	1.2	1.9	14.7	9.2	0.6	1.9	1.6	1.5
Kardhitsa	1,100,241	57.0	1.2	0.8	22.4	14.3	0.2	1.1	1.5	1.5
Larissa	2,170,628	74.7	1.0	2.3	12.8	4.7	0.8	2.0	0.8	0.9
Magnisia	536,104	77.8	1.2	1.7	3.9	7.4	0.9	0.5	3.8	2.8
Trikala	620,545	51.4	2.2	2.5	16.8	17.7	0.6	3.9	2.5	2.4

SOURCE: 1971 Agriculture Census (Part 1).

cent). Within the region cotton in dominant in all the nomoi, but sugar beet is only important in Larissa and Magnisia since the processing plant is in the town of Larissa.

In 1971, the proportion of cultivated land under vines was less than half the national figure, and in part this might be attributed to physical factors. They are found mainly in the coastal and in the higher areas rather than in the plains, and are grown both for wine and table use, but no raisins are produced in the region. There does not appear to be any significant differences between nomoi in the amount of cultivated land under vines.

The greatest intra-regional differences occur with tree plantations where the contrast between the eastern and western parts of Thessaly has already been noted. Trikala and Kardhitsa nomoi together possess only 2 per cent of the total number of trees recorded for Thessaly in 1971, while Magnisia has 67 per cent. Olives are numerically the most important (62 per cent of the total), and the fruit and nut and dried fruit categories form most of the remainder. There are only a few citrus, and these all in Magnisia.

Livestock rearing forms an important element in the rural economy, and is significant both from a subsistence and a commercial viewpoint. Although very few holdings appaar to be devoted entirely to the rearing of livestock, the 1971 Agriculture census records only 7 per cent which are entirely cultivated. Table 3:4 shows the number of different animals in December 1971.

Cattle are found throughout the region with some concentration on the upper plain. They are raised mainly

TABLE 3:4

Livestock numbers, December 1971

	Cattle	Sheep	Goats	Pigs	Horses mules, asses	Hens	Geese, ducks turkeys
Greece	986,355	7,686,404	4,184,703	504,502	731,356	28,643,507	401,583
Thessaly	92,533	1,331,009	429,498	59,847	78,179	1,408,920	119,079
Kardhitsa	40,845	170,359	58,087	18,219	20,381	329,623	48,645
Larissa	24,239	672,903	175,892	17,419	23,620	530,270	43,929
Magnisia	6,819	193,000	114,857	11,883	16,008	330,720	11,330
Trikala	20,630	294,747	80,662	12,326	18,170	218,307	15,175

SOURCE: 1971 Agriculture Census (Part 2).

for milk which is consumed directly or used by a number of local factories. Production of beef cattle is increasing, and there is a slightly higher proportion of improved stock among the herds compared with the national average.

Both sheep and goats are numerically more dominant than cattle in Thessaly as much as in other parts of Greece. The census data distinguish domestic, flock and nomadic animals. Almost every rural household, and a number of urban, keeps at least one goat and/or sheep for milk (which may be made into cheese and yoghurt). Farmers with only small amounts of cultivatable land may keep larger numbers of animals to make up their incomes and graze them on the common pasture, while the existence of semi-nomadic communities of Vlachs dependant almost entirely on their flocks is still a feature of the region.

Of the other animals, horses, mules and asses are used for transport and general agricultural work, although numbers are likely to decline with mechanisation. Pigs and poultry are kept on most farms, and in the towns many homes keep hens.

The agricultural sector of an economy cannot, however, be viewed simply in terms of acreages and livestock numbers. Consideration must be given to the social, organisational and technological framework within which it operates, and which ultimately effect its longer term development potential.

Land tenure and the size of plots and holdings are important elements in agricultural productivity. The farms of Thessaly are on average larger than those of Greece

as a whole, a characteristic that is particularly noticeable on the plains (Table 3:5). Within the region itself, however, there are some striking contrasts between nomoi; Larissa has by far the largest holdings, especially in the plains where the average size is more than twice that of Trikala nomos. In the mountains differences between nomoi are much smaller. As well as larger than average holdings, the number of plots per holding in Thessaly is smaller than the rest of Greece, and plot sizes correspondingly larger. The average number of plots in Thessaly, 5.4, with an average size of 8.2 stremmata[3] compare, for example, with Crete where the figures are 10.3 and 2.7 respectively. In part such differences can be attributed to the land consolidation programmes which have been operating on a rather piecemeal basis since 1953, but which have achieved more progress in Thessaly than other areas. Sivignon (1975) noted that by 1966 30 per cent of the cultivated area in the plains had been subject to consolidation. The implications for the mechanisation of agriculture are obvious, and are reflected, for instance, in the greater use made of tractors in Thessaly (in 1971, on 59.0 per cent of holdings compared with 46.4 per cent for Greece as a whole, and 18.6 per cent in the Aegean Islands).

Similarly, larger holdings do allow more extensive use of irrigation which physiographic factors also favour in this region. In 1971, 20.5 per cent of all cultivated land in Greece was irrigated, and in Thessaly 27.9 per cent. Important intra-regional differences do exist, however, as the western nomoi have a significantly higher proportion of irrigated land than the eastern due to the more ready availability of water from the Pindos mountains. Sivignon (1975)

TABLE 3:5

Average Size of Cultivated Holdings, 1971 (in *stremmata*)

	Plain	Semi-mountainous	Mountainous
Greece	37.5	34.5	28.3
Thessaly	53.7	39.0	22.6
Kardhitsa	47.1	33.6	20.0
Larissa	72.1	43.3	28.6
Magnisia	45.8	44.3	19.9
Trikala	31.8	26.8	23.3

SOURCE: 1971 Agriculture Census (Part 1)

described in some detail the development of irrigation in the region, and he noted that most expansion has taken place since 1951, the greater part by the tapping of ground water by pumps. Only in fairly restricted areas is irrigation from water courses or dams important, although it is envisaged that this source will be more fully exploited in the future so that eventually both plains will be completely irrigated.

Despite the progress that has been made, impediments to agricultural development still remain. Although consolidation is being carried out, and holdings and plot sizes are higher than the Greek average, they still remain small compared to those found in more developed agricultural economies with a strong arable bias. Moreover, the operation of the dowry system and inheritance customs are likely to lead to refragmentation of land unless legal constraints are placed on them. Government intervention in the sector remains on an ad hoc basis with price controls on some products and piecemeal improvements in infrastructure. Most influence is probably exerted through the Agricultural Bank and the associated Agricultural co-operative. In providing credit and advice, the Bank is able to assist farmers to modernise, while cheap fertilisers, seed etc, are made available through the Co-ops. In the field of marketing, however, very little is done by these organisations, and this is a factor contributing to the high costs of distributing produce (Sikianakis 1976). Overall, Sivignon (1975) p.365 considers that they do not play a sufficiently active or innovating role in the rural economy.

2 Industry

If the agricultural sector of the region's

economy is rather more productive and has shown more progress than that of many other parts of Greece, the industrial sector shows less variation from the Greek provincial norm. In 1971 Manufacturing accounted for 18.7 per cent of the region's economically active population compared to 16.5 per cent in 1951 (Table 2:3), and for a slightly higher proportion of regional G.D.P.

The numbers of establishments and employment in 1969 for the twenty principal industrial categories used in the Industrial Census are shown in Table 3:6. Three main features can be noted. Firstly, the preponderance of small establishments; for many categories the average number of persons per establishment is less than three (overall it is only 3.1). The great majority represent small family owned and oriented businesses, many of which carry out all the stages of production of a particular good. Secondly, there is some concentration of industry (and especially the few larger establishments) in the nomoi of Larissa and Magnisia. Together, the nomoi of Trikala and Kardhitsa contain 34 per cent of the region's industrial establishments and 27 per cent of employment. The average size of establishments is thus lower in these nomoi than in the eastern ones: 2.5 persons per establishment compared to 3.4. Thirdly, there is considerable emphasis on industries which process agricultural raw materials and those which produce common consumer goods; the latter includes the handicraft activities which are conducted from retail type premises and where the goods are sold directly to the public.

In general terms, the industrial sector

TABLE 3:6

Industrial Establishments and Employment in Thessaly, 1969

	KARDHITSA		LARISSA		MAGNISIA		TRIKALA	
	Est.	Emp.	Est.	Emp.	Est.	Emp.	Est.	Emp.
Food	225	627	430	1,860	570	1,774	260	692
Beverages	77	66	210(?)	169(?)	30	244	14	44
Tobacco	2	64	4	36	19	910	1	23
Textiles	68	259	118	1,126	60	938	149	519
Footwear	282	454	592	940	585	1,033	233	349
Wood, excl. Furniture	209	435	281	670	373	664	162	582
Furniture	55	180	160	530	189	442	43	112
Paper	-	-	3	400	4	25	1	2
Printing	9	42	21	101	26	162	8	33
Leather, Fur	7	9	7	15	11	22	7	13
Rubber, plastics	8	13	34	63	17	26	11	21
Chemicals	5	15	6	19	11	48	4	11
Petroleum/coal products	-	-	-	-	2	9	-	-
Non-metallic mineral prod.	94	386	113	674	104	1,000	64	261
Basic metal ind.	-	-	-	-	1	152	-	-
Metal products	242	380	328	667	282	1,248	183	354
Machinery	47	130	161	505	94	683	42	108
Electrical machinery	13	16	57	124	81	217	26	57
Transport equipment	92	202	221	658	164	506	90	296
Miscellaneous	31	50	39	69	41	67	17	25
TOTAL	1,466	3,328	2,785	8,626	2,664	10,170	1,315	3,502

SOURCE: Table 1, 1969 Industrial and Commercial Establishment Census.

has shown only modest growth in the post-war period. Between 1958 and 1969 the number of establishments recorded in the industrial censuses rose by 12.1 per cent and employment by 6.4 per cent. The population censuses recorded an increase of 19.7 per cent in the numbers of the economically active population classified as Manufacturing between 1951 and 1971 (c.f. 8.5 per cent in total economically active population). A substantial proportion of these increases can be accounted for by the continuing establishment of small new enterprises which has resulted in little change in either the sectoral or organisational structure of industry (c.f. trends in retail trade, Ch. 2B). In this period there have been relatively few large factories built in the region; most modern industrialization has been occurring in the Athens region and, on a smaller scale, in Thessaloniki. Even Volos, which is the only town in the region with any kind of industrial tradition, has not experienced much expansion since 1951. A large cotton gin is perhaps the most important of the more recent developments here while in Larissa the sugar beet processing plant built in 1961 and an American financed paper mill opened in 1963 have been the most important additions to the town's industrial base. All of these larger establishments are concerned with the processing of locally produced agricultural raw materials. In West Thessaly there have been no new factories of comparable size but simply the continuing establishment of small units. Sivignon (1975) pp 453-490 provides a more detailed description of the distribution and operation of industry in the region and it is not proposed to replicate this here. Instead a brief consideration will be given to the principal factors which have contributed to the limited industrialization of the region.

Seven principal influences can be identified which have shaped the nature of industrial development in Thessaly (and most apply to the rest of Greece too). These are:

1 An absence of raw materials apart from those produced from agriculture. Indigenous energy sources are limited, but there are prospects for HEP development in the region.

2 A shortage of skilled labour and management.

3 A low rate of capital investment. This can be attributed partly to low savings margins, partly to the absence of a well developed system of equity financing and partly to the diversion of resources into other spheres (particularly construction). On a national basis, Germidis and Negreponti-Delivanis (1975 p.58) found that housing accounted for over 50 per cent of investment in the secondary sector 1950-70, while the average share for manufacturing was 26.1 per cent. Between 1960 and 1970 the proportion of total investment made in manufacturing remained stable. Limited capital inputs are a major influence on the low productivity of the industrial sector.

4 There is lack of desire among local entrepreneurs to expand existing enterprises. In this the wish to retain control within the family is a major factor and it reduces the scope for capital investment in any business through any means but bank loans (Alexander 1964).

5 Much of Greek industry is strongly market oriented (Coutsoumaris 1963, Ward 1963) and the small size of

the domestic market together with the problems faced by the small firms in exporting produce a limited basis for expansion.

6 Political instability throughout much of the post-war period and an absence of detailed and continuous regional development policies has not resulted in any effective action by government to develop industry in the area.

7 Thessaly, like the other provincial regions of the country, suffers from the concentration of most large scale investments in Athens and Thessaloniki. It is in these two places that the requirements of modern industry for labour, infrastructure and services are most readily met, and for market-oriented industry Athens has the greatest concentration of population in the country as well as being at the centre of the communications networks. In comparison, Thessaly has relatively little to offer the modern industrialist.

In summary, the industrial sector of the economy of Thessaly has shown only modest increases in its significance and the composition and structure of the sector has remained virtually unchanged since 1951. This poses a problem in that it has not emerged as a viable alternative to agriculture as a major source of new employment. While changes in the economic, institutional and social environment might produce some change in this situation, the probability of major new development in the medium term must remain low. The main hope for the future may be in the further development of industry based on local agricultural raw materials but

there are clear limitations to this and it would not solve the problem of the seasonal industrial unemployment which is a feature of the area.

SECTION D THE POPULATION STRUCTURE AND DYNAMICS OF THESSALY

Since unification with Greece the population of Thessaly grew steadily up to 1961, but then in the following decade up to 1971 an absolute decline occurred for the first time. The urban population of the region has risen steadily since 1920, and the recent decline in total population is attributable to the decline of the semi-urban and rural populations of the region (Fig. 3:3). In general, the history of population change in Thessaly has not differed from the rest of Greece (Bennison 1970). In the 1920-40 period the influx and subsequent settlement and consolidation of the Asia Minor refugees was the main factor, although, as mentioned in Section B, Thessaly did not receive as many as some other regions. Between 1940 and 1951 the Axis occupation and the Civil War were the principal influences, and it is only in the post-1951 period that population changes can be related to specific economic and social factors. In this most recent period (1951-71) only Greater Athens has shown a relative increase greater than that of the national average. This implies that all the other regions have experienced net outward movements of population, particularly since 1961, and sample census data confirm this (Bennison 1976).

Some intra-regional differences exist in both the rate and direction of population change and in its settlement size distribution (Table 3:7). The two western

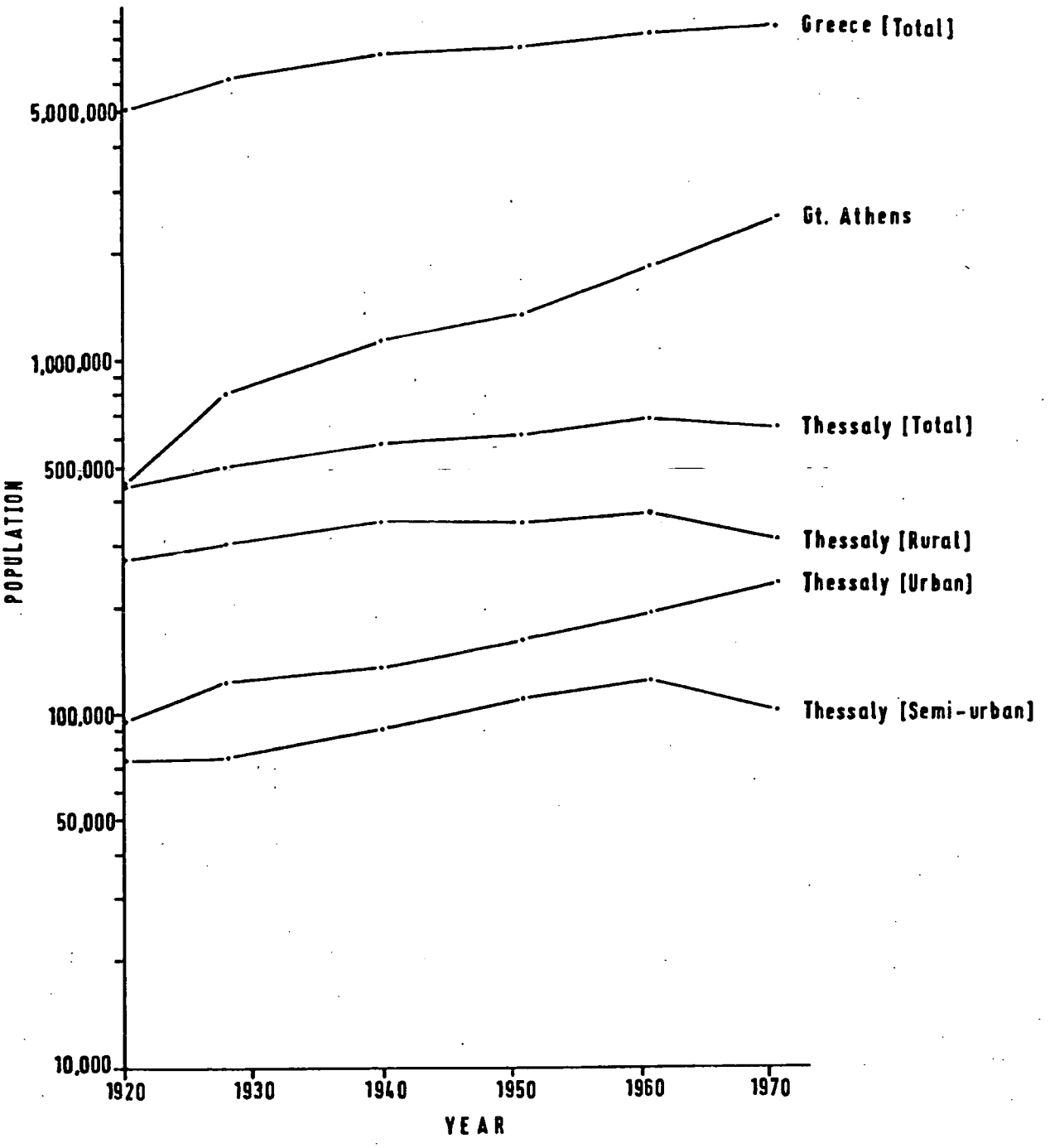


Figure 3:3 Population of Greece, Athens and Thessaly 1920-71.

TABLE 3:7

Population of the nomoi of Thessaly, 1971

	1971 Population	% Urban	% Semi-urban	% Rural	% change 1951-71
Thessaly	659,913	35.8	15.8	48.4	4.9
Kardhitsa	133,776	19.3	12.9	67.8	-3.6
Larissa	232,226	35.9	20.3	43.8	11.6
Magnisia	161,392	54.6	15.1	30.3	4.9
Trikala	132,519	29.2	11.8	59.0	3.3

Source: 1971 Population Census

nomoi have the highest proportion of population in rural areas, and have shown the least dynamism. Magnisia has relatively the highest urban component, while it is Larissa nomos that has shown the greatest population growth. However, the trends in population change by settlement size are common to all four nomoi. The increase in urban population and the decline in the rural are a reflection of the large scale migration movements which have characterised all of modern Greece. Within Thessaly itself there have been considerable movements but lack of data precludes a detailed analysis of their structure and pattern. Two types of movement out of the region are significant: emigration abroad, and migration to Athens.

Greece has a long tradition of emigration which today tends to be oriented mainly to Europe (especially West Germany). The size of the emigration is such that in the period 1961-71 the total population of the country rose by only 4.5 per cent. A substantial part of this movement is, however, temporary and resettlement in the place of origin

is common. By analysing the location of passport holders Sivignon (1975, p.219) has shown that within Thessaly there appears to be some variation in the degree of emigration between various parts of the region: the eparchies of Kalambaka, Trikala and Elasson have the highest rate of emigration, and there is some evidence to suggest that movement abroad tends to be of a self-generating nature (Kayser 1965b, Thompson 1967).

Although Athens is the main focus of internal migration, the pattern of movements revealed by the limited data which are available is more complex than might superficially seem to be the case. The migration pattern in the period 1966-71 appears to be similar to that of the 1956-61 period, although differences of classification preclude direct comparison. Table 3:8 shows the 1971 census data for the four nomoi of Thessaly expressed in percentage terms; taking inevitable regional differences into account, these do not deviate from the overall pattern. In all the nomoi except Larissa migration to Athens forms the largest component of total migration movements. In Larissa, the most important component is intra-nomos migration, migration to the rest of the country is second, and to Athens third. In Magnisia, intra-nomos migration forms the second most important component, while it comes third in Kardhitsa and Trikala. The relatively large amount of migration out of Kardhitsa (77.5 per cent of total) is confirmed in a detailed study of migration from six communes in the nomos by Kayser et al (1971).

The breakdown of the origin of the migration movements by settlement size shows important differences in destination. Migration from urban areas is mainly to Athens and the rest of the country (a substantial proportion of the latter

TABLE 3:8

Destination of Migration Movements from the Four Nomoi of Thessaly 1966-71

Residence in 1966	Total Movement	RESIDENCE IN 1971 (% TOTAL)				
		Athens	Intra - nomos			Rest of country
			Urban	Semi-Urban	Rural	
Kardhitsa	19,100	40.1	13.7	2.6	6.2	37.4
Urban	3,320	63.3	-	-	3.6	33.1
S-U	1,940	41.2	10.3	4.1	9.3	35.1
Rural	13,840	34.4	17.5	3.0	6.4	38.7
Larissa	27,020	26.0	22.1	11.0	9.6	31.3
Urban	9,400	46.2	4.3	3.4	3.4	42.7
S-U	5,160	17.8	25.6	3.9	12.8	32.9
Rural	12,460	14.1	34.2	19.6	13.0	19.1
Magnisia	17,860	39.6	16.3	7.3	7.7	29.1
Urban	8,060	56.7	-	3.7	3.5	36.1
S-U	3,200	44.4	17.5	7.5	4.4	26.2
Rural	6,600	16.7	35.5	11.5	14.5	21.8
Trikala	16,920	26.3	19.4	7.1	9.3	37.9
Urban	3,360	37.5	-	1.8	5.3	55.4
S-U	2,060	32.0	7.8	2.9	14.6	42.7
Rural	11,500	21.9	27.1	9.4	9.6	32.0

SOURCE: 1971 Population Census (sample elaboration).

may be to Thessaloniki), while migration from rural settlements is primarily within the nomos of origin. These data therefore lend support to conclusions drawn at the national level that rural-urban migration in Greece displays, in part at least, a two stage movement; from village to local town, and then from the town to the metropolis (Bennison 1976).

Up until 1950 rural-urban migration movements in Greece resulted mainly from the particular and unique events which have already been noted. It is only in the post-war period that rising material aspirations connected with the inability of agricultural occupations to fulfil them have become the dominant stimulus to movement. The limited number of surveys which have been made on this subject[4] indicate the lack of employment opportunities as the main 'push' factor and the availability of employment as the main 'pull' factor, although Sandis (1973) p.91 has shown that for females personal reasons (mainly marriage) were also a very important factor. Although no ad hoc study has been made of the reasons for migration from Thessaly, general observation and contact with local people suggests that this area is no different in this respect from any other in Greece.

Although Thessaly has a rather lower out-migration rate than more marginal regions such as the Aegean and Ionian Islands, the consequences of this migration are still important, and not only in the mountains where relatively depopulation is on a much greater scale than in the plains (Emerson et al 1972).

There are several effects of a heavy rate of out-migration on the source areas. In the first place,

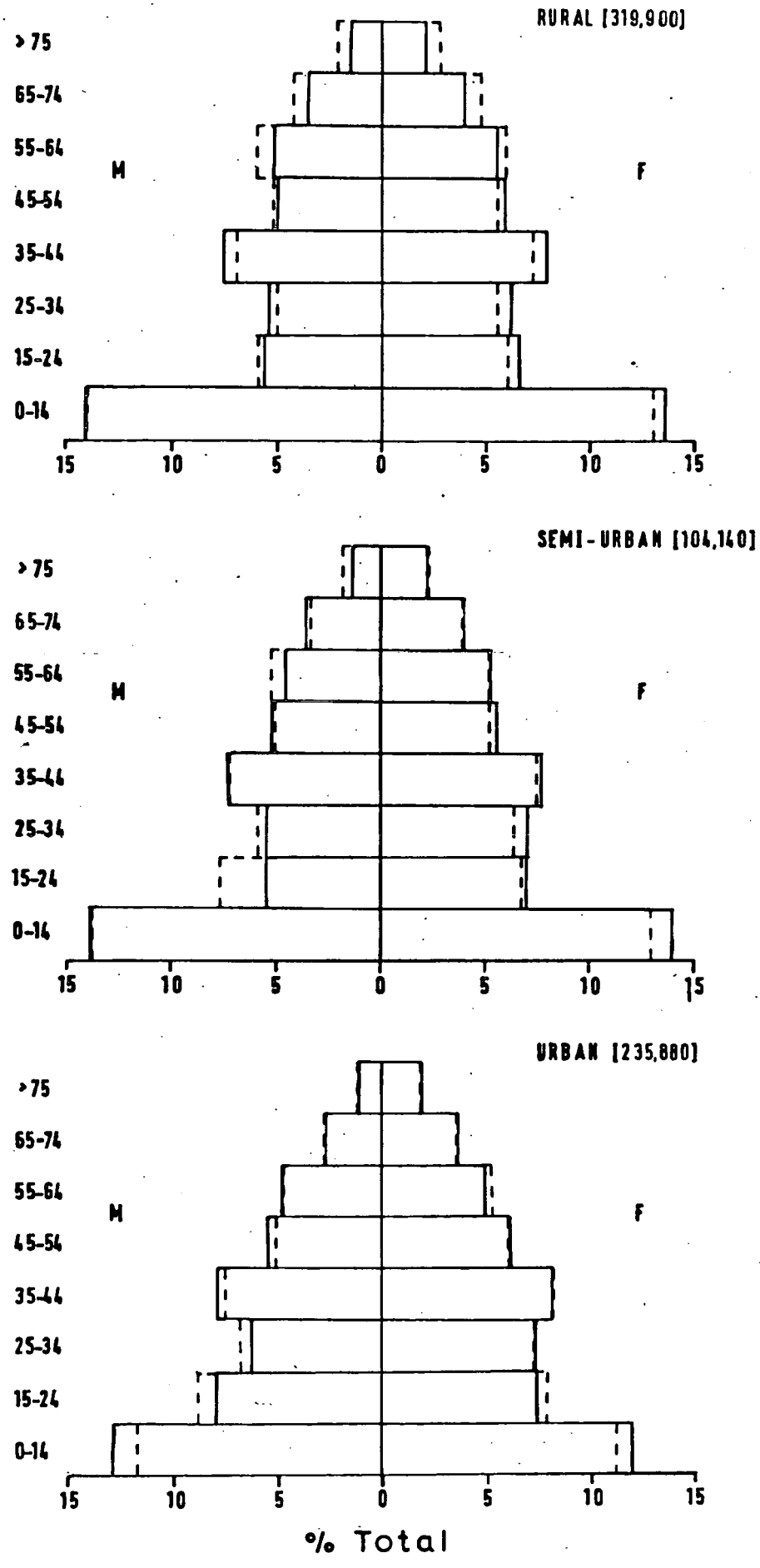


Figure 3:4 Age-sex pyramids of Thessaly, 1971. (Pecked lines indicate national proportions)

because migration tends to be confined to younger age groups, and within these to the better educated, their departure creates demographic and social imbalances within communities. This is reflected in the age-sex structure of the population where the proportion in the 15-34 age groups in rural and semi-urban areas is lower than in urban areas (Fig. 3:4). Economic implications arise from this and from other features of rural migration, with the net effect usually being combining stagnation of the local economy.

The migration movements from Thessaly are the most important symptom of the regional inequalities in the country, the dominant social and economic theme in provincial Greece today. The nature of the dichotomy between Athens and the rest of Greece, and its consequences for both, will be returned to in Chapter 8, but one element in this question is the structural and functional characteristics of the provincial settlement system, and it is this which forms the subject of the following four chapters.

FOOTNOTES

1 With the exception of the eparchy of Elasson which was not liberated until 1912.

2 To my knowledge, no systematic investigation has yet been made of this remarkable phenomenon. It is not mentioned by Sivignon.

3 One stremma is equivalent to a quarter of an acre or one tenth of a hectare.

4 These are reviewed in Bennison (1976).

Plate 2A

View of plain of West Thessaly from Fanarion (looking south). Note irrigation channel and small plot sizes.

Plate 2B

Eastern edge of plain of West Thessaly near Aghios Dhimitrios. Revenia hills in the background.

Plate 2C

Valley of River Kamnaitikos, Pindos Mountains. Village of Xilochorion on the opposite side.

Plate 3

Aerial photograph of Trikala town centre.

Plate 4A

Aerial photograph of Mataranga (Kardhitsa nomos).

Plate 4B

Aerial photograph of Platanos (Trikala nomos).

C H A P T E R F O U R

THE FUNCTIONAL REGIONS OF THESSALY

A functional region can be defined as an area whose components are more closely related with each other than with components outside that area. That is, the variables upon which a functional region are defined are interactions between areas or points, suggesting that the areas or points comprising the region differ so that they are functionally complementary to each other (c.f. a formal region).

A nodal region may be regarded 'as a special case of a functional region which has a single focal point and in which the notion of order or dominance is introduced. If a grouping of locational entities is based on the criterion that within group interaction is greater than interaction between groups, without considering the role of each entity in the interaction pattern, a functional region maintains. If, on the other hand, grouping is based upon both interaction between locational entities and the rank or order relationship of one locational entity to another, and a single locational entity is identified as dominating all others, a nodal region maintains' (Brown and Holmes 1971). In fact, this difference between a nodal and functional region may be regarded as an aspect of the geographical scale problem: a generalized functional region is the amalgamation of nodal regions at a lower level, although nodal regions will not always form more general functional regions, and a simple nested arrangement of nodal regions may occur. This latter phenomenon is what Philbrick (1957) claimed to be the basic pattern of the

functional organisation of human occupance in area, and subsequent workers such as Haggett (1965) have used this as the basis of a systems approach to the study of the spatial organisation of phenomena.

Before any kind of systems analysis can proceed, it is necessary to define the bounds of the system to be examined, and to attempt to identify systems that are isolated from their environment. When dealing with a spatial system this has to be done on two levels; firstly, as with any other system, the basic elements must be identified, and, secondly, its spatial limits should be determined. This latter requirement is particularly necessary when dealing with central place systems since, as Marshall (1969) p.24 has argued, one of the fundamental characteristics of an ideal central place hierarchy is the functional wholeness of the system. He states that the unit of analysis in the search for real hierarchies should be the complete functional system. Although this concept is not explicit in Christaller's original work it is present in principle 'and must necessarily be invoked to provide a satisfactory solution to the problem of identifying a study area for empirical research'. Because the limits of a central place system are those of a functional region, it is the aim of this chapter to attempt to delineate the spatial limits of the major functional sub-regions of Thessaly in order to enable a more detailed analysis of the central place system in Western Thessaly to be made, and to allow this analysis to be placed within a wider regional context.

SECTION A THE DELIMITATION OF FUNCTIONAL REGIONS

Functional regions are most easily delimited through an examination of the communications network in the area under consideration since it is through the communications network that the connections are made which allow the spatial differentiation of activities and the formation of functional regions and urban systems. Two approaches to the study of a communications network are possible: either through the analysis of its topological structure (particularly its connectivity) or through the flows along it.

The connectivity of a network can be studied in a number of ways depending on the ultimate aim of the analysis (Haggett and Chorley 1969). For distinguishing functional regions the method that can be adopted is an analysis of a connectivity matrix which will break down the network into its major regional components: Garrison and Marble (1964) and Dykes (1971) used factor analysis to achieve this and Gould (1967) used eigenvalues and eigenvectors. The fact that the analyses produce functional regions must really be assumed and, indeed, only Gould viewed his study in these terms. It is expected that points in a functional region will be connected with each other rather than with points outside the region, and so the identification of the components of the graph may be related to functional (or, more specifically, nodal) regions. The method has some disadvantages, the most important being that all the vertices (nodes) in a network must be included in the matrix even though they may not represent settlements, and that there is no way of distinguishing the relative importance of centres other than in terms of connectivity.

The result has been that this approach to studying connectivity has not been widespread, and has been confined to fairly simple networks.

The second approach, the examination of actual flows to and from nodes, has been more widely used. It is more satisfactory since it takes into account the actual differences in importance between settlements, allowing their position in a hierarchy to be determined. Most work has been done on the delimitation of single nodal regions - the 'spheres of influence' or 'hinterlands' of individual towns - and less effort has been applied to the analysis of whole settlement systems.

The delimitation of individual nodal regions has usually been on the basis of a number of criteria of which traffic flows may only be one. Studies which use only traffic flows have mainly been those concerned with delimiting more than one individual region, and have chosen traffic flows as the most useful single criterion. The distinction here between identifying a series of nodal regions and a nested hierarchy of nodal regions is that in the former no attempt is made to examine the functional integration of the regions while this is a basic component of the latter. That is, in the former a pattern of regions is delimited which can be regarded as a discrete cellular structure, while in the latter an integrated cellular structure is obtained. A variety of different types of flow have been used; for example, buses (Green, 1950, 1951, Godlund 1951, Brown 1959, Snyder 1962, Johnston 1966), air traffic (Taaffe 1952), and total road traffic (Brush 1953, Bengtsson 1957, 1959, Ullman 1960). A similar variety of

flows have been used in attempts to identify integrated nodal structures; for example, telephones (Nystuen and Dacey 1961, Ajo 1962), air traffic (Taaffe 1962), and shopping trips (Davies and Robinson 1968). Likewise, in the delimitation of generalized functional regions, commodity flows (Berry et al 1966), taxi flows (Goddard 1970) and journey to work (Brown and Holmes 1971) have all been used.

The techniques used on the raw data vary considerably in their complexity. At one end of the scale falls the work by Green, Brush, Godlund and Ullman. Here the method used is to draw maps of the flows from each centre, and then draw a single line between pairs of centres to represent the boundary between them. This may be a satisfactory, if not particularly rigorous, method where the boundaries between neighbouring service centres are relatively sharply defined, but is less so where the resolution is less clear. Although the technique can be applied, with reservations, to the delimitation of a discrete cellular structure of nodal regions, it is more difficult to use it for the delimitation of an integrated cellular structure of nodal regions, and impossible for the delimitation of generalised functional regions where the pattern of interaction may be much more complex and not necessarily dominantly nodal in character.

A second method which has been used is based on maximum flow linkages. A hierarchy of settlements is built up by allocating a town of rank n to the service area of the town of rank n+1 with which its interaction is greatest. Taaffe (1962) and Ajo (1962) used this technique with air and telephone traffic respectively, determining before-

hand the hierarchical order of settlements and using only direct flows. The a priori assumption of the hierarchy is not satisfactory, while the use of only maximum direct flows ignored the potential importance of secondary and indirect flows. Nystuen and Dacey (1961) and Davies and Robinson (1968), using telephone traffic and shopping trips respectively, improved on the method by determining the hierarchy on the basis of total flows to each place. Using graph theory, Nystuen and Dacey took indirect flows and linkages into consideration, but not secondary flows, while Davies and Robinson used secondary direct flows, but not indirect, as well as flows within sub-areas. Neither used all the data in the interaction matrix, however, and the technique does not allow the satisfactory determination of generalized functional regions where the dominant structure is multi-nodal.

Of the more advanced statistical techniques the one that has been used most frequently in the delimitation of functional regions on the basis of flows is factor analysis. Berry (1966), Illeris and Pedersen (1968) and Goddard (1970) have each applied factor analysis to an interaction matrix in order to delimit functional regions. The technique allows the handling of a large quantity of data and resolves complex inter-relationships into their major and distinct regularities. It assumes that 'in the matrix of intercorrelated variables there are some common factors running through the data and it is these common factors that are extracted and expressed by the factor analysis' (Cole and King 1968, p.153). The basic advantage of the technique is that all the data in the interaction matrix are taken into account in the calculation of

the factors and relationships which may not be revealed by simpler methods may emerge. The method itself is objective, although the interpretation of the significance of factor loadings and scores involves some subjectivity (W. K. D. Davies 1969). Using Q-mode factor analysis on an interaction matrix each group of factor loadings may be interpreted as destinations and each group of factor scores as origins. Berry (1966) and Goddard (1970) applied varimax rotation procedures to ensure that each variable loaded highly on particular factors. This rotation destroys generality and facilitates the search for group variable effects (W. K..D. Davies 1971).

Brown and Holmes (1971) have developed a method using Markov-chain analysis to delimit hierarchies of nodal regions as well as more generalized functional regions within an area. The interaction matrix is subjected to the analysis in order to abstract a matrix of equal dimensions containing mean first passage times (MFPTs). The fij element of this matrix represents the mean number of steps that are needed for an item to reach j given that it started in i by considering both direct and indirect links between i and j. This is regarded as an abstract measure or index of the functional distance from nodes i and j, and from this functional regions can be identified. The MFPTs are then recalculated for sub-matrices for each functional region, and this produces the nodal structure of these regions. The technique has also been used by Johnston and Kissling (1971) in a study of the internal functional structure of suburban shopping centres.

SECTION B THE DELIMITATION OF FUNCTIONAL REGIONS IN THESSALY

1 Data Source

Bus traffic has been chosen as the criterion for the delimitation of functional regions in Thessaly because the data were readily available. It may have been more desirable to have used total road traffic flows, but the only data on these are from traffic censuses which only give information on the size of flows between pairs of census points. These data have been used to map road traffic in all of Greece by Kayser and Thompson (1964), Doxiadis (1968) and, in greater detail, Coukis (1969). However, it is not possible to use them to delimit functional regions at the scale proposed, partly because the network of census points is too coarse, and partly because information on the origin and destination of traffic is not available at a suitable level of disaggregation.

The disadvantages of using traffic censuses are for the most part overcome through the use of bus traffic as a criterion. Although this may no longer be a very justifiable one to use in Western Europe or North America, it can be justified in Greece where private transport is restricted to a relatively small minority. In 1971 in Thessaly there were about 13.1 private cars per 1,000 population (Table 4:1). In addition to road transport there are narrow gauge railways from Volos to Mileai, Volos to Larissa and Volos to Kalambaka. Data in Y.P.A.T. (1968) indicate that relative to bus transport these railways are not very important, carrying only about 6 per cent of the former's traffic. In the National Transportation Study (Coukis 1969) it was found that in all of Greece in 1965 71 per cent of passenger movements on land

TABLE 4:1

Motor vehicles in circulation at 31 December, 1971

	BUSES+			CARS			
	Total	City	Inter-city	Private	Taxis	Lorries/ vans	Motor cycles
Greece	10,979	2,904	4,070	252,688	11,346	118,284	72,394
Greater Athens	5,041	1,823	167	161,834	8,089	34,270	32,523
Transport region of Volos	554	105	370	8,472	216	6,940	3,933
Kardhitsa	85	11	65	740	21	960	389
Larissa	176	27	118	3,966	81	2,474	1,583
Magnisia	175	50	96	2,829	77	2,297	1,597
Trikala	118	17	91	917	37	1,209	364

+ School and tourist buses are included in the totals but are not itemised separately

SOURCE: TRANSPORT AND COMMUNICATIONS STATISTICAL BULLETIN, 1972

were by bus, and this figure includes the Greater Athens area with its far higher than average rate of car ownership.

Outside of Athens and Thessaloniki the main bus operators in Greece providing public services are organised into two groups: K.T.E.L. (Bus Owners' Joint Fund) and K.T.E.Y.L. (Inter-urban Bus Owners' Joint Fund) operating, respectively, bus services within towns and to nearby villages, and the bus services between towns and the majority of villages, and other towns.[1] Both K.T.E.L. and K.T.E.Y.L. are organised nationally. K.T.E.L. is subdivided into sections on the basis of nomoi (although primarily serving the nomos capitals) which in Thessaly are numbered as follows:

15th - Larissa
16th - Kardhitsa
17th - Trikala
29th - Magnisia

K.T.E.Y.L. is organised on the basis of regions, and Thessaly has the fourth division. In addition to the services operated by these two groups there are small businesses which operate services to remoter and more inaccessible villages in the mountains (called 'agones grammes' literally, 'barren lines'), based mainly on small towns at the foot of the mountains. Their vehicles are often only converted lorries (fortoepivatika) seating 10-12 people, the only large transport capable of negotiating the mountain roads.

The data, obtained from bus stations and local newspapers, are used in the form of total number of bus journeys per week. Ideally, it would have been preferable to use actual passenger flows as a measure, but such data are not

available. As Coukis (1969) remarks, 'whereas railroad networks and airline companies keep detailed statistics of their transport output, maritime flows and road transport outputs are notoriously known as extremely elusive quantities'. A measure of bus seats available per week might have been used, but this would have added little because seating capacities on all buses except the fortoepivatika are about the same, and in any case the number of seats may bear little relation to the number of people carried since there do not appear to be any regulations regarding the numbers allowed to stand. Weekly rather than daily flows have been used because Sunday services may differ from weekday, and smaller villages may receive less than seven buses a week. Services operating solely within towns are not included in this study, and neither are services operating beyond the region of Thessaly except for seven which serve villages close to the regional boundary and whose routes take in a number of villages within the region. Special school services have also been excluded.

2 The Analysis of Bus Traffic Flows

The bus traffic flows have been mapped (Fig. 4:1). There are problems in mapping flows which range from 1 to 611 and these have been overcome by dividing the data into nine groups and making the thickness of the flow line proportional to the square root of the central value in each group. Termini have been classed into five groups on the basis of the number of services which terminate at them.

The pattern of bus flows shows a clear orientation around four main centres - Kardhitsa, Larissa,

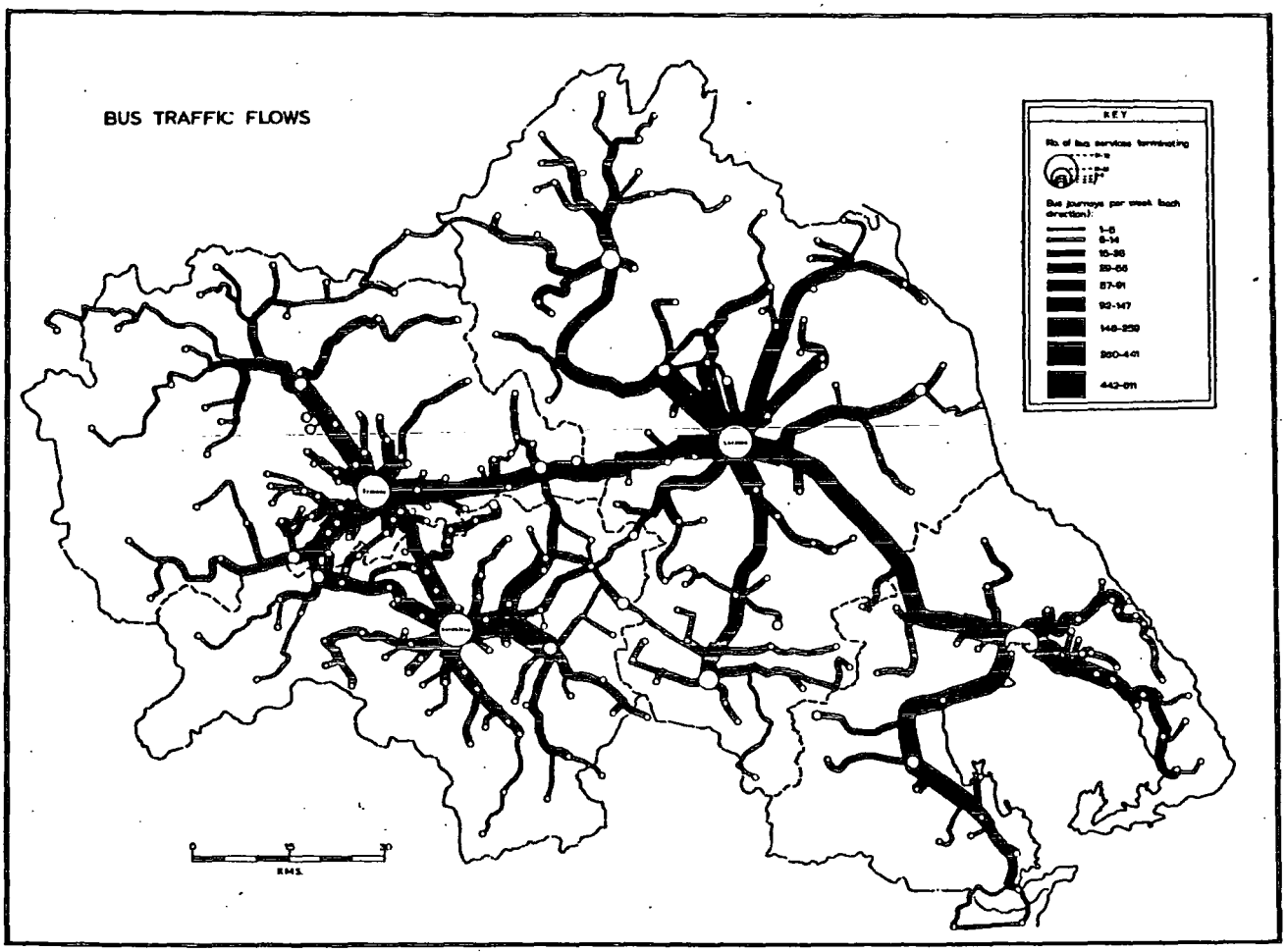


Figure 4:1 Bus traffic flows in Thessaly.

Trikala and Volos - with lesser flows concentrating on a number of other places, notably Elasson, Farsala and Kalambaka. The four nomos capitals provide the basic structure on which the pattern of flows is based, although not in equal degree. There are differences in both the total number of bus journeys per week and in the number of services operated (Table 4:2).

TABLE 4:2

Numbers of bus services and journeys per week terminating at the four nomos capitals, 1971

	Services	Journeys per week
Kardhitsa	67	1,411
Larissa	56	1,937
Trikala	70	1,928
Volos	39	1,105

In terms of numbers of journeys per week Larissa is marginally the most important centre, while in terms of number of services Trikala and Kardhitsa are more significant. Volos is fourth in terms of both criteria. The position of Larissa in having the greatest number of weekly bus journeys but only coming third in terms of services can be explained by four factors. Firstly, the density of settlement in Larissa nomos is less than in the nomoi of Trikala and Kardhitsa (approximately one village per 33 sq. km. in Larissa, compared with one per 25 and 18 sq. km. in Trikala and Kardhitsa respectively). Secondly, the average size of village in Larissa nomos is higher than in the other two (about 1,100 compared with 830 and 914), and may therefore justify more journeys per service. Thirdly,

a considerable number of villages in the northern and southern parts of Larissa nomos are connected with the subsidiary centres of Elasson and Farsala and not directly to Larissa. Although such subsidiary centres exist in the other nomoi their importance as bus termini is not as great. And fourthly, the total number of bus journeys operated from Larissa to the other main centres is greater than for any of the three other main centres; Trikala and Kardhitsa have only small direct links with Volos.

The radial network of routes from each centre reflects the pattern and quality of the road network. There is a basic regional network of roads connecting the main towns and their principal subsidiary centres, and these are all asphalted. Feeder roads, many with surfaces of compacted stone, lead from this basic network to the villages and they can be negotiated by all vehicles. Other roads or tracks which connect villages with their fields or with other villages not on the same feeder road to the principal network vary greatly in quality, and few have any kind of covered surface and can easily become impassable after heavy rain (see Plate 8C).

The relatively unconnected network of roads suitable for buses therefore dictates the pattern of bus flows, which increasingly amalgamate with movements towards the main centres. In addition to this basic radial structure centred on the four large towns of the region, there are major links between these main centres. As well as this, there are subsidiary radial patterns centred on smaller towns. A more complex pattern is found in some

parts of the region mainly because of the influence of subsidiary centres which, although they may not actually be the termini of many bus services, are sufficiently important to warrant the diversion of services from their most direct routes to pass through them. In some cases bus services are routed to serve the maximum number of villages even though this may involve a considerable diversion from the most direct route between the termini.

The map alone, however, can only give a relatively incomplete picture of the flow patterns, and it is therefore necessary to delimit functional regions on the basis of a deeper analysis of the flow structure which will yield more objective criteria of demarcation. In order to identify functional regions, three techniques were considered; the method of maximum flow linkages, factor analysis and Markov-chain analysis. The second of these was chosen as being the most satisfactory for the purposes of the present study. There were two reasons for not adopting the simpler maximum linkage method which might have been considered adequate given that the map of bus traffic flows shows a dominantly nodal structure. Firstly, there was the problem of deciding what the settlement hierarchy should be based on; number of services, number of weekly journeys, population size or some other measure. Different criteria would give different results. Secondly, because the method only takes into account a relatively small part of the data in the interaction matrix, it would not reveal any underlying pattern should it exist. The Markov-chain analysis was not used because it was considered too complex for the present purpose of identifying the major

sub-systems of the settlement structure of Thessaly.

One principal operational problem rose in the analysis: namely, the construction of the interaction matrix. Within Thessaly in 1971 there were 258 places which acted as bus termini, and an interaction matrix drawn up with all these places would have contained 66,564 elements. Because of limitations imposed by the capacity of the NUMAC computer[2] some aggregation of the termini was necessary. This was done by superimposing a pattern of grid squares on the map of termini. Two sizes of grid square were drawn: the larger which overlay the mountainous areas with scattered settlement being four times the size of the smaller, which overlay the plain areas with their denser settlement. Out of approximately 250 whole or part grid squares, 160 were found to contain bus termini (see Figs. 4:2 to 4:7). On this basis, therefore, a 160 x 160 matrix (containing 25,600 elements) was constructed and the bus flows between grid squares calculated.

Connections must not be entered more than once in an interaction matrix. That is, if, for example, there are 20 bus journeys per week between A and C which pass through B, this cannot be entered in the matrix as 20 from A to B, and another 20 from B to C as well as 20 from A to C. This, therefore, necessitates a certain degree of simplification in the construction of the matrix, and so only flows to or from places of dhimos status have been included; inter-village flows are excluded. Should a bus service be operated from dhimos A to a village C through a smaller dhimos B (a fairly frequent occurrence) it was decided

arbitrarily to enter half the flows as representing traffic from B to C, and the other half as traffic from A to C. None were taken as representing traffic between A and B since in every case there was an existing frequent service. This is not entirely satisfactory as there must be some inter-village contact, but the majority of such contact is unlikely to be for specifically commercial purposes. Most of the elements in the matrix therefore have a value of zero, including the diagonals, and the matrix is symmetrical.

The factor analysis program which was used was written by Klovan (1965), and is described in detail in Palmer (1974). The factor analysis extracted ten factors from the interaction matrix, the maximum that the Klovan program allows. In total these explained 91.5 per cent of the variance, the first four factors accounting for 67 per cent. Subsequent varimax rotation of the factor matrix in order to relate each area (grid square) as highly as possible onto only one factor so as to facilitate classification led to only very marginal changes in the percentage of variance explained by each factor (Table 4:3). This confirms that the functional structure of Thessaly is overwhelmingly nodal in character. In an unrotated matrix of factor loadings as much of the variance as possible is loaded onto the first factor, and this can be regarded as an indicator of generality within the data matrix (W. K. D. Davies 1971). The fact that there is virtually no difference between this and the rotated matrix in terms of variance explained does indicate the lack of any more general field effect. The rotation does, however, produce changes in individual factor loadings by reducing the spread of variance over factors, and in some cases the

highest loading of a particular grid square is on a different factor. The use of the rotated matrix in classification should thus ensure the maximum clarification of particular nodal tendencies.

Communalities are for the most part very high and are 1.00 for squares 1 to 8 inclusive. The lowest

TABLE 4:3

Percentage of variance explained in factor analysis of bus traffic interaction matrix.

Factor	Eigenvalue	Variance Explained	Cumulative %
1	31.6	19.7	19.7
2	30.4	19.0	38.7
3	26.6	16.6	55.3
4	18.5	11.6	66.9
5	9.8	6.2	73.1
6	9.3	5.8	78.9
7	8.1	5.0	83.9
8	4.5	2.8	86.8
9	4.2	2.7	89.5
10	3.3	2.1	91.6
Varimax Rotation			
1	-	19.4	19.4
2	-	18.6	38.0
3	-	16.0	54.0
4	-	11.2	65.2
5	-	6.2	71.4
6	-	5.8	77.2
7	-	6.0	83.2
8	-	3.2	86.4
9	-	3.0	89.4
10	-	2.1	91.5

communalities are for those squares whose only links are with the termini of Aghia, Pili and Tirnavos. If the computer program had not been limited to extracting a maximum of ten factors, then there is no doubt that these squares would have had high loadings on these subsequent factors and therefore high communalities.

Following Goddard (1970) each factor is mapped by linking each group of destinations (factor loadings) to its respective set of common origins (factor scores). Loadings greater than 0.5 are connected to the square with a score of more than 1.0 (Figs. 4:2 to 4:7).

Factor one, explaining 19.4 per cent of the variance, defines a nodal region centred on Larissa. This corresponds approximately to the area taken in by the eparchies of Tirnavos and Larissa, but in addition includes the dhimoi of Aghia, Elasson, Farsala and, perhaps most significantly, Volos. It also includes squares 56 and 76 which contain Zarkos and Vounaina in the nomoi of Trikala and Kardhitsa respectively. No other parts of these nomoi are in this region.

Factor two, explaining 18.5 per cent of the variance, represents the nodal region centred on Kardhitsa. It is almost wholly contained within the area of Kardhitsa nomos, although it does not extend to the western mountain area, nor to squares 121 and 135 in the east of the nomos. It includes square 72 which contains Servota (Trikala nomos) as well as two termini in Kardhitsa nomos.

Factor three, explaining 16.0 per cent of the variance, represents the nodal region centred on Trikala. This region extends over most of Trikala nomos except for a couple of squares in the mountain region to the north and west. More important, however, is the fact that it has three extensions into Kardhitsa nomos. Firstly, there is square 72 mentioned above. Secondly, there is square 73 which contains Kordha, a terminus for services to both Trikala

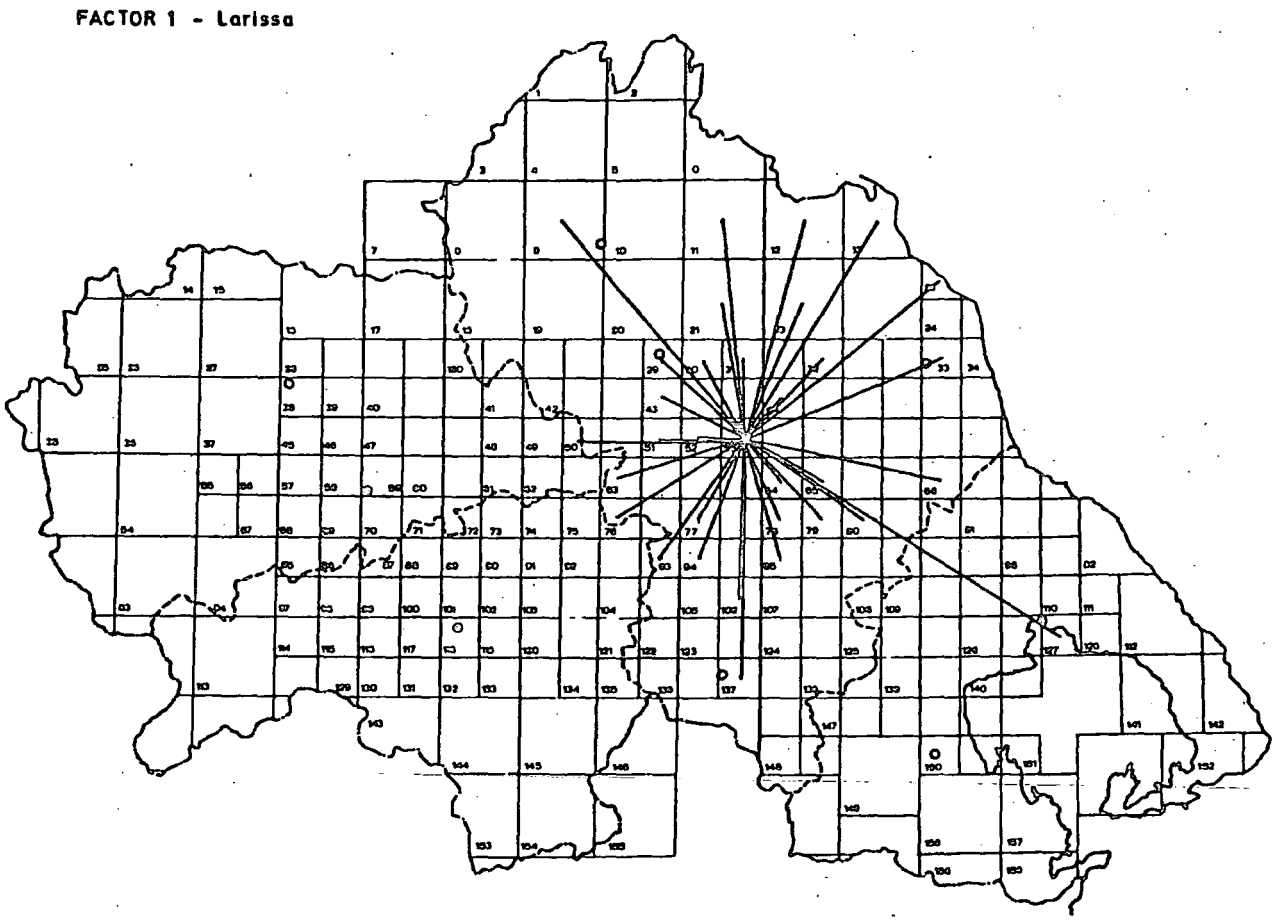


Figure 4:2 Factor one - Larissa

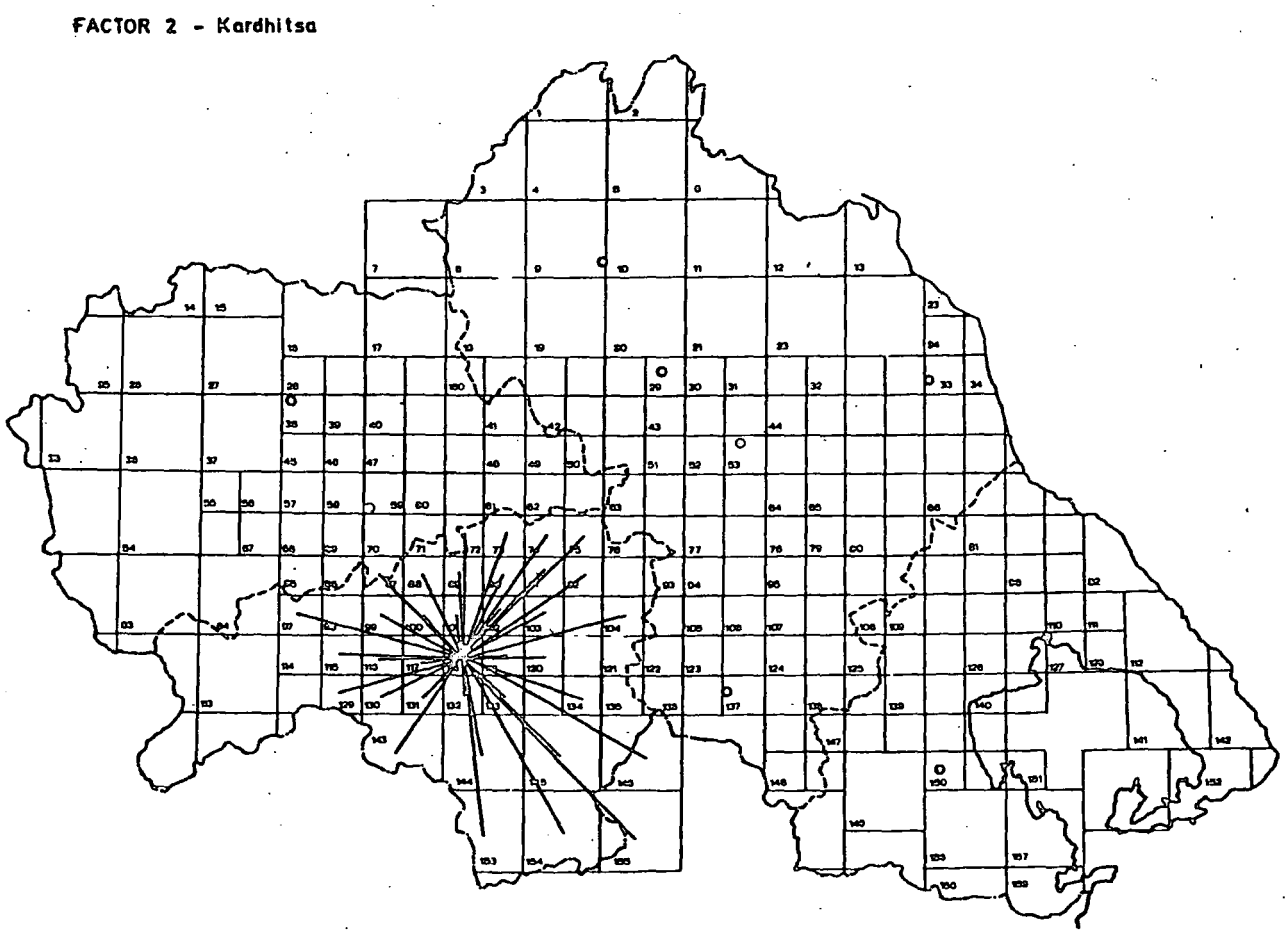


Figure 4:3 Factor two - Kardhitsa

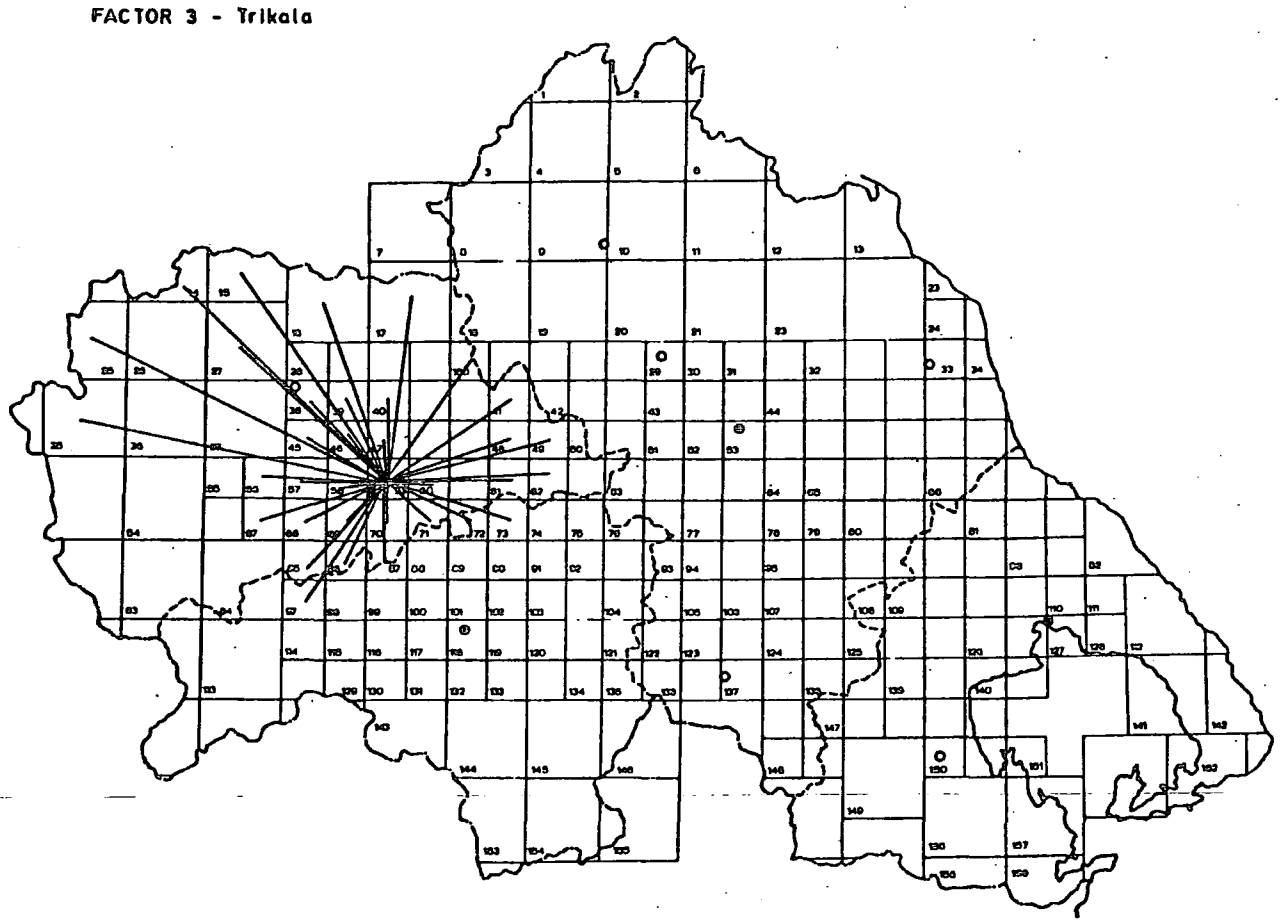


Figure 4:4 Factor three - Trikala

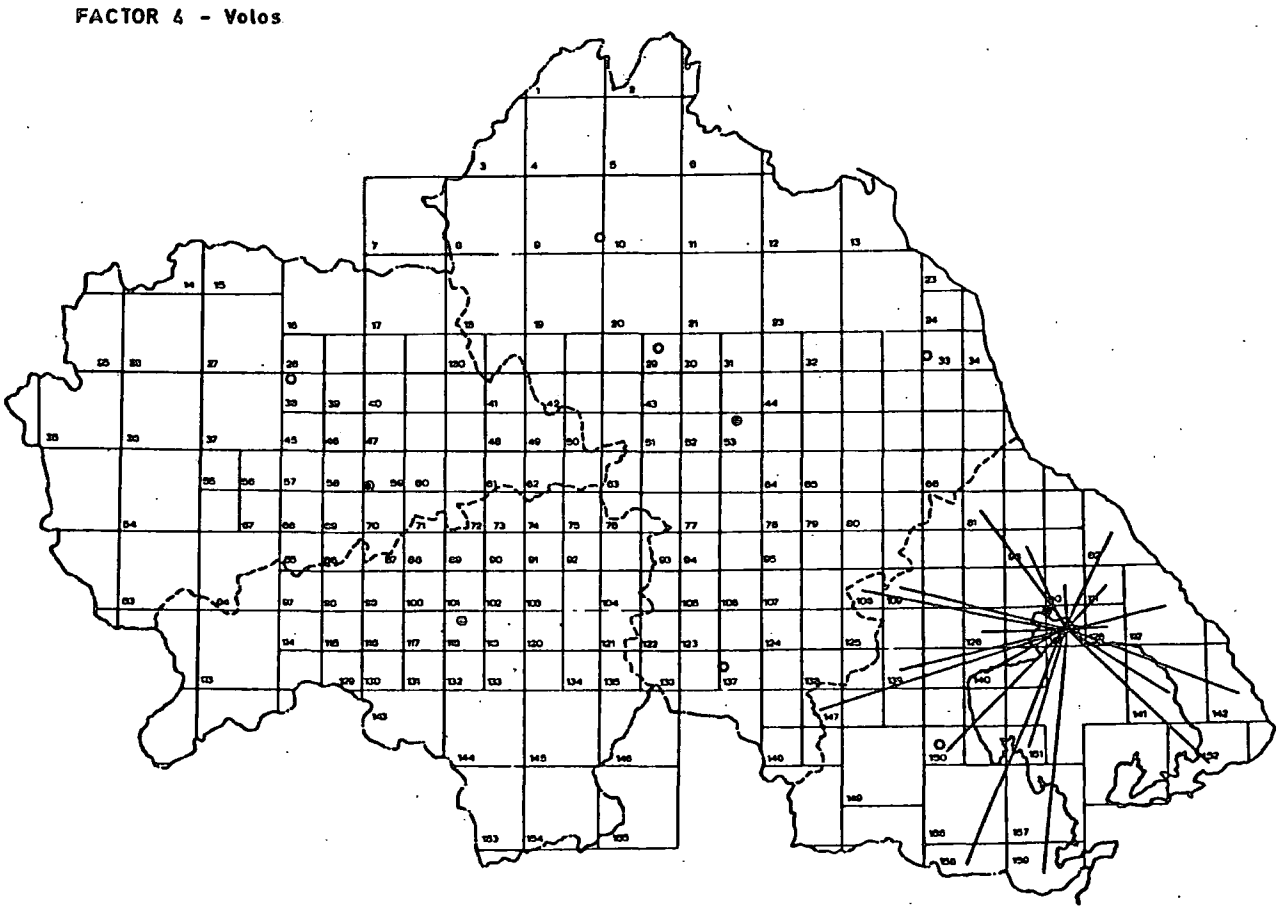


Figure 4:5 Factor four - Volos

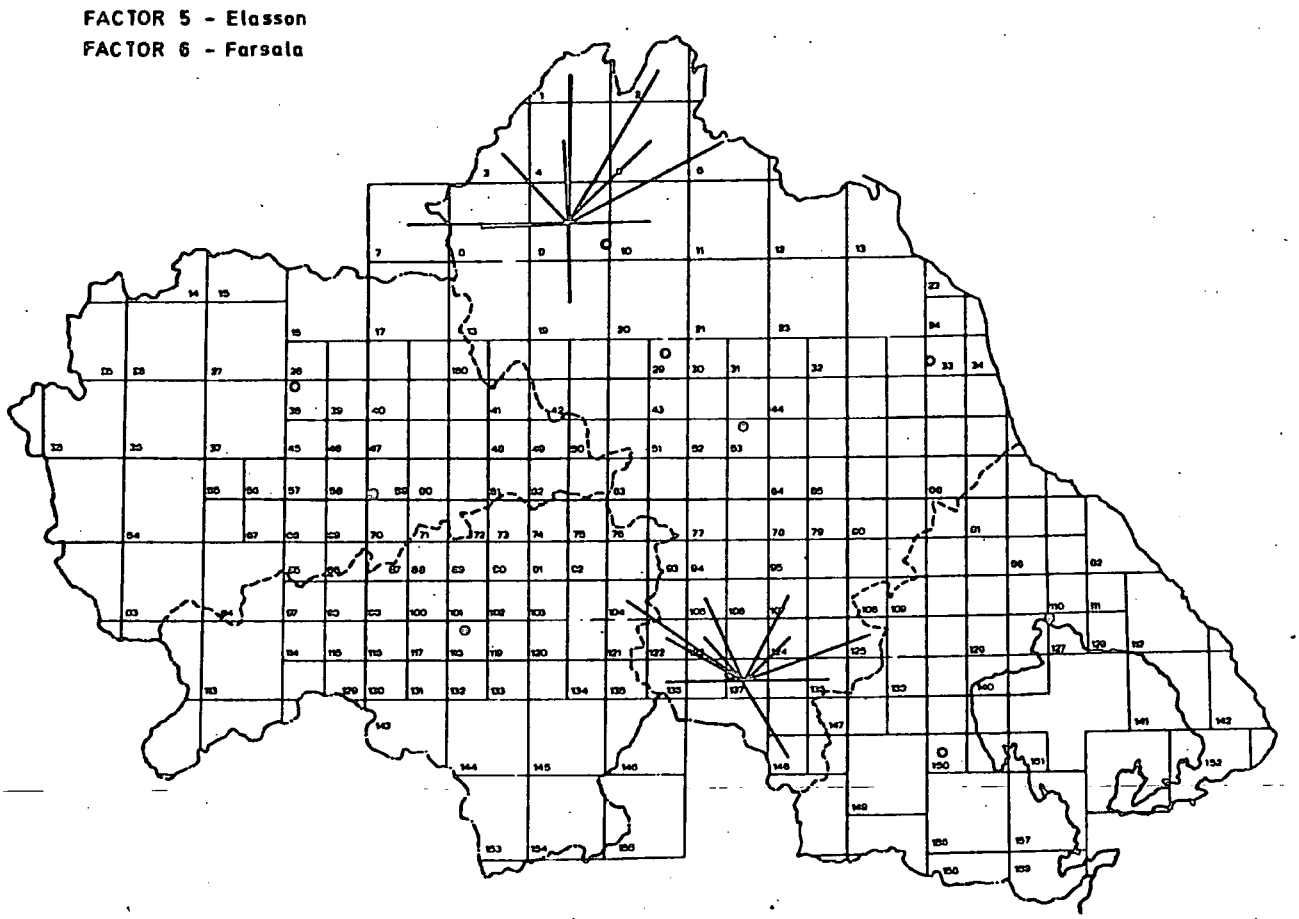


Figure 4:6 Factors five and six - Elasson and Farsala

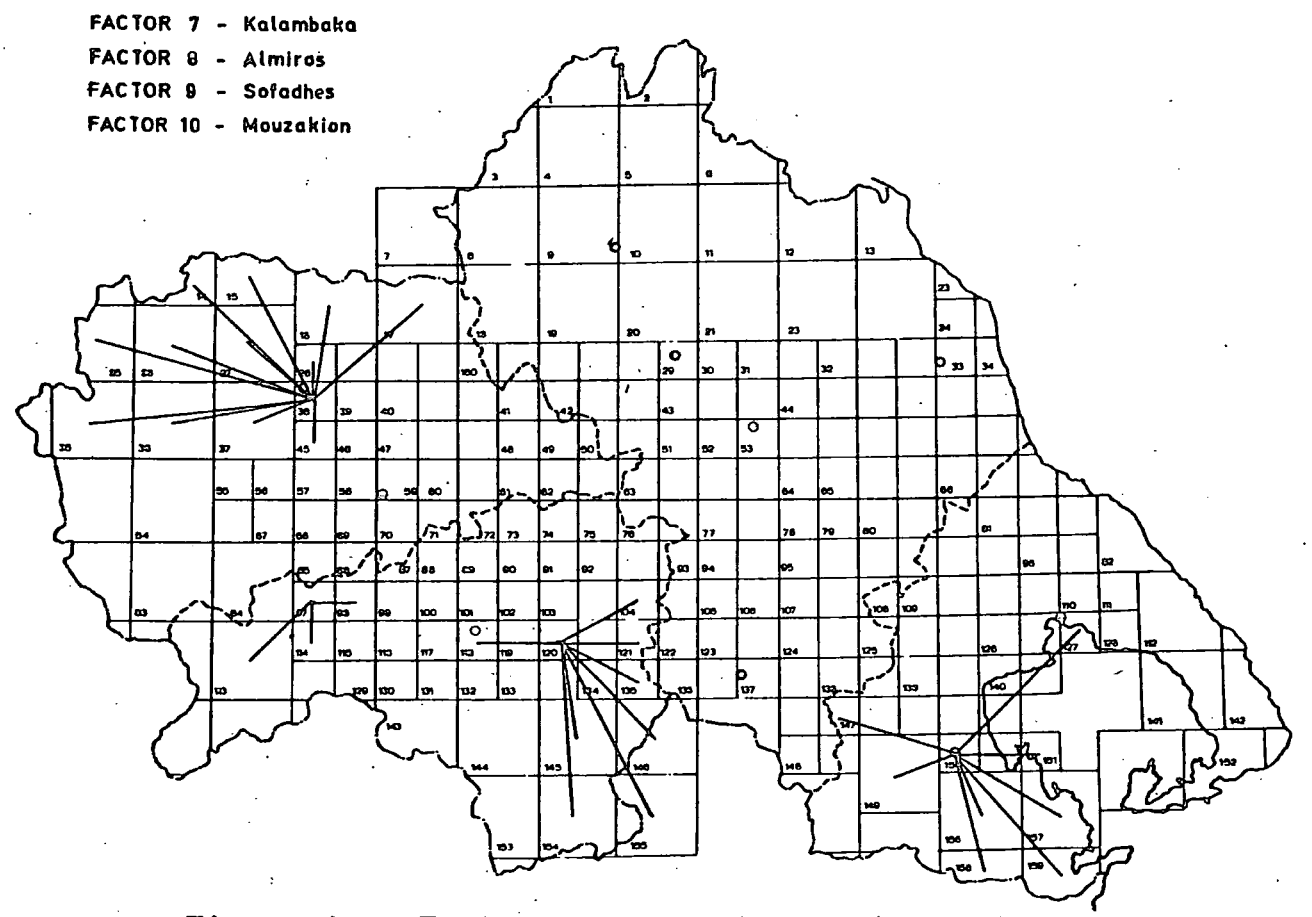


Figure 4:7 Factors seven, eight, nine and ten - Kalambaka, Almiros, Sofadhes and Mouzakion

and Kardhitsa. Finally, there is an extension to square 97 which contains the dhimos of Mouzakion, the terminus of a large number of journeys to both Trikala and Kardhitsa. It may be noted here that the dhimos of Pili, occupying a virtually identical position in Trikala nomos to that of Mouzakion in Kardhitsa nomos, and only two kilometres apart, has no service at all to Kardhitsa.

The fourth factor, accounting for 11.2 per cent of the variance, defines the nodal region centred on Volos. This is confined almost entirely to the nomos of Magnisia, although squares 158 and 159 contain termini in Fthiotis. Squares 149, 156 and 157 in the south of the nomos are not linked to Volos. The loading of square 53 (which contains the town of Larissa) on this factor (0.41) is lower than the loading of the square containing Volos on the first factor (0.54).

Factors five and six, accounting for 6.2 per cent and 5.8 per cent of the variance, represent the nodal regions centred on Elasson and Farsala respectively, the two largest eparchy seats in the region. That of Elasson covers the largest area although this is a part of Thessaly with lower population densities. It is oriented primarily to the north, west and east of the town, and does not extend very far in the direction of Larissa. Farsala, which lies near the nomos boundary, has a region which extends in an east-west direction, and again not towards Larissa.

Factors seven, eight, nine and ten account for 5.0, 2.8, 2.7 and 2.1 per cent respectively of the variance, and they represent the nodal regions centred on the small

towns of Kalambaka, Almiros, Sofadhes and Mouzakion. All these cover only parts of the nomoi in which they are located, and, as with the Elasson and Farsala regions, there is a strong tendency for them to occupy areas on the sides of their nodes facing away from the chief centres of each nomos. Volos and Kardhitsa have loadings greater than 0.5 on the Almiros and Sofadhes factors respectively (0.51 and 0.52), but the loadings of Almiros and Sofadhes on the Volos and Kardhitsa factors are much higher (0.82 and 0.95).

3 Functional Regionalization

The final stage in the derivation of functional regions is the application of grouping analysis to the matrix of factor loadings. As Goddard (1970, p.174) noted in his study, the simple amalgamation of the maps already described 'would fail to satisfy the criterion of any regionalization or classification scheme, namely that each observation should fall into a separate group'. This is because, despite the overwhelmingly nodal character of the regional structure in Thessaly, several squares belong to more than one system, while the arbitrary selection of limits of factor scores and loadings in the construction of the maps introduced an element of subjectivity which it would be desirable to eliminate as far as possible.

Berry (1961) was the first to introduce multi-dimensional grouping analysis into geography and it has since become a common analytical tool. However, in the studies of functional regions which use the technique of factor analysis only Goddard (1970) has used grouping analysis for the final delimitation of regions. In the analysis which follows, each grid

square is regarded as a point in ten dimensional space, the co-ordinates being the loading of the square on each of the ten factors. At the beginning there are as many groups as there are points. Points are then grouped together on the basis of their proximity to each other in ten dimensional space. At the first step the two points closest to each other are grouped, and replaced in the calculation by one new point whose location is mid-way between the two grouped ones. At the second step the next two closest points are grouped, and replaced by another mid-way point. This continues until after (x-1) steps (where x equals the number of points to be grouped) these remains only one group, containing all the points.

The formula used in the calculation is

$$Dij = \sqrt{\sum_{m=1}^{n} (Lmi - Lmj)^2}$$

where, L = factor loading
m = factor
i = ith square
j = jth square
n = number of factors (10)
Dij = euclidean space separating i and j

No contiguity constraint was written into the program since it was not considered necessary for this particular analysis.

It is possible to break into the grouping analysis at any step between the beginning (when detail is complete) and the end (when generalization is total). There is no truly objective way of deciding where to make the break, but ideally it should be at a point where the loss of detail is minimized for the maximum amount of generalization. It was

decided in this case to make the first break at the point where only eleven groups were left since the factor analysis produced ten factors representing highly nodal regions (the eleventh group containing squares with low communalities which did not emerge with high loadings on any factor). These eleven groups should therefore represent the basic functional regional structure of Thessaly, and they are shown in Fig. 4:8.

As might have been expected, regions emerge which are centred on all of the main bus termini. Areas around Pili, Tirnavos and Aghia emerge as one group together with the squares containing Larissa, Kardhitsa and Trikala. This is a result of the termination of the factor analysis after the extraction of ten factors, and it is clear that as far as the first three are concerned the extraction of more factors would have resulted in these being separated. It also seems likely that another factor would have emerged which would have grouped Larissa, Kardhitsa and Trikala since they have a common position with respect to their location in the network of bus services, and are all linked to each other by a relatively large number of weekly journeys. On this basis one might interpret the functional structure of Thessaly as being based on these three centres; in this respect Volos would not emerge as one of the main elements of the structure. This analysis groups it with the region centred on Larissa, and this might have been expected when it is considered that it serves only a relatively small number of places - Pelion and a small area to the west. In its relative position, however, it does perform a similar role to the other three as the focus of movements for its

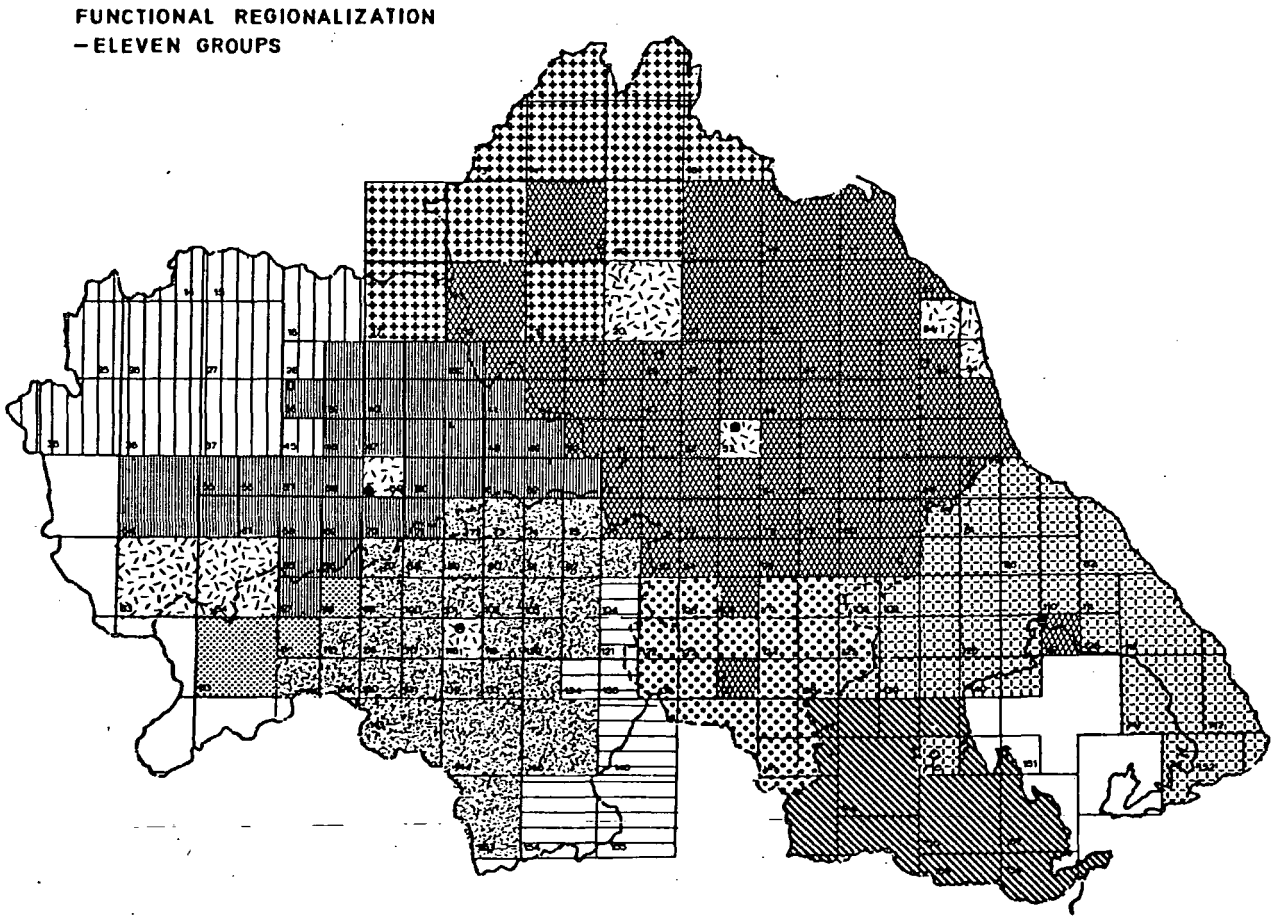


Figure 4:8 Functional regionalization - eleven groups.

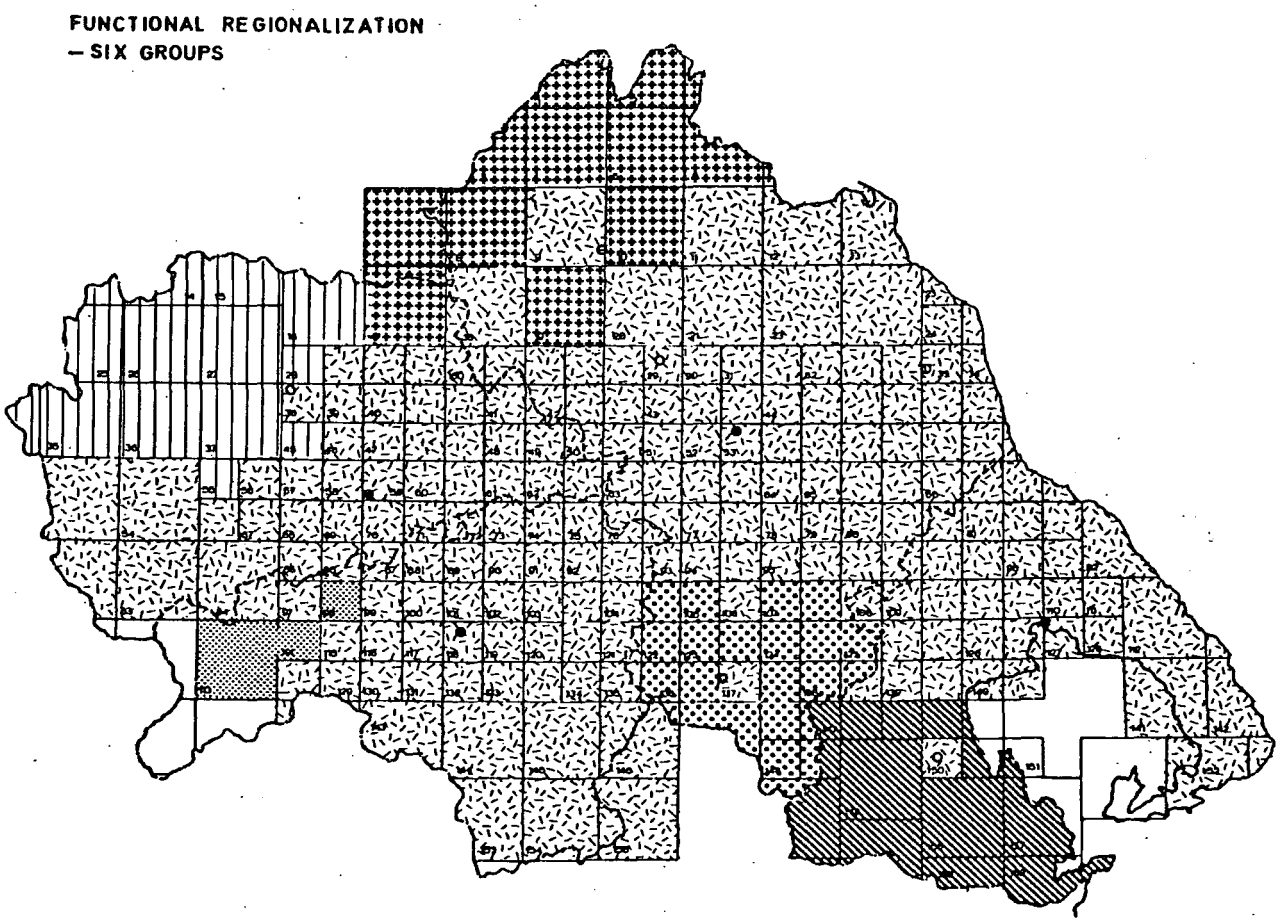


Figure 4:9 Functional regionalization - six groups.

nomos, and, of course, the maritime flows to the Sporadhes have not been included in the analysis.

All the termini which are the centre of a functional region but which are not the chief town of a nomos form a component of the functional region which is centred on their respective nomos capitals. Mouzakion, which had high loadings on the Trikala factor as well as the Kardhitsa, is incorporated into the latter's region, as are squares 72 and 73 on the boundary between the nomoi of Trikala and Kardhitsa. Square 50 is part of the Larissa region.

Advancing the grouping analysis further, at step 150 the region centred on Sofadhes merges with the Kardhitsa region. However, rather than leading to the combination of, for example, the regions of Kalambaka and Trikala, or those of Almiros and Volos, the next four grouping steps result in the amalgamation of the regions centred on Larissa, Volos, Trikala and Kardhitsa, so that with six groups the pattern shown in Fig. 4:9 results. That is, there is one large region covering most of the area, leaving small subsidiary functional regions on the periphery, and further grouping simply integrates these into the former. This supports the view that the basic functional regional structure of Thessaly is based on Larissa, Kardhitsa, Trikala and Volos (with the proviso noted above), with a series of sub-regions which are linked to individual centres within the basic structure.

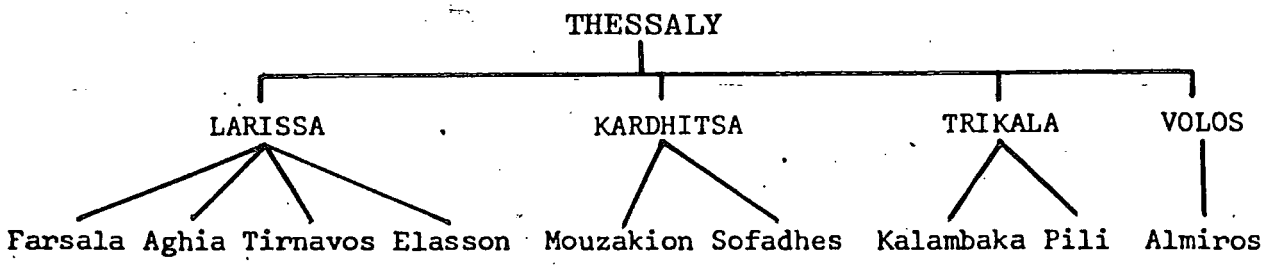
4 The Hierarchy of Functional Regions

It is possible to identify a hierarchy of

functional regions by using the results of the grouping analysis at the stage where eleven groups remain. The position of a region in the hierarchy is determined by the linkage relationship between the node of that region and the nodes of other regions. Thus, for example, Kalambaka is the centre of a region, but the town itself is part of the Trikala region; the Kalambaka region is therefore subordinate to that of Trikala. In this way it is possible to derive a two-level hierarchy of functional regions in Thessaly based on the bus traffic flows.

The first order regions - the basic structure - are those centred on Larissa, Kardhitsa, Trikala and Volos. Because this analysis is based on bus-traffic flows the role of high-level tertiary functions is not likely to emerge since, by their nature, these functions are used only occasionally and are therefore unlikely to be reflected in additional bus services. Thus, the Larissa region is classified at the same level as those of Volos, Trikala and Kardhitsa, whereas if more detailed alternative data sources had been available and been used, it may have emerged as the primate region, with the other three subordinate to it. To an extent this is reflected in Larissa's role as the terminus of frequent bus services to all of the other major towns, although this was not sufficient to distinguish it in the preceding analysis.

At the second level are the smaller subsidiary regions linked to their respective centres as follows:



On the basis of size alone (either of bus traffic or population served) it may be possible to divide the second order regions and identify a third level. There is, however, no clear break in the rank-size distribution of these regions, and any division would therefore be rather arbitrary. Moreover, no third order region, however defined, would be nested within a second order: the link would be directly to a first level node. It is thus not easy to define accurately further levels below a second with the data used here, although from the viewpoint of the ultimate aim of this analysis, this degree of detail is not necessary.

5 Conclusion

The aim of this chapter was to identify the spatial limits of the central place sub-systems in the area in order to allow the following more detailed analysis of the settlement system of Western Thessaly to be placed within a wider regional framework.

For reasons already mentioned (Chapter 1C), the area of the detailed study of the structure of the system was initially defined primarily in terms of physical geography, and is confined to the parts of the nomoi of Kardhitsa and Trikala which occupy the upper Thessalian plain. Using the results of the functional region analysis the bounds of this study area have been adjusted slightly through the exclusion of some settlements in the east of the area, but it has not been possible to subsequently include others in the detailed analysis for which information was not initially obtained in the field.

The study area embraces the greater part of the Trikala and Kardhitsa functional regions and includes all of their major subsidiary centres (although only parts of their associated sub-regionsas for the most part they occupy mountain areas). Although this is not entirely satisfactory in terms of Marshall's (1969, p.24) qualification that the 'unit of analysis in the search for real hierarchies' should be the 'complete functional system', it is nevertheless felt that the inclusion of the greater part of two of the major functional regions in Thessaly, as well as the total exclusion of the third, goes as far as is practically possible in meeting this requirement while ensuring that the study area is of sufficient size to enable any conclusions reached on the structure of the settlement system to be stated with certainty. The combination of the two nodal regions of Trikala and Kardhitsa for the study is felt to be justifiable not only for the consideration of area size, but also because they appear to be more strongly linked than any of the other major nodal regions, even if this was not strong enough to have emerged in the regionalization. The position of Mouzakion is regarded as being of particular significance here, but there are also another four cross-boundary links in addition to the direct Trikala-Kardhitsa one. This compares with one Larissa-Trikala, one Larissa-Kardhitsa, and one Farsala-Kardhitsa; the latter is not supplemented by a direct link between the two central nodes.

FOOTNOTES

1 The Greek Railway Organisation (O.S.E.) also operates long distance coach services to supplement their trains. From Thessaly these services are primarily to Thessaloniki; K.T.E.Y.L. operates the services to Athens.

2 An IBM 360/67 at the time of the analysis.

C H A P T E R F I V E

THE STRUCTURE OF THE CENTRAL PLACE SYSTEM OF WEST THESSALY

The structure of a central place system has three principal dimensions: a hierarchical, a spatial and an aggregate. This chapter examines the central place system of West Thessaly from these three viewpoints.

The question of the existence and/or the nature of hierarchical structure in central place systems has been the focus of much of the research work into them, and this is the aspect which is considered in most detail in this chapter. Firstly, a critical assessment of the techniques used in previous studies to determine the existence of hierarchical structure in settlement systems is made. Subsequently the three previous attempts to describe the hierarchical structure of the Thessalian system are outlined, and then a measure of settlement centrality is developed and used for a detailed analysis of the West Thessaly system. A section on the spatial structure of the system is followed by one that considers the aggregate relations between the population, and numbers of functions and functional units of the settlements. The historical evolution of the system is then described and in the final section an attempt is made to widen the analysis beyond that of the study area to the whole of the nomoi of Trikala and Kardhitsa.

SECTION A THE MEASUREMENT OF CENTRALITY AND THE DETERMINATION OF HIERARCHICAL STRUCTURE IN CENTRAL PLACE SYSTEMS

Christaller (1966, p.18) defined 'centrality' as the 'relative importance of a place with regard to the region

surrounding it, or the degree to which the town exercises central functions'. Expressing this in simple mathematical terms, if a town has an aggregate importance $\underline{B}$ of which $\underline{B_Z}$ represents the town's population, then $(\underline{B-B_Z})$ is the surplus of importance, or centrality, for the surrounding region. A settlement which possesses centrality is a central place and a necessary requirement of every empirical central place study is therefore to measure the significance of each settlement as a central place. As Preston (1971 p.302) noted, however, 'this is the point where most of the efforts deviate radically from classical guidelines' because of a failure to differentiate between the concepts of nodality and centrality. The nodality of a settlement is its aggregate importance, $\underline{B}$ in Christaller's formula, and is conceptually quite distinct from its centrality. Moreover, as Preston (1971) also pointed out, little is known about how well measures of nodality identify centrality since there have been no bases for comparison.

The large number of empirical central place studies has meant that a considerable number of techniques have been used to measure centrality/nodality, and to assess the presence or nature of a settlement hierarchy. Excluding indirect methods of measurement such as bus services or telephone linkages, the techniques can be divided into two broad groupings - (i) those based on the direct measurement of the functional attributes of settlements, and (2) those which use indices derived either from data on the functional attributes of settlements, or from other data.

1 Direct Measurement of the Functional Attributes of Settlements

This may consist simply of a count of

functional types (for example, Bracey 1962), giving each function equal weight in the same total, but there are major limitations to this method if it is applied to areas with complex systems (see W. K. D. Davies, 1966). Alternatively, it can consist of weighting functions by points, a higher number of points being allocated to functions that are considered to have high centrality than to those with lower (for example, Carruthers 1962, Lomas 1964). This technique is subjective, however, and makes comparability between different studies rather difficult. A third approach is to characterize levels in a hierarchy by a specific function or set of functions, and then proceed to allocate settlements to a hierarchical level on the basis of the presence or absence of these diagnostic functions (for example, Smailes 1944) The usefulness of this method depends upon the grounds for the selection of key criteria, and the objective demonstration that the criteria are significant (W. K. D. Davies 1966). Moreover, the a priori assumption of a hierarchy is unsatisfactory.

More complex methods of delineating settlement hierarchies using the functional attributes of settlements as a basis have been devised by Berry and Garrison (1958a), Berry, Barnum and Tennant (1962), Palomaki (1964) and Abiodun (1967).

Palomaki (1964) measured centrality in two ways in his study of central places in south Bothnia. The first was quantitative, using data on the number of types of central function occurring in the settlements. The totality of functions was broken down into separate elements, and for each the number of functions per settlement was plotted against

each settlement. Groupings (indicator groups) were identified by subjective inspection, and the internal uniformity of each was estimated by calculating correlation coefficients between a subjectively chosen 'indicator' function and the others. The results are then combined in a 'partial synthesis' from which a final ranking is derived, again subjectively. Although he attempts to test the validity of his groupings, the dependence at several stages in the analysis on subjective determinations raises doubts as to whether the additional complexity of the technique is justifiable compared to the simpler methods outlined above.

In their study of central places in Snohomish County, Washington, Berry and Garrison (1958a) established for the first time in central place studies the use of complex quantitative techniques for the delimitation of settlement hierarchies. They recognized the need to show that settlement groupings were derived objectively from the data and were not the consequences of subjective imposition.

The study was confined to 33 of the smaller settlements of the county, and excluded the largest. The first stage in the analysis was the ranking of the central functions. A distinction was made between central functions which were variates (that is, the number of stores performing these functions varied from place to place) and those which were attributes (that is, central places either possessed a unit performing this function or did not).

For the variates scatter diagrams were prepared between settlement populations and the number of stores for each function, and best-fit exponential curves

fitted to each diagram. It was then possible to rank the central functions on the basis of threshold populations, defined as the population of the smallest settlement in which the function first appeared. The attributes were examined by calculating correlation coefficients between each of the activities and the population of the centres, and then ranking them in ascending order of these coefficients since it was observed that higher correlations were associated with occurrence in larger centres.

The second stage in the analysis was to determine whether or not distinct functional groupings occurred. Using Clark's (1956) criterion that every member of a group should be closer to some other member of the group than to any other outside the group, three groups of functions were identified among both the variates and the attributes. These two sets of groupings were shown to be associated, and were interpreted as characterizing a three level central place hierarchy.

The study was a great methodological advance in terms of its aims to provide techniques for the objective delimitation of hierarchies which could be applied in other areas and at other levels in a hierarchy. Nevertheless the technique has not subsequently been used in toto since it has several practical and theoretical inadequacies. Firstly, the distinction that is made between variates and attributes is not very meaningful since most attributes will become variates at higher hierarchical levels. Secondly, the grouping of settlements depended only on the number of different functions that each possessed and took no account of the number of outlets. This may not be particularly

important at the small regional scale at which Berry and Garrison were working, but at larger scales the distinctions between higher hierarchical levels may be blurred. Thirdly, the method of deriving threshold populations by using only the populations of the centres and not of their hinterlands as well is unsatisfactory, particularly in an area of dispersed population. This is likely to have led to some underestimation of thresholds, the basis of the determination.

Berry, Barnum and Tennant (1962) and Abiodun (1967) have used factor and/or principal components analysis to delimit settlement hierarchies: the former were concerned with a central place hierarchy; the latter was less specific and examined the 'urban hierarchy'. Both use the analysis on an incidence matrix of functions, but in differing ways.

Berry et al (1962) begin 'with an incidence matrix in which the rows are central places and the columns are central functions. Cells are coded 1 if the function is present in the centre, and 0 otherwise. Direct factor analysis of such an incidence matrix yields pairs of principal components which summarize the underlying dimensions of variation of centres and functions in the matrix. To each pair of components corresponds the same eigenvalue or characteristic root of the incidence matrix. This root reveals the amount of total incidence accounted for by the pair'. The focus of most criticism in this method has been the coding of the incidence matrix simply on the basis of the presence or absence of a function. This fails to take into account variations in the size or the numbers of functional outlets. Abiodun recognized

this inadequacy in as much as it reduces all central functions to an equal level of significance, and attempted to overcome this by weighting functions according to their relative importance. Three classes of function were recognized and allocated 1, 5 and 10 points respectively on the basis of their 'quality' rather than ubiquity. Berry et al use a wide variety of functions in their study (80), but Abiodun's shorter list (28) is heavily biased towards non-retail service functions.

In both cases the incidence matrices were subjected to unrotated R-mode analysis. Berry et al determined the nature and characteristics of the hierarchy by associating the components extracted from the analysis with discontinuities. The first component, which accounted for 60 per cent of the variance, 'indicated the presence of groups of central places characterized by groups of central functions' by showing a smooth order-of-entry of functions and size-of-centre pattern. The analysis was said to confirm the presence of both an overall pattern and separate regimes.

Abiodun used the concept of functional distance and the technique of linkage analysis. A symmetrical matrix was constructed whose element dij was the functional distance between settlements i and j and the settlements were then grouped systematically. Distinct groups were identified through a close examination of the grouping steps prior to the final step when maximum generalisation is achieved. It is not clear, however, whether the groups were derived from the data or predetermined since she states that the identification of the hierarchy is greatly aided by a good knowledge of the study area. In neither study was an attempt made to test

whether the groups which were identified conformed to Clark's (1956) definition. Carter (1975, p.166) concluded that 'it is not improper.. to question whether the application of these complex procedures, possible only with the use of modern high speed computers, is fully justified. However collected, the data tend to be crude and very variable in form.'

2 The Derivation of Indices of Nodality or Centrality

The approaches examined so far have used, with varying degrees of complexity, the basic data on the functional equipment of settlements as their basis for the delimitation of hierarchies. The alternative approach is to derive indices either from these data or from other. Of the former the measure devised by W. K. D. Davies (1967) is the best known. Taking as a basis the location coefficients used in industrial location studies, he calculated the location coefficient of a single outlet of any function from the formula

$$C = \frac{t}{T} \times 100$$

where, C = the location coefficient of function t

t = one outlet of function t

T = the total number of outlets of function t in the system.

Since the coefficient reduces all functions to a common base, the degree of focality of each functional type is immediately comparable in an objective fashion.

The second stage is the calculation of a 'centrality value', which is said to measure the degree of centrality imparted to each settlement by every type of function,

by multiplying the relevant location coefficient by the number of outlets of each functional type present in a settlement. In other words, the centrality value of a given function in a settlement is the percentage number of outlets of that function in the settlement.

The final stage is the addition of all the centrality values of a settlement to yield its 'functional index'. Through weighting outlets by turnover, number of employees or floor space, it is possible to include some measure of the varying size of outlet into the index.

As applied by Davies, there are two disadvantages of this technique for defining central places. Firstly, it is a measure of nodality and not centrality since it reveals the relative importance of settlements in aggregate but not their status as a central place: the application of the term 'centrality value' to the proportion of a function contained by any settlement is therefore both inaccurate and misleading. Secondly, since the technique assumes that the study area is a closed settlement system, it is desirable to delimit the area with this consideration to the fore, and this Davies did not do. Nevertheless, the formulation of the functional index must be regarded as a significant development in empirical central place studies, and it has been used by a number of subsequent workers (O'Farrell 1967, Marshall 1969, Lewis 1970, Rowley 1970).

Although the index can be weighted by floorspace etc., this should not be regarded as an important advantage. Davies and Rowley both weighted their indices by the employment in each outlet, but since Rowley found a

strong linear relationship with a correlation of 0.98 between employment and numbers of establishments in more than 120 settlements, weighting, in these cases at least, is perhaps being unnecessarily pedantic. It is most likely to be of value when dealing with non-retail and, in particular, administrative and educational functions where the size of functional outlets can vary considerably.

The next stage in Davies' identification of the central place hierarchy is both conceptually and technically better than the first stage of determining the basis of the classification. Using Clark's (1956) definition of a group (q.v.), he distinguished groups of centres by measuring the distance between functional indices. But rather than compare places simply in terms of their functional indices he used the range of centrality values for the functions in each place to calculate Spearman rank correlation coefficients. Centres that were most alike were classified as being members of the same group, with the edge of a group defined by a reciprocal relationship between two members. A similar method was used by O'Farrell (1967), although he used Pearson product moment correlation coefficients. Spearman rank correlation is the most suitable of the two correlation coefficients to calculate since, being a non-parametric technique, it does not require data to be normally distributed. This is an important consideration when dealing with data on the functional characteristics of settlements since the majority have only a few functions and most of the arrays of functional units are skewed, a feature which cannot be overcome through transformation since many of the values are zero.

Another group of indices has been based on the concept of supply and demand. In any settlement a surplus of the supply of a function over that settlement's demand for the function can be regarded as a measurement of centrality. These are the only group of techniques based on the direct measurement of functional status which measure centrality rather than nodality. Two approaches have been used to derive such measurements. The first, used by Fleming (1954) and Preston (1971), utilizes monetary measures of sales and, in Preston's study, incomes, the data being obtained from censuses. These studies are aggregative in that they are not concerned with individual functional outlets.

Fleming's study was not specifically concerned with central place or settlement hierarchies, but rather with town-hinterland relationships, and his grading of centres is not well defined. He showed that a close relationship exists between total retail sales and the population of town and hinterland, particularly for populations of less than 30,000. Towns having a high level of sales per person were identified as important centres, and this was confirmed by showing them to have shops which were on average larger than those in smaller centres.

The principal aim of Preston's (1971) study was 'the verification of a 'classical' centrality model'. He drew attention to the conceptual inadequacies of most empirical central place studies and attempted to overcome them through the formulation of an index which is a true measure of centrality. This is:

$$C = R + S - aMF$$

where C = centrality of settlement

R = total sales in retail establishments

S = total sales in service establishments

a = average percentage of median family income spent on retail items and selected services by families in a central place

M = median family income for a central place

F = total number of families in a central place.

That is, the centrality of a place is the difference between total sales made in that place and sales made to its own population. Although the actual hierarchy was not determined at all in this study, the centrality values were related to exported daily newspaper circulation (which was regarded as being a data series that logically satisfied Christaller's specific definition of centrality), and a high correlation was found.

The main advantage of the technique used in these two studies is that the data are easily obtained from censuses, and can therefore readily be used for areas far larger than those in which studies are based on ad hoc personal surveys. Nevertheless, from a central place viewpoint, there are two important limitations which apply to both of these studies. Firstly, because they are based on census data information is not available below a given population level so that nothing can be said about the lowest levels of the hierarchy. Secondly, the use of monetary measurements means that a large number of non-commercial service functions are not included in the analysis: administrative, health and educational functions are particularly important omissions here. A third criticism which applies specifically to Preston's

formula, is that he assumed that all of the income available to a family for expenditure on retail goods or selected services is actually spent in the place of residence. This contradicts the classical central place theory which he was trying to verify since it assumes that every place contains the whole range of possible central functions.

The second approach using the supply and demand concept makes use of data on the provision of functions and population data. In a region R, which is assumed to be closed, all the demand for a given function by the population of the region is met by outlets within the region. As in the previous approach, any surplus of supply of a function in a place is taken as indicating centrality. The main difference between the approaches is that the first one used aggregative monetary measurements of centrality surplus or deficit, while in this one centrality is measured either absolutely or relatively by surpluses or deficits of functional outlets in relation to population, or vice versa.

The first to use this approach was Siddal (1961) in a study that covered all the large urban centres of the U.S.A. In fact, he used only one unit of measurement, the wholesale-retail trade ratio, from which he derived both an absolute and relative measure. From census data he found that the ratio of wholesale workers to retail trade workers for the USA as a whole was 1:4.3, that is 18.8 per cent of distributive trade workers are employed in wholesale trade. He then assumes that if the figure is higher than 18.8 per cent for a city, that city is making some of its wholesale purchases outside its area. For his second measure he converts

the percentage surplus or deficit into absolute figures. Although the actual measure that he adopted in this study could not be used very satisfactorily at the local scale where there is need for a greater degree of disaggregation, the general principle is perhaps worthy of more attention. Indeed it may be more usefully applied on a smaller scale than on the national since the validity of using a national ratio to derive indices which measure a localized phenomenon is open to serious doubt.

Johnson (1964), using a similar principle, derived indices for measuring the centrality of the component parts of the Boston SMA. Two indicators were chosen - total employment and numbers of retail trade establishments. For each of these centrality was calculated for each area by subtracting the percentage of the total population of the metropolis which the area contained from the percentage of employment or retail establishments which it had. The average of the two values gave a measure of 'general' centrality. Perhaps the most serious criticism of this work is the use of total employment as a measure of centrality. In so doing Siddal is fusing the secondary sector of the urban economy with the tertiary, and thus regarding the locational forces on each as equal and complementary: this is clearly not the case.

The most sophisticated of this group of centrality measures is the one developed by Balasundarampillai (1972). The centrality of a given function in any place is determined from the formula

$$C = \left(\frac{PS}{TU} \cdot C\ U \right) - PC$$

where C = centrality

PS = population of the service area of a central function found in a central place, or the population of a closed system for a central function found in the central places within the defined close system.

TU = number of functional units in the service area

CU = number of functional units in the central place

PC = population of central place

The formula is used to calculate the dependent population for a function and the sum of the dependent population for every function in any settlement (the cumulative dependent population) measures the centrality of that place. The dependent populations are calculated on the basis of regions delimited for groups of similar functions in each place and not, as in other studies, on the whole of the study area. This is important in the context of Balasundarampillai's own study in north Sri Lanka since it encompasses two very different geographical areas: a small, heavily populated fertile peninsula and a large, less fertile interior region of low population densities. Conceptually the technique is sound, but a number of practical difficulties are raised when attempting to operationalize the measure, the most important of which is the identification of the service areas for the central functions found in central places. A good deal of work is needed to do this, and unless the study area is as heterogenous as that of Balasundarampillai it must be doubted whether the effort is justifiable.

SECTION B PREVIOUS STUDIES OF THE SETTLEMENT SYSTEM OF THESSALY

Two attempts have been made to classify the

towns of Thessaly. The first was by the Regional Development Service of Thessaly (Y.P.A.T. 1968), and the second by Sivignon (1971), working as an adviser to the Regional Development Service. The latter piece of work is incorporated only in part into Sivignon (1975), where the commercial and administrative functions of towns are treated within the context of a more general consideration of the urban economies and the role of towns within the region. In addition, a third study for the Ministry of Co-ordination (National Polytechnic 1971) which formed the basis for dealing with the problems created by an earthquake in the Pindos mountains in 1967 contained a description of the settlement system of parts of Western Thessaly as well as Epirus. Clearly, these three studies must be given fairly detailed consideration here, and this is a suitable point to do so since the first two are concerned with the settlement system in all of Thessaly, and they therefore provide a background against which the following more detailed study of West Thessaly can be placed and contrasted.

1 The Regional Development Service Classification

Settlements were classified on the basis of the following nine criteria:

(i) the population and its rate of increase;
(ii) the position of the centres on the map (sic) and in relation to the transport network;
(iii) building activity;
(iv) industrial activity;
(v) tourist activity;
(vi) the importance of other economic activities (agriculture etc.);

(vii) the existence of the offices of public services;

(viii) the degree of influence on neighbouring settlements;

(ix) the ability of a centre to restrain migration from its region.

In a rather arbitrary fashion, centres were classified into three groups as follows:

(a) large centres of attraction,

(b) medium centres of attraction and

(c) small centres (Table 5:1).

2 Sivignon's Classification

The aim of Sivignon's study was the 'classification of the different urban centres of Thessaly on the basis of their size and the specific functions which they exercise'. In both the report to the Regional Development Service and in his monograph, the area from which migrants came to each town is delimited (see Kayser et al 1971), and this permits an assessment of their dynamism. The functional classification is made by assessing the relative importance of the primary, secondary and tertiary sectors in the urban economies, and then by attempting a 'numerical evaluation'.

The employment structure of settlements in 1961 is examined and those towns in which agriculture or industry play a dominating role are identified. Tirnavos, with 53 per cent employment in agriculture, is considered in reality as being a large village, while Volos is thought by Sivignon to be the only 'true industrial town', although it is recognised that the size of this sector is not negligible in other towns.

TABLE 5:1

Classification of Settlements by Y.P.A.T. (1968)

	KARDHITSA	LARISSA	MAGNISIA	TRIKALA
Large centres of attraction	Kardhitsa	Larissa	Volos	Trikala
	Palamas	Tirnavos	Almiros	Kalambaka
		Farsala		
		Elasson		
Medium centres of attraction	Sofadhes	Aghia	Velestinon	Farkadon
	Mouzakion	Gonnoi	Zagora	
		Sikourion	Skiathos	
			Argalasti	
			Sourpi	
Small centres	Kedhros	Zappeion	Milies	Pili
	Leondari	Chara	Pteleos	Panaghia
		Kipseli		

The classification of towns on the basis of their tertiary sector is considered from the viewpoint of commercial activity, banking services, medical and hospital services, administrative services and transport. Of these, the study of the commercial functions of towns was noted by Sivignon to be the most difficult because of the absence of detailed and comparable data, and he confined this aspect to a listing of the weekly markets and annual fairs in the region. Following a description of the other parts of the service sector, Sivignon then attempted a more general synthesis by bringing together the population and employment data with those that he had obtained on the service sector.

He stated that there were hardly any problems in defining a town, and he gave the following criteria:

1 More than 10,000 inhabitants
2 Less than 25 per cent employed in agriculture
3 At least ten commercial merchants being present.

On this basis, there are four towns in Thessaly, the four nomos seats. Neither did Sivignon consider there to be any problem in distinguishing a village centre (Kefalochori) from the simple village. The following criteria characterize the village centre:

1 It always has a high school
2 It nearly always has a weekly market or annual fair
3 It nearly always has a population of more than 2,000 inhabitants

4 It has a greater variety of non-agricultural occupations, and these comprise more than 15 per cent of the labour force.

This definition of a village centre allowed a large number of villages which have a population of more than 2,000 yet whose function is exclusively agricultural to be excluded.

The main problem, however, was to establish a distinction within the size range 2,000 to 10,000 between the 'village centre' and the 'small town'. All settlements in these categories have a certain number of common characteristics:

1 All have more than half their labour force engaged in agriculture.
2 None can be distinguished in demographic terms from their neighouring countryside.
3 Both have a commercial and artisan function.
4 Most have both a doctor and a dentist.

Even so, this was not considered by Sivignon to be sufficient reason to regard them as being all of the same type since there are also notable differences between them: only the 'small towns' are true secondary administrative centres, and only these have one or more branches of commercial banks. An attempt was therefore made to make these considerations more 'mathematical'. Ten criteria were chosen and points allocated to settlements as follows:

		Points
(a)	1 branch of a bank	20
(b)	1 bus service	5
(c)	1 chemist	5
(d)	1 per cent of population consisting of immigrants	1

(e) 1 annual fair	20
(f) 1 weekly market	20
(g) 1 clinic	5
(h) 1 court	10-20[1]
(i) 1 administrative service	10
(j) 100 industrial workers	10

While recognizing that the choice of criteria and the values assigned to them are open to debate, Sivignon considered that they were sufficient to classify the small towns. The final points totals are shown in Table 5:2.

Sivignon drew the following conclusions:

(a) All village centres have some administrative service: other large villages do not exercise any attraction and are only distinguished by their size.

(b) These village centres cannot be regarded as true towns even if in certain cases such as Aghia they are the seat of an eparchy. Among them, however, those with more than 100 points (Aghia, Pili, Sofadhes, Mouzakion) are better equipped than the others, but this is a difference of degree rather than nature.

(c) The small towns (those with more than 200 points) form a group (Elasson, Tirnavos, Farsala, Kalambaka, Almiros) which corresponds to a type of intermediate centre between the village centre and the nomos capitals.

(d) The four large towns distinguish themselves very clearly from the other centres although differences do exist between them. Kardhitsa is the least important, and thenTrikala. This classification puts Larissa and Volos at about the same level because of the important industrial sector of Volos. If a measure of economic

TABLE 5:2

Points Totals of Settlements
in Sivignon's Classification

KARDHITSA		LARISSA		MAGNISIA		TRIKALA	
	Pts		Pts.		Pts.		Pts
Kardhitsa	776	Larissa	1,488	Volos	1,511	Trikala	821
Mouzakion	168	Elasson	398	Almiros	246	Kalambaka	211
Sofadhes	162	Farsala	314	Skopelos	60	Pili	102
Palamas	94	Tirnavos	233	Velestino	48	Farkadon	81
		Aghia	209				
		Rapsani	52				
		Ambelon	21				

and demographic dynamism had been introduced, Larissa would have been the clear leader: its choice as the regional capital illustrates this superiority.

3 The National Polytechnic Classification

The classification produced in the Polytechnic study is limited to the mountainous areas of West Thessaly and the main towns of the plain. It also includes part of the region of Epirus. Five grades of settlement were recognized, the basis for the classification being largely intuitive although some functions considered characteristic of particular levels are noted:

A-level - Trikala, Kardhitsa: nomos seats with associated administrative functions and centres of commerce.

B-level - Kalambaka, Pili, Mouzakion: entrances to the plain with functions like police station, high school and agricultural bank; they also act as local commercial centres.

C and D level - for example, Mesochora, Kastanea: settlements with police station, high school, health centre and post office.

E-level - remaining settlements, usually containing at least a primary school.

SECTION C THE MEASUREMENT OF CENTRALITY IN WEST THESSALY

1 Data Sources

The most important set of data that was needed for the study of the structure of the central place system of West Thessaly was that relating to the tertiary functional provision of the settlements in the area. There had been an absence of data in Greece at the relevant scale until the 1969 census of commercial and industrial establishments and even these data are not sufficiently disaggregated for a detailed study down to the level of the individual shop. Moreover, the census does not, of course, include non-commercial functions.

By comparison with the published statistical data, it is possible to obtain relatively more detailed information on commercial establishments from local sources, notably the prefectures. However, the coverage between nomoi is not consistent, and judging by the difficulty which was involved in actually finding the data, no great use appears to be made of it. Its reliability may therefore be suspect. In Kardhitsa, for example, a list of 'the most important' shops in the towns of Kardhitsa, Sofadhes, Mouzakion and Palamas was produced. The criterion which determined the importance of a shop was thought by the official concerned to be based on the amount of taxes paid. The number of shops given in this list may be compared with the numbers of retail establishments derived from field survey:

Town	Prefecture	Field Survey	P/FS x 100
Kardhitsa	181	750	24.1
Palamas	60	121	49.6
Sofadhes	43	151	28.5
Mouzakion	41	102	40.2

Data could also be obtained from the local equivalent of the Weights and Measures inspectorate. They had a list of all the shops using measures, but with no typological breakdown These figures were: Kardhitsa 440, Palamas 76, Sofadhes 116 and Mouzakion 98, and the total for all other settlements in the nomos was 893.

Thus in order to obtain sufficiently detailed and homogeneous information on commercial activity in an area encompassing two nomoi, a direct ad hoc field survey was considered necessary. For non-commercial functions, the relevant data were obtained by a combination of field survey and requests to local authorities.

The field survey was made in 1971 and 1972 and almost all settlements in the plain region of the nomoi of Trikala and Kardhitsa were visited (a total of 166). A catalogue was made of the number and type of functions and functional units, and the number of establishments in each place.[2]

The mode of transport used to visit most of the settlements was bicycle, based on Trikala, Kardhitsa and Sofadhes. Although the limits imposed by the availability of time and resources meant that it was not practical to survey the mountain villages in detail, groups of undergraduate students, some of which were accompanied by the author, visited settlements in the mountains to the west of Trikala and prepared reports on all aspects of their geography.[3] From the viewpoint of tertiary functions it was clear that there were no significant differences between these villages and those in the plain. Nevertheless, despite its considerable limitations,

an attempt is made to use the 1969 census information to confirm this (Section H), while the data coverage on consumer movements in Chapter 6 does extend to the mountain areas.

Depending on the size of a settlement and the number of shops it had, two methods of survey were employed. For small settlements (that is, those with a population of about 2,000 or less) the information on both retail and non-retail functions was obtained in the first place directly from the secretary or the president of the Koinotis or, if these people could not be found, from the nearest people who were willing to provide it. A quick tour of the village on the bicycle was then usually made for confirmation. For settlements with a population of more than 2,000 population, and for those smaller than this but with a clearly urban character (for example, Pili), the retail establishments were surveyed street by street. Generally, no problems were met in classifying outlets although the determination of functional units is a rather subjective exercise: how significant must any function be in a shop before it is valid to regard it separately from another, more dominant function?[4] Particular effort was made to ensure a complete survey of these places and care was taken to avoid either the repetition or oversight of streets.

Information on most non-retail functions was obtained mainly from the local authorities in each settlement, usually the town hall, although in Kardhitsa from the prefecture, and in Farkadon and Mouzakion, the police station. This was considered the best method for getting these data because some of the functions do not have a clearly recognizable establishment and can therefore be overlooked in an extensive field survey. Moreover, they are all functions which are both

limited in number and well defined.

Two survey sheets were used, one for retail functions and the other for non-retail functions. Initially, the former had 65 different functions as well as three shop types (kiosk, general store and department store), and the latter had 43. However, trials in the field showed that certain of the functions were not present in this part of Greece at least, while others could not be distinguished clearly. Finally 55 retail and 33 non-retail functions were identified for the survey, representing a high (if unknown) proportion of the total number of functional units in the study area.[5] Classified as retail functions were some functions such as dry cleaning and restaurants which are not, in a strict sense, 'retail'. However, their establishments resemble in physical structure and locational characteristics those of true retail shops, and there is some precedent and justification for including them so (for example, Hall, Knapp and Winsten 1961).

Retail establishments were recorded in terms of functional units rather than simply as establishments. The method of survey was to record one vertical stroke per functional unit and distinguish by means of a horizontal stroke those functions which were combined with others in the same establishment. This meant that it was possible to obtain three basic sets of aggregate statistics for each settlement: number of functions, number of functional units and number of establishments. By their nature, non-retail functions were not found combined with one another, so that only two sets of statistics were obtained: number of functions and number of functional units. The number of establishments is equivalent to the latter. Appendix B provides a full listing of functional units by settlements, and

Appendix C provides the aggregate statistics and population.

2 The Weighted Functional Index

In attempting to decide on a suitable measure of settlement centrality for the detailed study area of West Thessaly it became clear that none of the techniques reviewed in Section A were completely satisfactory. All techniques which measured nodality were excluded since the concern here is with centrality. As far as the techniques which give a specific measure of centrality are concerned, that used by Siddal (1961) and Johnson (1964) was considered, but the use of differences in percentages was thought unlikely to lead to sufficient differentiation between settlements, the smaller ones in particular. The measure developed by Preston (1971), or a similar one, could not be used in this context because data on incomes and expenditure are not available at the required scale, and the study also includes non-commercial activity. Finally, the technique used by Balasundarampillai (1972) was considered too complex and time consuming.

Investigation into the problem indicated that centrality could be measured both absolutely and relatively. Of the techniques so far used to measure centrality (as opposed to nodality) all the measures were absolute. While such measures might be useful in explaining or predicting the amount of consumer movement into and out of settlements, for example, they cannot satisfactorily be used to identify or describe the nature of a central place hierarchy. This is because very small settlements of low functional status will have low and invariably negative absolute centrality values, which could be very similar to the values possessed by larger settlements of higher functional status.

Any classification solely on the basis of absolute centrality values might therefore lead to the grouping together of such settlements since in absolute centrality terms they are similar, but in terms of a central place hierarchy they would be rather different. Consequently, for the purposes of determining the existence of a central place hierarchy in West Thessaly it was considered necessary to derive a relative measure with a base value of zero.

After some experimentation, an adaption of W. K. D. Davies' (1967) Functional Index was developed as a specific measure of relative centrality which gives no negative values. The modification retains all the advantages of Davies' index and the only additional data needed are the populations of the settlements. Similarly, the assumptions implicit in the Functional Index are retained: in particular, that the region being studied is functionally closed, that there are no spatial variations in per capita consumption within the region, and that all outlets (or their equivalents) of a given function are of equal economic significance.

The first step in the derivation of the Weighted Functional Index is the calculation of the Centrality Ratio for each function in each settlement in the region from the formula:

$$CRis = \frac{Fis}{Pst}$$

where CRis = centrality ratio of function i in settlement s

Fis = number of functional units of function i in settlement s as a percentage of the total number of functional units of i in region r

Pst = population of settlement s as a percentage of the

total population of region r.

If the centrality ratio has a value greater than 1.0 this is taken to show that there are functional units of the function which are surplus to the demand for that function by the settlement, and this surplus must therefore be supported by demand originating outside the settlement. If the centrality ratio is less than 1.0 then the demand for the function in the settlement is not being fully met by the functional units in the settlement, while if the ratio equals 1.0 then supply and demand for the function are in equilibrium.

The second stage is to weight each of Davies' centrality values by the centrality ratio:

$$WC_{is} = C_{is} \cdot CR_{is}$$

where WC_{is} = weighted centrality value of function i in settlement s

C_{is} = centrality value of function i in settlement s (derived from Davies' formula).

Thus, the centrality value is increased or decreased in direct proportion to the degree to which centrality is or is not actually found. For computation these first two steps may be combined in one formula:

$$WC_{is} = \frac{C_{is}^{2} \cdot Pr}{Ps. \; 100}$$

where Pr = total population of region r

Ps = population of settlement s

The third stage is to standardize each of the arrays of weighted centrality values by expressing each weighted centrality value of a function as a percentage of the sum total

of weighted centrality values of that function:

$$SWC_{is} = \frac{WC_{is}}{\sum_{s=1}^{s=n} WC_{is}} \cdot 100$$

where SWC_{is} = standardised weighted centrality value of function $\underline{i}$ in settlement $\underline{s}$

n = total number of settlements in region $\underline{r}$

The final stage in the derivation of the weighted functional index is the addition of all the standardised weighted centrality values for each settlement:

$$WF_s = \sum_{i=1}^{i=f} SWC_{is}$$

where WF_s = weighted functional index of settlement $\underline{s}$

f = total number of functions in settlement $\underline{s}$

Although the calculation of the weighted functional index involves several stages, these are straightforward and are easily programmed for a computer. The input is a matrix of functional units by settlements, and the population of the settlements. If data were to have been obtained on, for instance, numbers of employees then, as in Davies' original functional index, these could have been substituted for functional units.

SECTION D THE HIERARCHICAL STRUCTURE OF THE CENTRAL PLACE SYSTEM OF WEST THESSALY

Using the Weighted Functional Index (WFI) an attempt is made in this section to determine whether or not the central place system of West Thessaly is characterized by a hierarchical structure and, if it is, to identify its principal components and characteristics.

As a first step in the calculation of the WFIs, the location coefficients of each of the 88 functions identified for the study were found (Table 5:3). The range in numbers of functional units, and therefore in the values of the coefficients, is considerable. The most ubiquitous function is the coffee shop, with a coefficient of 0.10, while there are five functions with coefficients of 50.0. However, the histogram of functional units is leptokurtic and has a high positive skew with 51 functions having 50 or less functional units, and only 6 functions with more than 200 (Fig. 5:1). Non-retail functions have a relatively lower number of functional units per function than retail: they account for 37.5 per cent of the total number of functions identified in the study but comprise 49 per cent of those with 50 or less functional units, and for none of those with more than 200 units.

The WFIs for the 153 settlements which contained functions are shown in Table 5:4, sub-divided into retail and non-retail components. While it would be possible to proceed with the analysis of hierarchical structure using only the indices in this table, it is more satisfactory to follow Davies' (1967) example and assess the degree of similarity or dissimilarity between places in terms of the whole distribution of weighted centrality values. This can be done by calculating correlation coefficients between each settlement and every other and, through an examination of these coefficients, ensure that the series of groups are composed of units with maximum internal homogeneity and between group dissimilarity at the required level of generalization. Here the Spearman rank correlation coefficient is used because a non-parametric technique is desirable for this kind of data. The tie-break formula was

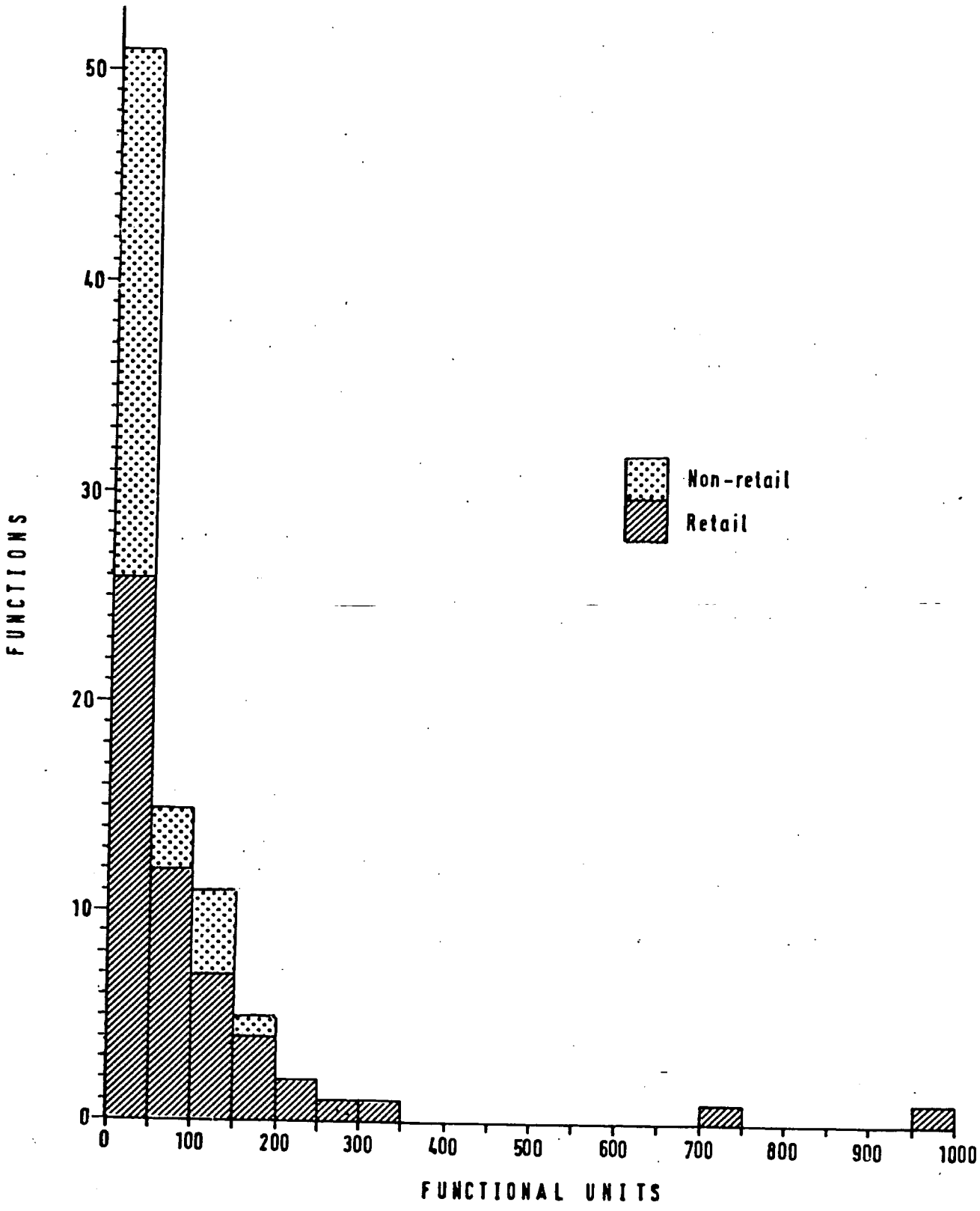


Figure 5:1 Functions and functional units.

TABLE 5:3

Number of Functional Units, Location Coefficients and the distribution of functions by settlements.

FUNCTION	No. of Func. Units	Location Coefficient	Settlements with Function	
			N	% Total
1. Baker	86	1.16	32	20.9
2. Butcher	212	0.47	59	38.6
3. Coffee shop	953	0.10	152	99.4
4. Confectionary	59	1.69	14	9.2
5. Dairy produce	37	2.70	10	6.5
6. Fish	87	1.15	33	21.6
7. Fruit and veg.	74	1.35	16	10.5
8. Groceries	160	0.63	10	6.5
9. Restaurant	57	1.75	13	8.5
10. Sweets	5	20.00	2	1.3
11. Taverna	22	4.55	9	5.9
12. Wines/drinks	111	0.90	9	5.9
13. Bridal wear	23	4.35	6	3.9
14. Clothing - childs	150	0.67	17	11.1
15. Clothing - mens	159	0.63	17	11.1
16. Clothing - womens	161	0.62	17	11.1
17. Leather/skins	9	11.11	2	1.3
18. Shoes	117	0.85	22	14.4
19. Sports clothes/equipment	3	33.33	2	1.3
20. Tailor	245	0.41	74	48.4
21. Textile goods	117	0.85	16	10.5
22. Clocks/watches	47	2.13	8	5.2
23. Chinaware	46	2.17	11	7.2
24. Electrical goods	103	0.97	14	9.2
25. Furniture	104	0.96	14	9.2
26. Glassware	55	1.82	11	7.2
27. Hardware	124	0.81	12	7.8
28. Household appliances	94	1.06	12	7.8
29. Radio/T.V.	64	1.56	9	5.9
30. Agric. machines	28	3.57	5	3.3
31. Bicycles	58	1.72	11	7.2
32. Cars	20	5.00	2	1.3
33. Vehicle accessories	64	1.56	10	6.5
34. Vehicle repairs	169	0.59	50	32.7
35. Barber	252	0.39	111	72.6
36. Cleaning	57	1.75	14	9.2
37. Hairdresser	88	1.14	35	22.9
38. Art	3	33.33	3	1.9
39. Books	35	2.86	8	5.2
40. Chemist	39	2.56	9	5.9
41. Flowers	2	50.00	2	1.3
42. Jewellery	47	2.13	8	5.2
43. Music	5	20.00	2	1.3
44. Newspapers	11	9.09	6	3.9
45. Office supplies	2	50.00	2	1.3
46. Photography	25	4.00	9	5.9
47. Religious goods	11	9.09	5	3.3
48. Stationery	25	4.00	8	5.2
49. Gifts/souvenirs	15	6.67	4	2.6

cont'd

TABLE 5:3 Cont'd

FUNCTION	No. of Func. Units	Location Coefficient	Settlements with Function	
			N	% Total
50. Toys	20	5.00	9	5.9
51. Candles	13	7.69	4	2.6
52. Handbags/Luggage	9	11.11	2	1.3
53. Perfume	5	20.00	2	1.3
54. Kiosk	315	0.32	104	68.0
55. General store	720	0.14	152	99.4
56. Commune office	138	0.72	138	90.2
57. Nomos offices	2	50.00	2	1.3
58. Court	14	7.14	9	5.9
59. Police H.Q.	2	50.00	2	1.3
60. Police station	22	4.55	21	13.7
61. Accountant	74	1.35	3	2.0
62. Dentist	61	1.64	8	5.2
63. Doctor	118	0.85	21	13.7
64. Lawyer	138	0.72	6	3.9
65. Optician	5	20.00	2	1.3
66. Printer	18	5.56	5	3.3
67. Vet	37	2.70	14	9.2
68. Clinic	13	7.69	2	1.3
69 Hospital	3	33.33	3	2.0
70. Library	8	12.50	8	5.2
71. Post Office	15	6.67	15	9.8
72. Telegraph Office (OTE)	12	8.33	12	7.8
73. Social institution	6	16.67	4	2.6
74. Kindergarden	80	1.25	68	44.4
75. Primary school	188	0.53	150	98.0
76. Secondary school	28	3.57	12	7.8
77. Private college	33	3.03	9	5.9
78. Agricultural college	2	50.00	2	1.3
79. Bank	13	7.69	6	3.9
80. Agricultural Bank	6	16.67	6	3.9
81. Insurance agency	14	7.14	2	1.3
82. Cinema	33	3.03	14	9.2
83 Driving school	8	12.50	3	2.0
84. Electricity office (DEH)	3	33.33	3	2.0
85. Travel agent	10	10.00	3	2.0
86. Trucking Co.	12	8.33	5	3.3
87. Agric. co-op.	141	0.71	141	92.2
88. Undertaker	9	11.11	3	2.0

TABLE 5:4

Ranked Weighted Functional Indices

Settlement	Total	Retail	Non Retail	Settlement	Total	Retail	Non Retail
1. Trikala	2384.4	1451.3	933.1	77. Georgikon	6.6	4.3	2.3
2. Kardhitsa	2071.9	1416.4	655.5	78. Dhipotamos	6.6	2.1	4.5
3. Kalambaka	813.4	370.2	443.2	79. Frangon	6.5	4.1	2.4
4. Mouzakion	483.3	360.9	122.4	80. Kappas	6.4	2.3	4.1
5. Sofadhes	468.1	364.5	103.6	81. Gelanthi	6.3	4.2	2.1
6. Pili	381.6	338.7	42.9	82. Kranea	6.2	3.1	3.1
7. Palamas	271.3	186.1	85.2	83. Petroporos	6.1	2.0	4.1
8. Farkadon	184.1	134.3	49.8	84. Ilias	6.1	1.0	5.1
9. Fanarion	136.0	45.2	90.8	85. Lefki	6.0	2.3	3.7
10. Leondari	117.6	57.1	60.5	86. Comfoi	6.0	5.0	1.0
11. Fiki	79.0	40.6	38.4	87. Megarchi	5.9	4.6	1.3
12. Neochorion	75.3	57.6	17.7	88. Aghiopighi	5.9	0.8	5.1
13. Itea	73.6	41.5	32.2	89. Moscholourion	5.9	1.6	4.3
14. Meg.Kalivea	71.0	6.2	64.8	90. Lazarina	5.8	3.4	2.4
15. Proastion	56.7	28.4	28.3	91. Eleftherochorion	5.7	3.6	2.1
16. Kedhros	52.1	24.3	27.8	92. Ligaria	5.6	3.6	2.0
17. Merina	33.3	1.1	32.2	93. Koskinas	5.6	2.0	3.6
18. Metropolis	29.4	21.6	7.7	94. Meg.Kefalovrison	5.6	3.7	1.9
19. Parapotamos	28.2	2.8	25.4	95. Zarchanadhes	5.5	1.0	4.5
20. Anavra	24.7	22.4	2.3	96. Karpochorion	5.5	3.3	2.2
21. Megalochorion	23.2	5.3	17.9	97. Nomi	5.4	2.8	2.6
22. Mataranga	22.6	18.3	4.3	98. Petrinon	5.3	2.6	2.7
23. Kastraki	21.4	19.3	2.1	99. Ag.Vessarios	5.2	3.6	1.6
24. Mavromattion	21.3	19.4	1.9	100.Patoulia	5.2	3.3	1.9
25. Dhialekton	19.4	6.2	13.2	101.Astritsa	5.2	0.6	4.6
26. Ardhanion	16.6	1.1	15.5	102.Panagitsa	5.1	2.5	2.6
27. Pedhinon	15.8	13.1	2.7	103.Kipseli	5.1	3.7	1.4
28. Fillon	15.4	12.5	2.9	104.Ag.Theadhoros	5.1	1.9	3.2
29. Agnanteron	15.1	10.3	4.8	105.Artesianon	5.1	3.3	1.8
30. Magoula	14.9	4.3	10.6	106.Filia	5.1	1.4	3.7
31. Valtinon	14.2	6.3	7.9	107.Filira	5.1	2.4	2.7
32. Gefiria	13.6	9.6	4.0	108.Keramidhion	5.0	2.2	2.8
33. Xinonerion	13.4	8.7	4.7	109.Mikro Kefalovrison	4.9	3.6	1.3
34. Ag.Vessarios	13.0	8.3	4.7	110.Prinos	4.9	3.0	1.9
35. Rizoma	12.9	11.0	1.9	111.Platanos	4.8	1.7	3.1
36. Theopetra	12.5	8.1	4.4	112.Glinos	4.8	2.5	2.3
37. Metamorphosis	12.4	3.6	8.8	113.Vlochos	4.8	1.5	3.3
38. Marathea	12.4	11.0	1.4	114.Kalivakia	4.6	1.0	3.6
39. Vasiliki	11.8	4.8	7.0	115.Mouria	4.6	2.8	1.8
40. Petroton	11.6	9.4	2.2	116.Taxiarchai	4.6	2.4	2.2
41. Geoganadhes	11.6	8.9	2.7	117.Achladhochorion	4.5	0.2	4.3
42. Neon Ikonion	11.5	1.5	10.0	118.Pirgos Ithomis	4.5	1.8	2.7
43. Kappadhokikon	11.4	5.9	5.5	119.Palaiochorion	4.5	2.5	2.0
44. Kallifonion	11.1	3.0	8.1	120.Ag.Paraskevi	4.5	2.3	2.2
45. Orfana	10.4	7.6	2.8	121.Palaiokklision	4.4	3.0	1.4
46. Asprovaltos	10.4	4.1	6.3	122.Valamandrion	4.4	2.2	2.2
47. Sarakina	9.8	4.8	5.0	123.Prodhromos	4.3	1.7	2.6
48. Pighi	9.8	7.8	2.0	124.Zelefti	4.2	1.5	2.7
49. Fotas	9.7	7.0	2.7	125.Kria Vrisi	4.1	1.3	2.8
50. Dhroseron	9.7	7.3	2.4	126.Stavros	4.1	1.4	2.7
51. Magoulitsa	9.7	7.0	2.7	127.Longos	4.1	0.9	3.2
52. Paschalitsa	9.3	5.5	3.8	128.Ptelopoula	4.0	1.2	2.8
53. Krini	9.2	8.0	1.2	129.Zaimion	3.8	1.3	2.5
54. Charma	9.1	6.1	2.9	130.Melissa	3.7	0.4	3.3
55. Anogeiou	9.0	3.3	5.7	131.Ag.Kiriaki	3.7	0.4	3.3
56. Peristera	8.9	4.7	4.2	132.Pirgos Kieriou	3.6	1.8	1.8
57. Palaiomonastirion	8.9	6.8	2.1	133.Gorgovites	3.6	1.3	2.3
58. Kalogriana	8.9	6.1	2.8	134.Ambela	3.6	1.8	1.8
59. Achladea	8.6	4.3	4.3	135.Raxa	3.4	1.7	1.7
60. Dhendrochorion	8.3	6.4	1.9	136.Ambelos	3.4	2.4	1.0
61. Pialeia	8.0	4.9	3.1	137.Sotira	3.3	1.0	2.3
62. Makrichorion	7.7	5.6	2.1	138.Krinitsa	3.3	0.4	2.9
63. Ag.Dhimitrios	7.6	2.4	5.2	139.Kordha	3.2	1.0	2.2
64. Kallithea	7.5	6.3	1.2	140.Mavrachades	3.2	1.7	1.5
65. Grizanon	7.4	5.7	1.7	141.Loxadha	3.1	0.5	2.6
66. Ermetsion	7.4	4.8	2.6	142.Leptokaria	3.0	0.3	2.7
67. Klokotos	7.4	5.8	1.6	143.Palaiopirgos	3.0	1.8	1.2
68. Rizovounion	7.3	2.5	4.8	144.Rousson	2.8	0.8	2.0
69. Chrisavge	7.3	5.0	2.3	145.Fanaromeni	2.6	0.8	1.8
70. Servota	7.3	3.1	4.2	146.Psathochorion	2.5	1.5	1.0
71. Asimochorion	7.1	4.0	3.1	147.Loutron	2.4	0.6	1.8
72. Makron	7.0	3.6	3.4	148.Rizareion	2.0	1.0	1.0
73. Melissochorion	6.9	4.2	2.7	149.Rengia	1.9	0.6	1.3
74. Ag.Trias	6.9	4.2	2.7	150.Ag.Apostoli	1.6	0.8	0.8
75. Kardhitsomagoula	6.8	5.7	1.1	151.Karaia	1.4	0.0	1.4
76. Grammatikon	6.8	3.6	3.1	152.Ag.Theodhoros	0.3	0.3	0.0
				153.Ag.Anaryiroi	0.2	0.2	0.0

used because of the large number of ties that were likely to occur in the data, especially between smaller settlements. The formula is:

$$r_s = \frac{\sum x^2 + \sum y^2 - \sum d^2}{2\sqrt{\sum x^2 + \sum y^2}}$$

where $\sum x^2 = \frac{N^3-N}{12} - \sum Tx$, and $\sum y^2 = \frac{N^3-N}{12} - \sum Ty$

(Siegel 1956)

The correlation coefficients were calculated for retail and non-retail functions separately, and then using the complete matrix of weighted centrality values. In this way it can be seen whether a hierarchy based on retail functions differs from that based on non-retail, and it facilitates the interpretation of an aggregate hierarchy.

1 The Retail Hierarchy

After ranking the settlements by their retail WFI, the rank correlation coefficients between adjacent pairs were calculated. A lower correlation between a pair of settlements than that between pairs of immediately higher ranking was taken to indicate the edge of a group. The correlation coefficients between all members of the provisional group were found, and if all had higher correlations with each other than with settlements adjacent to the group this was interpreted as confirming the existence of a group which satisfies the definition of Clark (q.v.). Nevertheless, an element of subjectivity is still involved in deciding when a correlation coefficient marks a break: with 151 degrees of freedom very low coefficients are statistically significant.

The most interesting feature in the list of retail WFIs is the closeness of Trikala and Kardhitsa (1451.3

and 1416.4 respectively) and of Kalambaka, Mouzakion, Sofadhes and Pili (370.2, 360.9, 364.5 and 338.7 respectively), values which contrast notably with the larger range of unweighted Functional Indices (see Chapter 7). The correlation coefficient between Trikala and Kardhitsa is 0.45, and their correlations with all other settlements are negative. With Kalambaka they have correlations of -0.40 and-0.21 respectively, and they therefore emerge as a distinct high-level group. Below this the next six centres form another group, although the WFIs of the last two are rather lower than the others. Sofadhes is a slight anomaly in having relatively low correlations with all the other settlements, but has even lower ones with those outside the group. The boundary of the group is pronounced with all the settlements having low correlations with Neochorion, the ninth ranked centre in retail indices (Table 5:5).

TABLE 5:5

Rank Correlation Coefficients (Retail WFIs)

	1	2	3	4	5	6	7
1 Kalambaka	1.0						
2 Sofadhes	0.31	1.0					
3 Mouzakion	0.70	0.32	1.0				
4 Pili	0.58	0.32	0.57	1.0			
5 Palamas	0.43	0.43	0.56	0.49	1.0		
6 Farkadon	0.54	0.35	0.53	0.39	0.57	1.0	
7 Neochorion	0.07	0.18	0.19	0.18	0.25	0.23	1.0

In contrast, the identification of a third level in the retail hierarchy is more difficult. Although Neochorion and Leondari have almost the same retail WFI, the correlation between them is only 0.18. This implies significant differences in the retail structure of these two settlements

which may be related to the fact that Neochorion is a large village with a population more than twice that of Leondari, and its relatively large provision of retail outlets is supported by the indigenous inhabitants of the village while Leondari may be more of a true central place. Neochorion is only 7 kms fromFarkadon, while the closest large settlement to Leondari is Sofadhes, 18 kms distant. The highest correlation that Neochorion has is with Itea, and that is 0.42. Leondari also has low correlations with the other settlements, the highest also being with Itea (0.48). The next three settlements in rank order, Fanarion, Itea and Fiki all have similar retail WFIs, and they are also more highly correlated with each other. Taken in isolation they satisfy the criterion for group identification (Table 5:6). The inclusion of Neochorion and Leondari as part of this group could be justified if a less strict approach to group identification were taken: in terms of the simple array of

TABLE 5:6

Rank Correlation Coefficients (retail WFIs)

		1	2	3	4	5	6
1	Neochorion	1.0					
2	Leondari	0.18	1.0				
3	Fanarion	0.29	0.27	1.0			
4	Itea	0.42	0.48	0.58	1.0		
5	Fiki	0.36	0.32	0.51	0.60	1.0	
6	Proastion	0.23	0.43	0.38	0.63	0.37	1.0

WFIs they form part of a distinct cluster with the other three, while they both have correlations of 0.4 with one of the other settlements. Below this it is not possible to define further groups. Proastion is the next settlement below Fiki, and has

a WFI 12 points lower. Continuing further down the array no other large breaks in WFI values occur, and all these places must be assigned to a fourth category where a continuum of values is found which can be related directly to the population size continuum.

2 The Non-Retail Hierarchy

There is a considerable contrast between the array of retail WFIs and that of non-retail WFIs. In particular, the remarkable closeness between the highest ranking values is not found while there are also differences in the rank ordering of settlements. As before, Trikala and Kardhitsa are respectively first and second rank and, although their non-retail WFIs differ by almost 300, there is a high correlation of 0.71 between them. Similarly their correlations with all other settlements are negative: with Kalambaka, the third ranking centre, -0.19 and -0.05 respectively. Consequently they again emerge as a distinct upper group. Kalambaka has a high index of 443.2, only about 200 less than Kardhitsa, and more than 300 higher than Mouzakion, the next settlement in rank order. Moreover, it has negative correlations with all places but Farkadon, Mouzakion, Sofadhes and Palamas, and the positive correlations with these are all low (Table 5:7). Therefore in terms of non-retail functions Kalambaka must be classed by itself, and this might be related to its functions as the seat of an eparchy, the only one in West Thessaly. Below Kalambaka no clear groupings emerge, except perhaps Mouzakion, Sofadhes and Palamas which are all highly correlated with each other. Fanarion and Leondari are highly correlated, as are Pili and Farkadon. Megala Kalivea, the seventh ranked centre, has low correlations with most other

TABLE 5:7

Rank Correlation Coefficients (non-retail WFIs)

		1	2	3	4	5	6	7	8	9	10
1	Kalambaka	1.0									
2	Mouzakion	0.22	1.0								
3	Sofadhes	0.16	0.67	1.0							
4	Fanarion	-0.19	0.50	0.39	1.0						
5	Palamas	0.15	0.70	0.97	0.38	1.0					
6	Meg. Kalivea	-0.07	0.23	0.12	0.25	0.15	1.0				
7	Leondari	-0.36	0.34	0.30	0.84	0.29	0.38	1.0			
8	Farkadon	0.03	0.75	0.47	0.71	0.47	0.43	0.55	1.0		
9	Pili	-0.05	0.60	0.39	0.55	0.42	0.59	0.48	0.84	1.0	
10	Fiki	-0.12	0.39	0.20	0.53	0.20	0.66	0.53	0.58	0.59	1.0

settlements. This can be related directly to it being the site of one of only six social institutions in the detailed study area: this produces a high WFI, but it correlates lowly with other centres with similar WFIs which are composed of a larger number of centrality values. Further down the array a very large number of settlements are highly correlated with each other, and coefficients of 0.82, 0.85 and 1.00 are common. This indicates the basically similar non-retail functional structure of these settlements, a structure which is more homogeneous than the retail because it is more a result of governmental service provision than the essentially individualistic provision of retail services.

3 The Aggregate Hierarchy

Repeating the correlation analysis with the complete matrix of weighted centrality values, and taking into account the results of parts 1 and 2 above, it is possible to identify a hierarchical structure in the central place system

of West Thessaly which is characterized by four levels with two subdivisions. This is as follows:

Level	Constituent Settlements
A	Trikala, Kardhitsa
B1	Kalambaka
B2	Mouzakion, Sofadhes, Pili, Palamas, Farkadon
C1	Fanarion, Leondari
C2	Fiki, Neochorion, Itea, Megala Kalivea, Proastion, Kedhros
D	Remaining settlements

The recognition of Trikala and Kardhitsa as the only two A level centres in the study area is not open to debate. Both have WFIs of over 2,000 while Kalambaka, the third in rank order, has an index of 813. The rank correlation coefficient between them is 0.58 whereas with all other settlements they both have negative correlations: between Trikala and Kalambaka it is -0.27, and between Kardhitsa and Kalambaka -0.19. The dominant position of Trikala and Kardhitsa applies in both the retail and non-retail sectors.

Six B level centres have been identified, although the allocation of Kalambaka to a separate subdivision has been considered necessary. This is because its WFI exceeds that of Mouzakion, the fourth ranked centre, by over 300, and it has relatively low correlations with all other members of this group except Mouzakion (Table 5:8). The subdivision results from the higher level of non-retail functions which Kalambaka performs since it is similar to the other B level settlements in terms of retail functions. The B2 group emerge as a distinct group by all having fairly high correlations with each other. The break between these settlements and those of the C group

TABLE 5:8

Rank Correlation Coefficients (total WFIs)

	1	2	3	4	5	6	7
1 Kalambaka	1.0						
2 Mouzakion	0.47	1.0					
3 Sofadhes	0.25	0.49	1.0				
4 Pili	0.30	0.62	0.43	1.0			
5 Palamas	0.31	0.63	0.67	0.51	1.0		
6 Farkadon	0.31	0.66	0.44	0.62	0.56	1.0	
7 Fanarion	-0.06	0.27	0.13	0.16	0.18	0.28	1.0

is clear: Fanarion, the ninth centre in rank order, has low correlations with all the settlements above it.

The C level centres have also been divided into two subgroups, although the basis for so doing is less clear than in the B group. Fanarion and Leondari are classified as C1 because, firstly, their WFIs are considerably higher than the others and, secondly, Leondari has relatively low correlations with Fiki and Neochorion, the next two centres in rank order. This subdivision can also be related to the position of these two places in terms of non-retail functions where they were very highly correlated with each other. Most of the other settlements have relatively high correlations with each other, the only exception being between Neochorion and Proastion and Kedhros (Table 5:9). The division between C and D level settlements was made at Kedhros. Although the correlation of Kedhros with next ranked settlement, Merina, is 0.45, Merina has relatively low correlations with all but one of the other members of the group, and has a WFI value almost 20 less than that of Kedhros. Furthermore, the relatively high index of Merina is due solely to the fact that it has a small library (one of only eight recorded in the area) without which its

TABLE 5:9

Rank Correlation Coefficients (total WFIs)

	1	2	3	4	5	6	7
1 Fiki	1.0						
2 Neochorion	0.44	1.0					
3 Itea	0.63	0.45	1.0				
4 Meg. Kalivea	0.61	0.42	0.44	1.0			
5 Proastion	0.46	0.28	0.72	0.47	1.0		
6 Kedhros	0.47	0.34	0.57	0.45	0.61	1.0	
7 Merina	0.33	0.31	0.24	0.47	0.37	0.45	1.0

WFI value would have been only 3.6.

The D group is the lowest if small settlements without any central functions are excluded from consideration. It is not possible to identify any significant breaks in the WFI array, and a continuum of 137 settlements must be recognised with WFI values from the 33.3 of Merina to the 0.2 of Aghioi Anaryiroi (Fig. 5:2).

4 The Functional Characteristics of Hierarchical Levels

The characteristics of each hierarchical level, the nature of the marginal hierarchical functions and whether the criterion of hierarchical structure regarding incremental baskets of goods is satisfied can be determined from Table 5:10.

Firstly, it is clear that the criterion of an incremental basket of goods is met. Each level contains all the functions of any lower level and an incremental basket of different functions in addition which form the marginal hierarchical functions for that level. The order of entry of functions is not, however, clear cut: a function which appears at a given hierarchical level is not generally found in all settlements of that level. In the case of B level settlements a lot of the

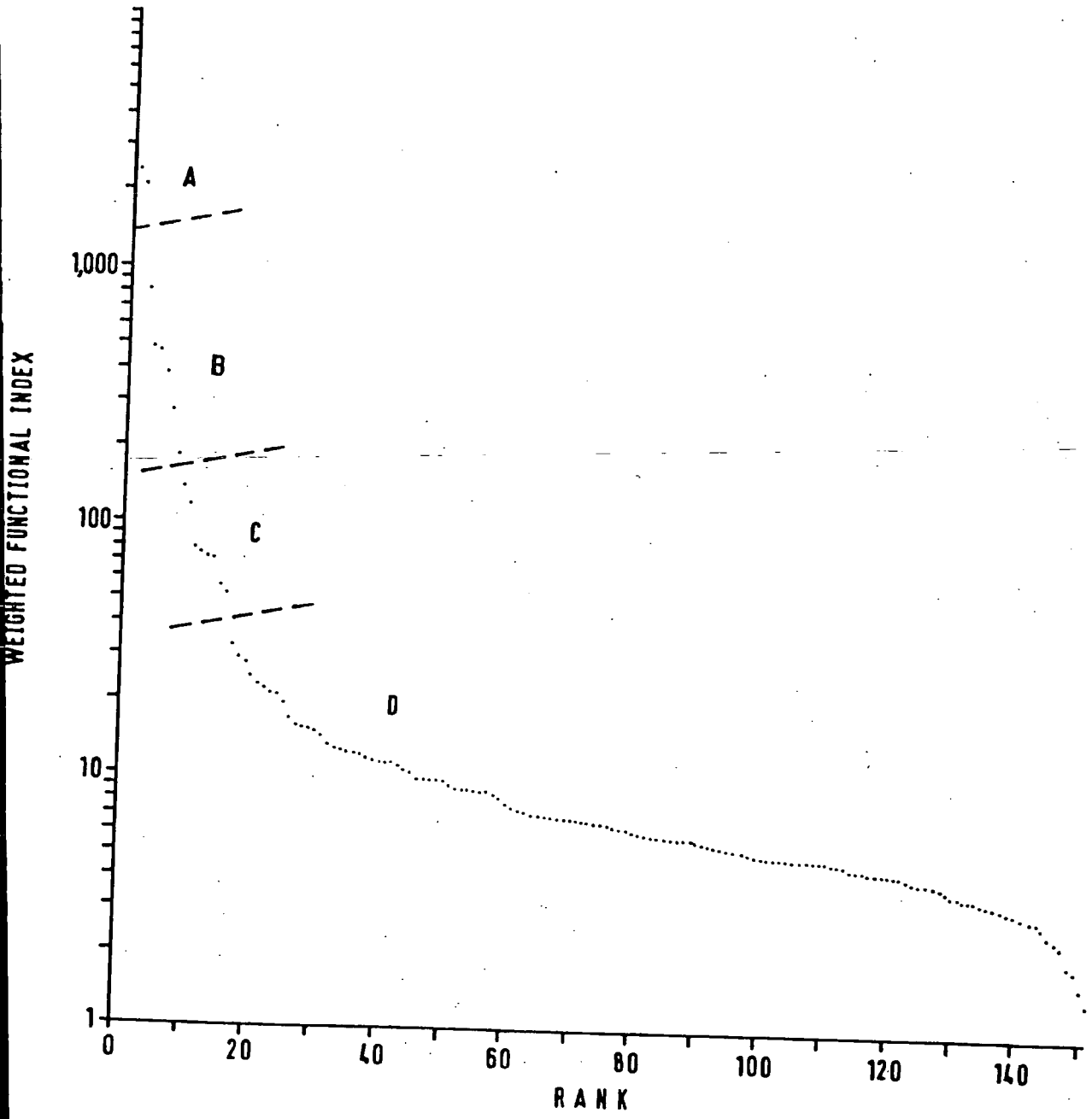


Figure 5:2 Rank-size distribution of weighted functional indices showing hierarchical breakpoints.

TABLE 5:10

Incidence Matrix of Functions in Settlements by Hierarchical Grades (% total)

FUNCTION*	A	B	C	D	FUNCTION*	A	B	C	D
1. Coffee shop	100.0	100.0	100.0	99.3	45. Cinema	100.0	100.0	37.5	2.2
2. General store	100.0	100.0	100.0	99.3	46. Agric. machines	100.0	33.3	12.5	-
3. Kiosk	100.0	100.0	100.0	64.2	47. Secondary school	100.0	100.0	37.5	0.7
4. Barber	100.0	100.0	87.5	70.1	48. Photography	100.0	100.0	12.5	-
5. Tailor	100.0	100.0	87.5	43.1	49. Stationery	100.0	100.0	-	-
6. Butcher	100.0	100.0	100.0	31.4	50. Bridal wear	100.0	66.7	-	-
7. Primary school	100.0	100.0	100.0	97.8	51. Taverna	100.0	50.0	50.0	-
8. Vehicle repairs	100.0	100.0	100.0	24.8	52. Police station	100.0	100.0	100.0	3.7
9. Clothing (women)	100.0	100.0	62.5	2.9	53. Cars	100.0	-	-	-
10. Groceries	100.0	100.0	25.0	-	54. Toys	100.0	100.0	12.5	-
11. Clothing (men)	100.0	100.0	62.5	2.9	55. Fish	100.0	100.0	25.0	13.9
12. Clothing (childs)	100.0	100.0	62.5	2.9	56. Printer	100.0	50.0	-	-
13. Co-operative	100.0	100.0	100.0	91.2	57. Gifts/Souvenirs	100.0	33.3	-	-
14. Commune office	100.0	100.0	100.0	89.1	58. Post office	100.0	100.0	75.0	0.7
15. Lawyer	100.0	66.7	-	-	59. Court	100.0	100.0	12.5	-
16. Hardware	100.0	100.0	50.0	-	60. Insurance agency	100.0	-	-	-
17. Shoes	100.0	100.0	75.0	5.8	61. Candles	100.0	33.3	-	-
18. Textile goods	100.0	100.0	50.0	2.9	62. Clinic	100.0	-	-	-
19. Doctor	100.0	100.0	87.5	4.4	63. Bank	100.0	66.7	-	-
20. Wines/drinks	100.0	100.0	12.5	-	64. Telegraph office	100.0	100.0	62.5	-
21. Furniture	100.0	100.0	50.0	1.5	65. Trucking	100.0	50.0	-	-
22. Electrical goods	100.0	100.0	50.0	1.5	66. Newspapers	100.0	66.7	-	-
23. Household appl.	100.0	100.0	25.0	1.5	67. Religious goods	100.0	33.3	12.5	-
24. Hairdresser	100.0	100.0	75.0	15.3	68. Travel agent	100.0	16.7	-	-
25. Baker	100.0	100.0	75.0	13.1	69. Leather/skins	100.0	-	-	-
26. Kindergarden	100.0	100.0	100.0	37.9	70. Handbags	100.0	-	-	-
27. Fruit and veg.	100.0	83.3	50.0	3.7	71. Undertakers	100.0	16.7	-	-
28. Accountant	100.0	16.7	-	-	72. Library	100.0	33.3	37.5	0.7
29. Radio/T.V.	100.0	100.0	12.5	-	73. Driving school	100.0	16.7	-	-
30. Vehicle accessories	100.0	83.3	25.0	0.7	74. Social institution	100.0	16.7	12.5	-
31. Dentist	100.0	100.0	-	-	75. Agric. Bank	100.0	66.7	-	-
32. Confectionary	100.0	100.0	62.5	0.7	76. Sweets	100.0	-	-	-
33. Bicycles	100.0	83.3	50.0	-	77. Music	100.0	-	-	-
34. Restaurant	100.0	100.0	37.5	1.5	78. Perfume	100.0	-	-	-
35. Cleaning	100.0	100.0	37.5	2.2	79. Optician	100.0	-	-	-
36. Glassware	100.0	100.0	25.0	0.7	80. Sports clothes/equip.	100.0	-	-	-
37. Clocks/watches	100.0	100.0	-	-	81. Art	100.0	16.7	-	-
38. Jewellery	100.0	100.0	-	-	82. Hospital	100.0	16.7	-	-
39. Chinaware	100.0	100.0	25.0	0.7	83. Electricity office	100.0	16.7	-	-
40. Chemist	100.0	100.0	12.5	-	84. Flowers	100.0	-	-	-
41. Dairy produce	100.0	100.0	25.0	-	85. Office supplies	100.0	-	-	-
42. Vet	100.0	100.0	25.0	2.9	86. Nomos office	100.0	-	-	-
43. Books	100.0	100.0	-	-	87. Police H.Q.	100.0	-	-	-
44. Private college	100.0	83.3	25.0	-	88. Agric. college	50.0	16.7	-	-

Functions are ranked in ascending order by location coefficient.

marginal hierarchical functions are found only in Kalambaka: of the functions which are found in 16.7 per cent of B settlements (that is, in one only), all but Art are found in Kalambaka. All of the B level marginal hierarchical functions are found in both of the A centres, with the exception of 'Agricultural College' which is found only in Kardhitsa. Similarly, most of the C level marginal hierarchical functions are found in all of the B level settlements, but the same relationship does not occur with the D level marginal hierarchical functions and C level settlements. Ten of the functions are found in all of the C level settlements, including six of the first eight functions ranked in ascending order of location coefficient. With other functions the proportion of C settlements containing them varies considerably, being lowest where the marginal hierarchical function is found in only a small number of D level settlements.

It will be seen that A level centres are not distinguished from B level so much by the range of functions which they possess as by the number of functional units of the various functions which they contain (the main exception are administrative functions). Many of the A level marginal hierarchical goods subsumed under general function headings can be obtained in B centres, although demand is not sufficient to warrant specialisation by any particular outlet to a degree where it would have been identified in the field survey (for example, sweets, music, perfume, handbags). In reality, very few functions are confined solely to Trikala and Kardhitsa although the range widens if Kalambaka is excluded from consideration. On the other hand, it should be remembered that the field survey could not be completely comprehensive and that functions omitted

from the study are usually those more characteristic of higher rather than lower hierarchical levels.

The main distinction between B and C level settlements is in the provision of non-retail services: only 40 per cent of the B level marginal hierarchical functions are retail (c.f. 62.5 per cent of all functions identified in the study), whereas with C and D level settlements the proportion is 75 per cent and 72 per cent respectively. This may be interpreted as reflecting primarily the different locational influences on retail and non-retail service provision, including the random decisions of individual entrepreneurs within a satisfaction maximisation rather than profit maximisation frame of reference and, secondly, the limitations on the size of retail functional outlets imposed by various social and economic factors (Chapter 2B). In comparison, the location of non-retail functions, particularly those associated directly or indirectly with government, is more subject to rational objective decisions, and the size of the units of some functions such as schools can vary considerably.

The kind of retail functions which characterize the B settlements are those which might be considered as luxuries rather than necessities - jewellery, books, gifts, art - whereas the non-retail functions are mainly professional activities (lawyer, dentist) or financial (banks). In contrast, the retail functions which characterize the third hierarchical level tend to be those which could be classified as necessities, but those not supplying goods requiring frequent purchase (for example, hardware, chemist). Finally, the D group has a large number of marginal hierarchical functions but very few of these are found in more than 50 per cent of these settlements. Indeed,

only the coffee shop, general store, kiosk, barber, primary school, co-operative and commune office functions are found in more than 60 per cent of the total, although it should be remembered that the range of goods available within a village general store can be very wide. Most of the other functions are found only in the larger villages such as Mataranga and Kardhitsomagoula, although there is also a certain random element involved which classical deterministic central place theory cannot adequately explain: the existence of a small library in Merina and a secondary school in Magoula are examples of this.

5 Threshold Populations

The concept of threshold is basic to central place theory and any central place study should therefore make an effort to calculate the threshold population of the functions it considers. Moreover, there is a potential practical application of threshold populations in the planning of future retail provision. However, while the concept itself is not complex, the empirical assessment of the values is not without complication. Although the classical theory predicts a smooth order of entry of functions at increasingly higher hierarchical levels, a number of factors operate in the real world to produce a rather more variable pattern of entry.

In the first place, there are variations in consumer behaviour over space produced by variations in real disposable income, tastes and buying habits (see Chapter 6). Secondly, there are variations in the size and quality levels of establishments providing any particular good or service. Although it was suggested in Chapter 2 that establishment size

variations are not very significant in retail trade in Greece, they are certainly of relevance when considering some non-retail functions such as administration, education and health. It would be possible, however, to overcome this problem by using floorspace or employment data if they were available. Variations in the quality level of establishments is a less tangible influence on threshold values but it has been considered a vital element in some theoretical formulations of retail land use (Garner 1966) and attempts have been made to quantitatively assess them (R. L. Davies 1972). In addition, random influences on entrepreneurial behaviour also complicate the picture, particularly social factors and the operation of businesses on a part-time basis.

To accommodate this operational problem of assessing threshold populations, Haggett and Gunawardena (1964) suggested that the concept of an entry level should be replaced by one of an entry zone. At the lower limits of the zone all settlements lack the function being considered while at the upper limits of the zone all settlements possess it. In simplified form, what they suggest is that the threshold population of a function should be the median population between the population of the settlement below which no others possess the function and the population of the settlement above which all settlements possess it. This is a straightforward technique although it does have one major theoretical drawback: in considering only the population of the central places it is excluding the population of the hinterlands they serve. Nevertheless, given the necessary crudities of any attempt at calculating thresholds, the values which this method provides are sufficient for the present purpose. Furthermore, for the

TABLE 5:11

Median Population Thresholds

1. Baker	974	45.Office supplies	15,569
2. Butcher	673	46.Photography	1,724
3. Coffee shop	109	47.Religious goods	2,333
4. Confectionary	1,419	48.Stationery	2,219
5. Dairy produce	1,724	49.Gifts/souvenirs	2,298
6. Fish	814	50.Toys	2,073
7. Fruit and veg.	1,306	51.Candles	4,912
8. Groceries	1,832	52.Handbags/luggage	15,569
9. Restaurant	699	53.Perfume	15,569
10.Sweets	15,569	54.Kiosk	658
11.Taverna	1,429	55.General store	109
12.Wines/drinks	1,860	56.Commune office	490
13.Bridal wear	2,219	57.Nomos offices	15,569
14.Clothing - childs	1,251	58.Court	1,724
15.Clothing - mens	1,251	59.Police H.Q.	15,569
16.Clothing - womens	1,251	60.Police station	1,053
17.Leather/skins	15,569	61.Accountant	5,386
18.Shoes	1,132	62.Dentist	2,219
19.Sports clothes/equipment	15,569	63.Doctor	1,045
20.Tailor	677	64.Lawyer	2,858
21.Textile goods	1,268	65.Optician	15,569
22.Clocks/watches	2,219	66.Printer	3,797
23.Chinaware	1,796	67.Vet	695
24.Electrical goods	1,631	68.Clinic	15,569
25.Furniture	1,796	69.Hospital	5,386
26.Glassware	1,796	70.Library	1,429
27.Hardware	1,429	71.Post office	1,419
28.Household appliances	1,796	72.Telegraph office (O.T.E.)	1,440
29.Radio/T.V.	1,846	73.Social institution	2,858
30.Agric.machines	4,912	74.Kindergarden	635
31.Bicycles	1,394	75.Primary school	197
32.Cars	15,569	76.Secondary school	1,435
33.Vehicle accessories	1,440	77.Private college	1,419
34.Vehicle repairs	707	78.Agricultural college	25,685
35.Barber	636	79.Bank	2,858
36.Cleaning	1,846	80.Agricultural Bank	2,858
37.Hairdresser	808	81.Insurance agency	15,569
38.Art	5,318	82.Cinema	1,394
39.Books	2,219	83.Driving school	5,386
40.Chemist	1,419	84.Electrical office (D.E.H.)	5,386
41.Flowers	15,569	85.Travel agent	5,386
42.Jewellery	2,219	86.Trucking Co.	3,797
43.Music	15,569	87.Agricultural Co-op	474
44.Newspapers	2,263	88.Undertaker	5,386

specific case of West Thessaly, the nucleated nature of rural settlement reduces the importance of this drawback.

The median population thresholds for the 88 functions identified are shown in Table 5:11. They range from 109 for Coffee Shop and General Store up to 15,569 for those functions found only in Kardhitsa and Trikala. Generally, the values confirm the picture revealed in the previous sub-section of the existence of many functions in at least some of the smaller settlements in the region, but some qualifications need to be made. This technique has probably overestimated the threshold population of some retail functions which do form components of the mix of General Store or other shops or are available from market traders, and underestimated others such as Nomos offices and Hospitals which clearly are supported by a much wider population than that of the towns in which they are located. In general, however, the threshold values do accord well with intuitive impressions gained during the fieldwork.

SECTION E THE SPATIAL STRUCTURE OF THE CENTRAL PLACE SYSTEM OF WEST THESSALY

One of the important features of Christaller's central place model is that the central places are distributed regularly over the isotropic plain, and centres of a given hierarchical level serve the same numbers of consumers. Perfect spatial competition means that the centres are located on a triangular lattice with hexagonal trade areas (Chapter IB). The model thus provides a useful basis for examining the spatial structure of a settlement system since in reality the tendencies to spatial uniformity are combined with forces such as variations

in resource availability and the efficiency of communications which lead to spatial heterogeneity. It is therefore interesting to see to what extent tendencies towards regular distribution can be discerned.

The most common technique that has been used to do this is nearest neighbour analysis, originally developed to analyse point patterns in ecological studies (Clark and Evans 1954). The earliest applications of this technique to central place systems were by L. J. King (1961) and Dacey (1962). The nearest neighbour statistic, R, is derived from comparing the actual mean distance between points and their nearest neighbour, $\bar{r}a$, with the mean distance to be expected if the points were distributed in a completely random fashion, $\bar{r}e$.

$$R = \bar{r}a/\bar{r}e$$

$\bar{r}e$ is derived from a formula based on the Poisson distribution:

$$\bar{r}e = 1/2\sqrt{p}$$

where p = the density of points in the given area.

The formula for R can therefore be written as:

$$R = \bar{r}a.2.\sqrt{p}$$

A value of 1.0 for R indicates a random distribution of points. When R is less than 1.0 the pattern will tend towards aggregation or clustering, and a value of zero for R would mean all points have the same location. When R is more than 1.0 the pattern will tend toward uniformity or dispersion, and the maximum value of R is 2.1491, which indicates that the points conform to Christaller's triangular pattern (that is, maximum uniformity).

The nearest neighbour statistic was calculated

for B, C and D level settlements. Where a settlement of a given level was located close to a settlement of a higher level than to one of the same, then the former distance was measured since every central place performs all the functions of lower order ones. For D-level seetlements distances were measured to the second, third and fourth nearest neighbours as well as the first. Distances were measured in millimetres from a copy of the 1:200,000 N.S.S.G. maps of Trikala and Kardhitsa nomoi, and the boundaries of the area were those of the outermost communes. The total area was estimated to be 54,925 sq. mm. (Fig. 5:3).

The values of $\bar{r}_a$ and $\bar{r}_e$, R and the 95 per cent confidence limits on $\bar{r}_e$ were calculated (Table 5:12).

TABLE 5:12

The Nearest Neighbour Statistic (R) for B, C and D Level Settlements

	R	$\bar{r}a$	$\bar{r}e$	95% limits on $\bar{r}e$
B-level	1.590	65.87	41.43	15.01
C-level	1.551	45.43	29.30	7.51
D-level (1st)	1.225	11.65	9.51	0.79
(2nd)	1.136	16.20	14.26	0.82
(3rd)	1.116	19.87	17.82	0.83
(4th)	1.097	22.82	20.79	0.84

The results show a tendency towards uniformity at all hierarchical levels but one which is greatest at the B-level and lowest at the D. While all the results are significant at the 95 per cent level, the values of R are somewhat less than the maximum of 2.1491, and so there is obviously a considerable

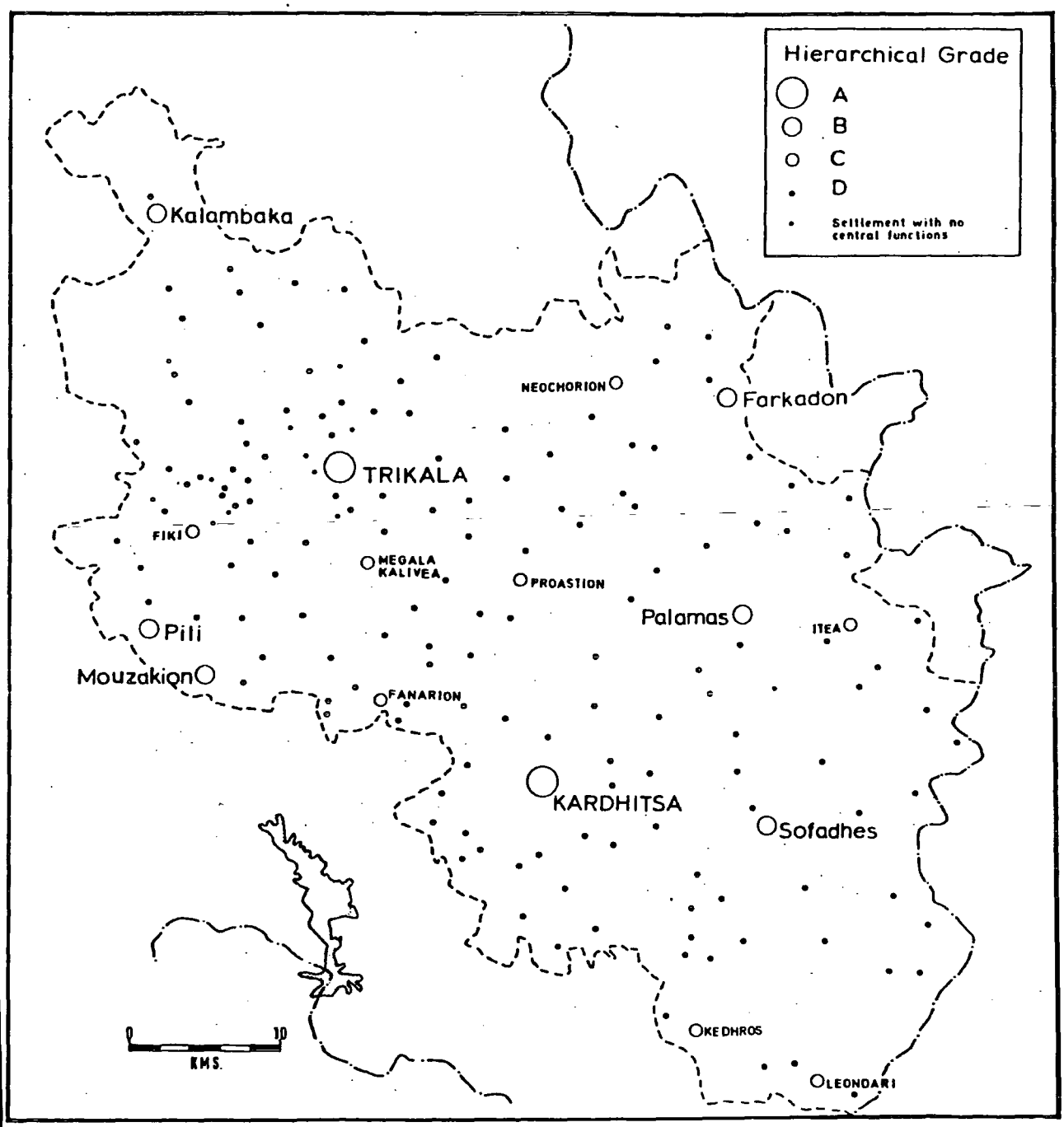


Figure 5:3 Settlements in West Thessaly classified by hierarchical level.

random element in the distribution. That this is strongest in the D-level settlements is not surprising since these are agricultural villages with only minor central place functions, if any, and their distribution should not therefore be interpreted in terms of the spatial competition between service centres. This is emphasized by the values of R for second, third, and fourth nearest neighbours which increasingly approach a value of 1.0, indicating a random distribution. However, at the two higher levels where central place functions are performed, spatial competition between centres must be considered as an influence on their distribution, and hence the greater regularity in their distribution.

SECTION F AGGREGATE RELATIONSHIPS IN THE CENTRAL PLACE SYSTEM OF WEST THESSALY

The attributes of the settlements which form the elements of the central place system are population, numbers of central functions and numbers of functional units. In examining the relationships between these variables, the aim is to confirm the expected hypothesis that increases in one variable will be reflected in constant increases in the others, and to assess the degree of organisation and optimality in the system.

1 Functions and Functional Units

Some workers have plotted these variables on a semi-logarithmic graph in order to show whether or not the number of functional units increases by a constant percentage of the previous total for each new central function which is added. Indeed, Berry and Barnum (1962) stated their structural

equation as

$$\text{Log } F = a_2 + b_2 C$$

where F = number of functional units in a central place

C = number of central functions performed by a central place.

It has been suggested that an explanation for the existence of this relationship is that there is some limit to the functional complexity of urban places. As cities become larger, greater numbers of establishments and functions are found within them, but once a certain level is reached establishments are added much more rapidly than functions. This suggests that the greater numbers of people found in larger places do not need different kinds of functions but rather easy access to the same ones (Thomas 1960).

If the data for West Thessaly are plotted on a semi-logarithmic graph, with functional units on the y axis, a pattern similar to that found by Berry, Barnum and Tennant occurs (Fig. 5:4). The distribution could be divided into three sections:

(1) the lower part, consisting of settlements with less than 15 functions, where the number of functions added increases only slowly with the increase in functional units;

(2) an upper part consisting of the towns of Trikala and Kardhitsa; and

(3) an intermediate part consisting of the remaining settlements where generally there is a rapid increase in functional diversification with increases in the numbers of functional units.

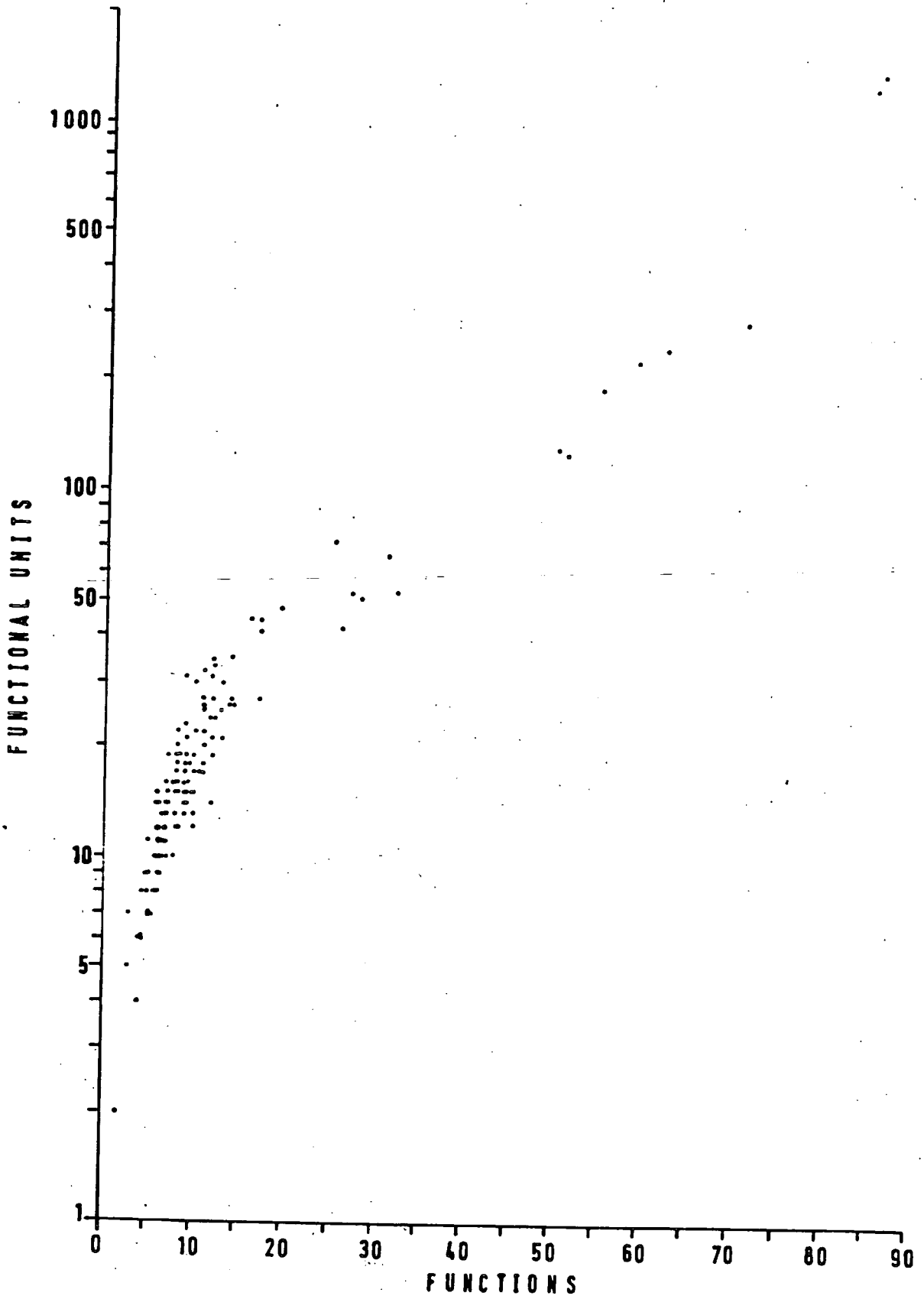


Figure 5:4 Functional units and functions (semi-logarithmic graph).

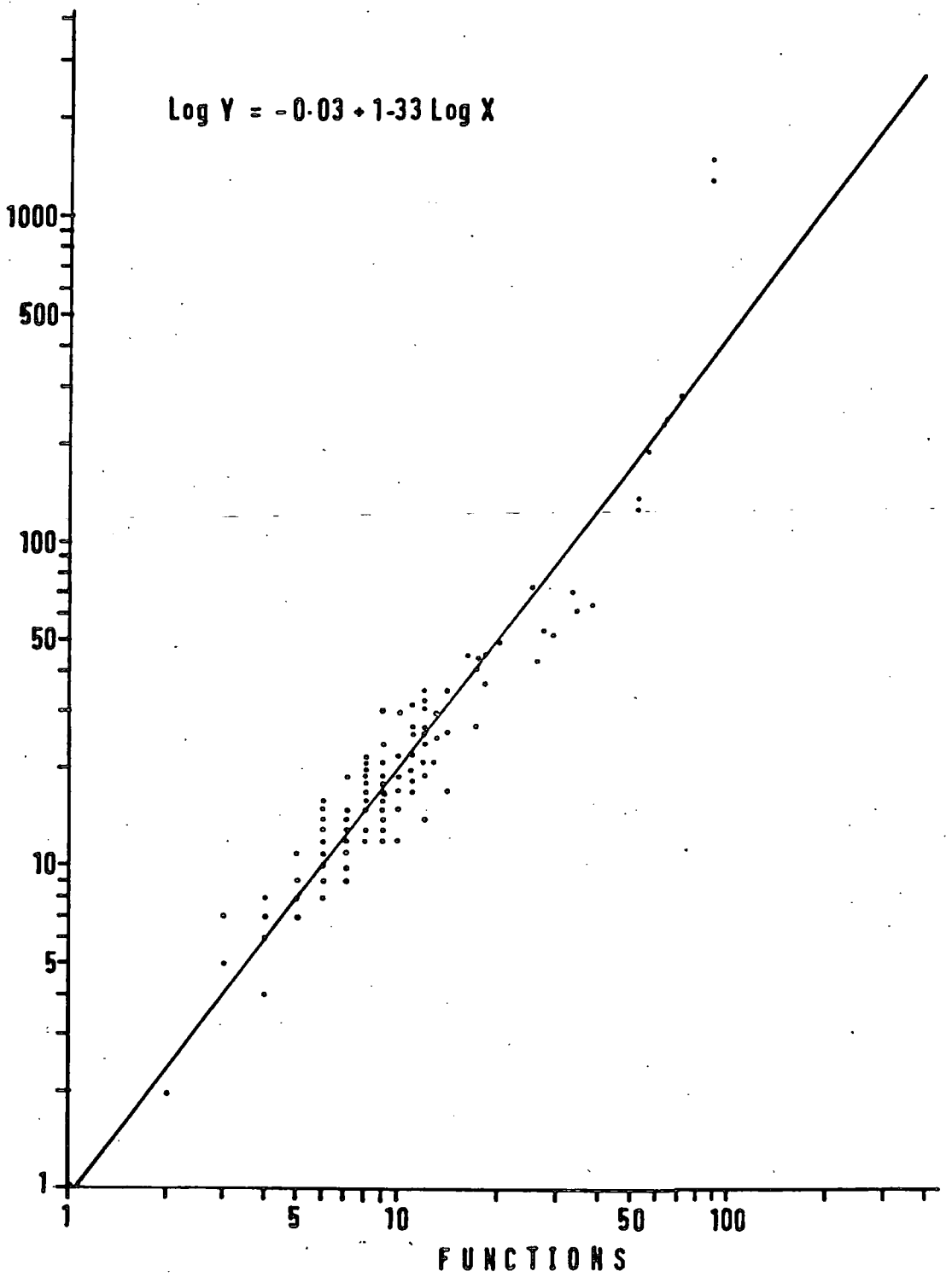


Figure 5:5 Functional units and functions (logarithmic graph).

The distribution is emphatically not log-linear. A similar curvilinear relationship was found by Scott (1964) in a study of central places in Tasmania, and he identified three groups which he thought had a distinctive rectilinear regime. The three groups were subjected individually to linear regression analysis, and high correlations were found. Johnston (1965) pointed out, however, that there was no real justification for identifying three groups, and that the high correlations resulted because a curvilinear line had been reduced to three segments which were approximately straight lines. Similarly there is no real justification for dividing the distribution for West Thessaly into groups: rather, the relationship between functional units and functions is a continuous one. Since data on settlement populations and functional attributes tend to have a frequency distribution which is highly skewed and leptokurtic any attempt to measure the relationship between variables by the parametric techniques of linear regression and correlation analysis cannot properly proceed until both data sets have been transformed. When this is done a log-log distribution is found (Fig. 5:5). The regression equation is

$$\text{Log } F = -0.03 + 1.33 \text{ Log } C, \text{ and } r = 0.96$$

It is interesting to note that the centres of the B hierarchical level lie almost exactly on the regression line, while those of the C level have negative residuals; that is, they have less functional units than their number of functions might suggest, which might imply a declining role as true central places (see Section G). In contrast, Trikala and Kardhitsa have high positive residuals. This can partly be explained by the fact that data were collected for 88 functions

and, for various reasons, some functions were not included. Since these were primarily high order functions occupying relatively few establishments, it means that the total number of functions performed by Trikala and Kardhitsa is underestimated to a greater degree than the number of functional units.

2 Population and Functions

These variables have also been thought to reflect a log-linear relationship, with population as the dependent variable, and Berry and Barnum (1962) had a structural equation of the form

$$\text{Log } P_c = a_1 + b_1 C$$

where P_c = population of central place

C = number of central functions performed by a central place.

The distribution which they found in S.W. Iowa certainly conformed more to this relationship than the previous one, and was similar to that found by Stafford (1963) in southern Illinois and O'Farrell (1967) in Co. Tipperary. However, other studies which included a larger range of settlement sizes than these ones found the curvilinear distribution more characteristic, indicating that the best expression of the relationship is a log-log one. This is shown for West Thessaly in Fig. 5:6, and the regression equation is

$$\text{Log } C = -1.06 + 0.71 \text{ Log } P_c, \text{ and } r = 0.86$$

The settlements of B and C hierarchical levels all have large positive residuals. That is, they have more functions than their population might warrant, confirming their role as central places. On the other hand, Trikala and

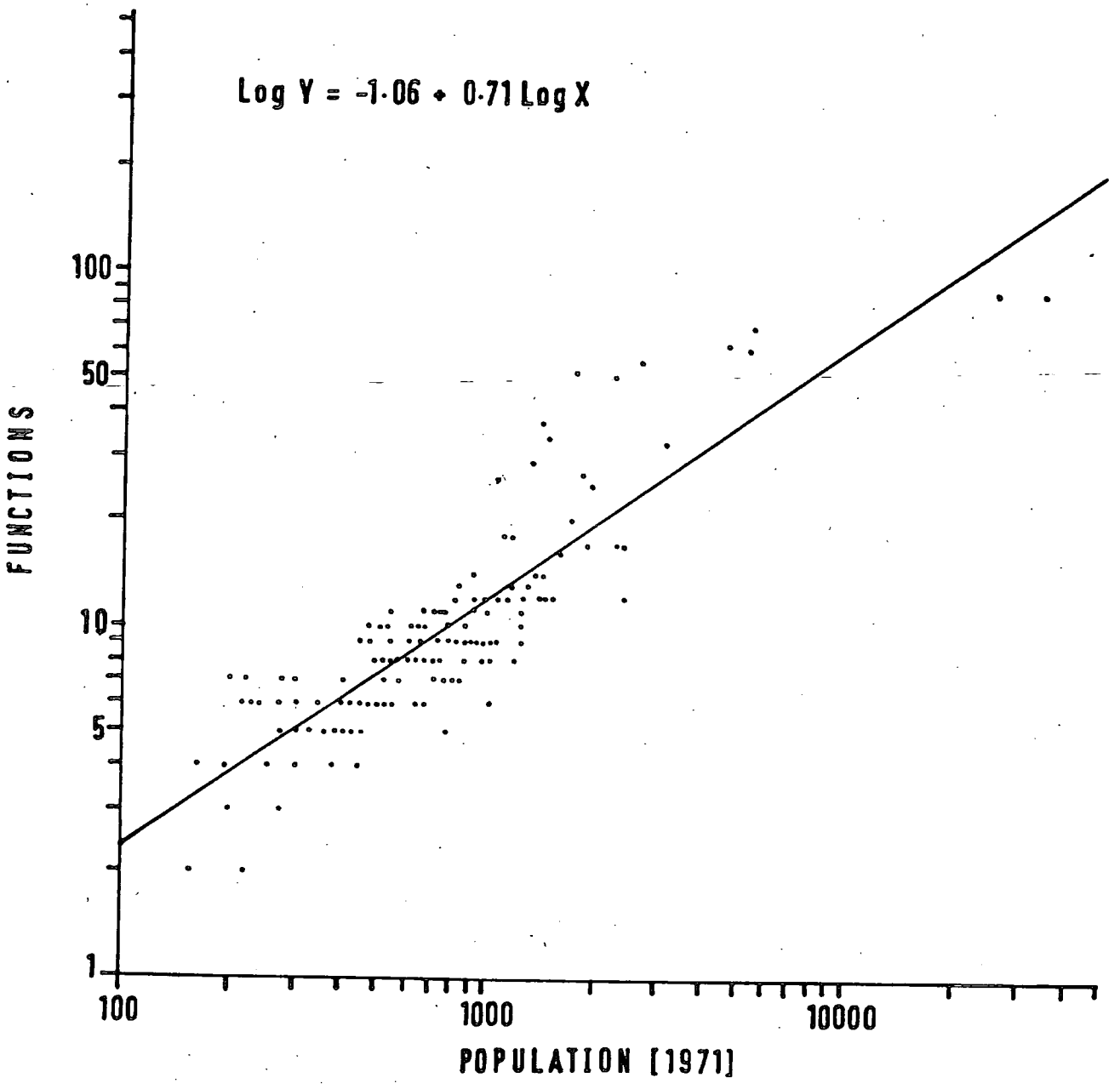


Figure 5:6 Population and functions.

Kardhitsa have negative residuals. This can be explained partly by the study not including all possible functions, and partly by Thomas's (1960) suggestion noted above.

3 Population and Functional Units

Berry and Barnum (1962) regarded this relationship as being log-log and their structural equation is

$$\text{Log } F = a_3 + b_3 \text{ Log } P_c$$

where F = number of functional units in a central place

P_c= population of central place

This relationship has been found in many studies and is also found in the present one (Fig. 5:7). The regression equation is

$$\text{Log } Y = -1.74 + 1.05 \text{ Log } X, \text{ and } r = 0.91$$

Berry and Barnum interpreted this as showing that multiplication of establishments of the same kind is in direct response to growing demand within the urban centre, and this implies that as higher order functions are added, it is the lower order functions which duplicate.

4 Organization and Optimality in the Settlement System

The analysis of aggregate relationships can be taken a stage further and the results interpreted in terms of the organizational and informational content of the settlement system, and an assessment made of optimality in the system.

Harvey (1969) illustrates the concept of system organisation as follows: 'Consider a system containing n elements that behaves in such a way that if we know the value of one element in the system we can predict the value

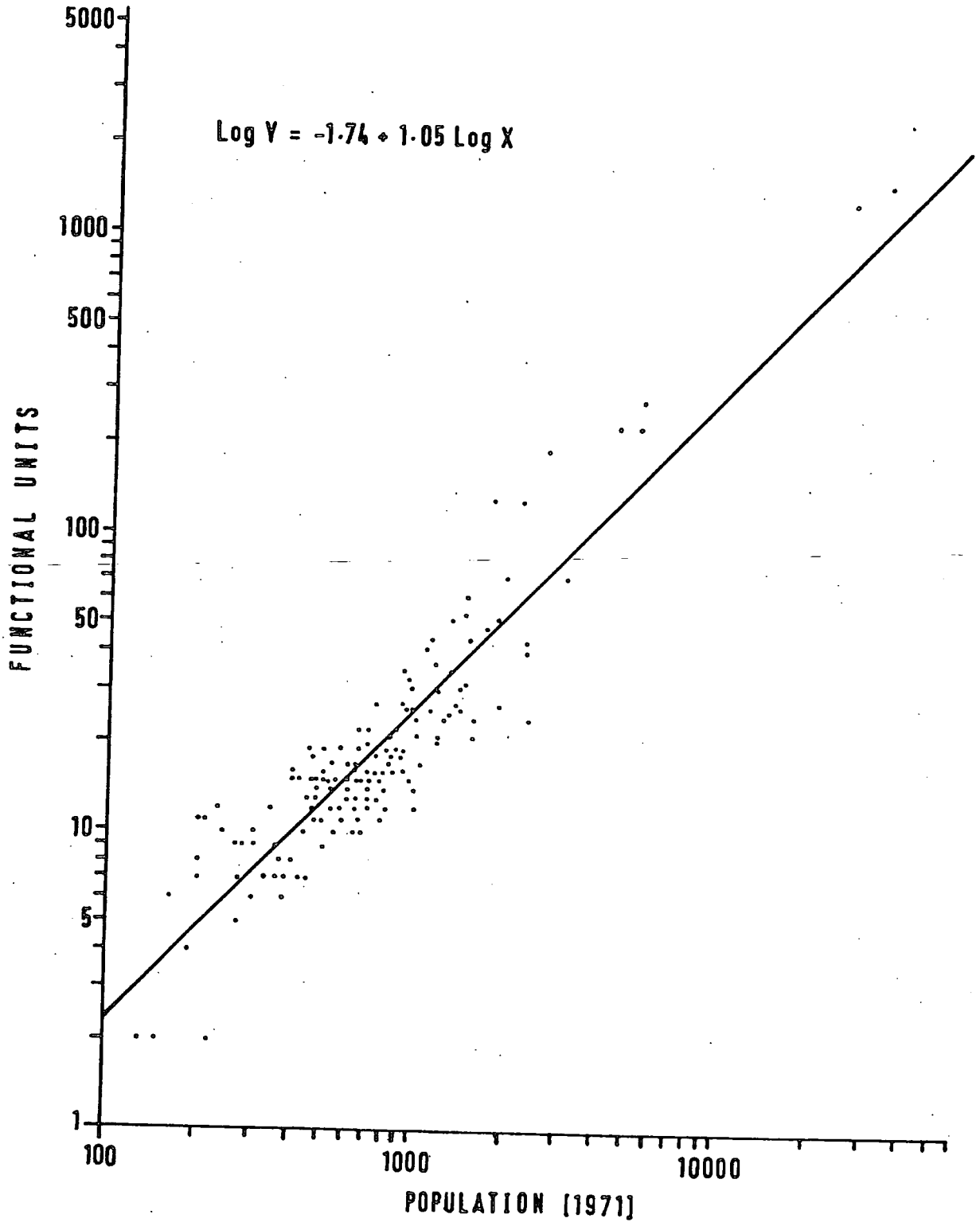


Figure 5:7 Population and functional units.

of all others. Such a system is highly organised. Consider a similar system in which even though we know the values of n-1 elements, we still cannot predict the values of the nth element. Such a system is disorganised.' Using regression and correlation analysis, it is possible to determine, respectively, the relationship between two or more elements and the strength and significance of their association, and predictions of the value of elements can be made within given confidence limits. The results obtained have already been noted, and the high correlations show a high degree of organisation within the system.

Another indication that the system is highly organised can be found through the application of information theory. This was first suggested by Odum et al (1960) in ecological work and was subsequently used by Berry, Barnum and Tennant (1962) in central place analysis (see also Berry and Woldenburg 1967). In information theory, information (H) is given by

$$H = K \log (\text{no. of states})$$

This condition is known as macroscopic negentropy and H is a measure of organisation which is complementary to entropy. In ecology, Odum et al had noted that if percentage change in individuals with the adding of species is constant, the following may be expressed

$$\frac{dI}{IdS} = k$$

where S = number of species

I = number of individuals

Integrating yields

$$\text{Log } I = kS + C$$

and

$$S = k \cdot \log I$$

When a hierarchy exists, organisation also exists and the above equations apply. The degree to which they apply is the degree to which simple semi-logarithmic structure applies. It has already been mentioned, however, that simple semi-logarithmic structure is not generally a characteristic of settlement systems: the graphs show a curvilinear relationship. Odum et al discuss deviations from the simple hierarchical organisation. Of most significance to the present study is the hypothesis that a curve which turns downwards (N.B. with logarithmic variable on the y axis, arithmetic on the x) shows more organisation and diversity than the straight semi-logarithmic line. This is the form of the curve produced in many studies, including the present one (Fig. 5:4), and if the hypothesis is regarded as tenable then it indicates a high degree of organisation in all the various systems which have been studied.

That a system is in 'good working order' must be determined before functional explanations can be made. Harvey (1969 p.464) states that it is possible to define good working order by developing notions regarding system optimality, although operational difficulties do arise. Theoretically, optimality may be considered as a cost minimization problem. Physical systems are known to operate according to such principles of optimality, and Zipf's (1949) notion of the principle of least effort in human behaviour indicates their probable presence in social systems. Rosen (1967) has suggested that optimality may be indicated through the operation of the allometric law, although the exact nature of this principle is obscure. This

law, which is a mathematical relationship of the form $y = ax^b$, has been found to apply widely in many fields: in geography it has been used to account for the city rank size rule, for example. That the settlement system of West Thessaly approaches an allometric system equilibrium, and thus optimality, is shown through the log-log straight line regressions of the elements of the system on each other. Moreover, since log-log straight line relationships yield curves that turn downwards on semi-log paper, then it follows that an optimal system is one with a high degree of organisation, and this is the character of the system under investigation.

SECTION G THE EVOLUTION OF THE CENTRAL PLACE SYSTEM

Classical central place theory is essentially static and attempts such as Morrill's (1962) to simulate the development of a central place system are the exception. The evolution of any central place system might be viewed, however, simply in terms of a changing social and economic environment: developments in transport, distributive channels and/or the local economy, for example, might lead to changes in the threshold population and range of particular goods and services. Alone such factors could logically be deduced to lead to continual changes in the structure of the settlement system, whereas in reality the additional element of inertia needs to be incorporated. Given the general tendency as economic growth takes place for travel costs to decline, incomes to rise, and the purchase of non-basic goods and services to increase, the dominant feature in the evolution of a central place system should be for the higher level centres to expand their trade areas and influence at the expense of lower order centres.

Indeed, this phenomenon has already been documented in several studies (for example, Dickinson 1932, W. K. D. Davies 1970).

Although there is probably sufficient source material to make such studies in Greece, none have yet been done as it is neither readily available nor easily collated.[6] Among one of the problems, for example, is the change of place names from Turkish to Greek after independence. By using only a limited number of sources, however, and drawing parallels from work in other countries, a brief description of the evolution of the settlement system in West Thessaly might be attempted.

Up until at least 1881 Trikala was the major urban settlement of West Thessaly, performing similar military and administrative functions to Larissa in the eastern part of the region. Both of these towns had been in existence a long time: these non-commercial functions date back in some form to at least the Classical period (Chapter 3B). Within West Thessaly other settlements also had some administrative or non-commercial service functions: Kalambaka, for example, was for long the seat of a bishopric, while Kardhitsa was originally founded as a military settlement in the early 19th century. The concentration of land ownership in the hands of an absentee urban-based minority up until the land reforms of the 1920s would have resulted in a parasitic relationship between town and country, with notable contrasts in living standards that contemporary 19th century writers commented on: 'In the midst of a most productive country, the inhabitants retain no more than is barely sufficient for existence and the price, even of the necessities of life, is beyond their means' wrote Leake

in 1835. Heuzey (1858) more succinctly characterized the material life of the region in two words, 'richesse et misère'.

From the specific viewpoint of the distributive trades, the effect of such a situation is the concentration of retailers and wholesalers in the major central towns, the former catering primarily for the landed elite, the latter perhaps forming the links between the town and its region and the wider national economy. Since the mass of the rural populace are existing at subsistence levels, there is insufficient demand to support a larger urban-based retail sector. Nevertheless, certain minimum levels do exist and these are catered for by regular fairs and markets which many studies in other countries have shown to be characterized by regular spatio-temporal periodicities (see, for example, Bromley 1971, Smith 1976).

Although the dates of origin are unknown, during the latter part of the Ottoman period fairs and markets were certainly a major feature of the commercial life of Thessaly. The annual fairs were the most important means for the distribution of 'consumer durables' - textiles, metalware etc. - as well as foodstuffs such as coffee and sugar. While some produce came by caravans through the Balkans, the French consul Felix-Beaujour (1800) noted that imports from France were shipped to Thessaloniki and distributed from there via the network of fairs. In Thessaly he cites the fair of Zeitoun in spring as the distributive point for French produce. He also mentions black slaves and produce from North Africa being shipped to Peloponnesia and sent from there to the fairs of Thessaly.

Tsopotos (1912) considered that Larissa was the principal centre of trade in the province at the turn of the 18th century. He attributed the large number of Jews in the town in 1804 to the 'many yearly fairs which are held in Thessaly', amongst the most important of which at this time he cited those of Farsala and Maschlouri, while in 1858 Heuzey (1927) described the fair at the village of Klokotos as the most popular in Thessaly.

Tsopotos (1912) noted that during the period of Turkish rule weekly markets were held in all the small and large towns of Thessaly, and they were concerned with food distribution. In contemporary traveller's accounts, however, only the markets and shops of Larissa and Trikala appear to have made any impression. Descriptions of other settlements rarely mention a significant commercial element in them although the use of the term komopolis by some of the Greek authors to characterize selected places (as distinct from komi or chorio - village) does imply the existence of some urban functions in them. This is the word used, for example, by Magnitos (1860) to describe Sofadhes and Palamas (but not Kalambaka - a komi) even if the only particulars he noted were their agricultural produce.

From the few sources used here it has not been possible to provide a comprehensive list of the fairs and markets in Thessaly, or, more specifically, West Thessaly, during the latter part of the Ottoman period. Nevertheless, it would appear that the annual fairs did form a significant element in the commercial life of the time, while weekly markets for foodstuffs were also well established. Even if

they were much smaller, the number of weekly markets was probably greater than at present (they are now confined to settlements of dhimos status) because of the difficulties of travel in the area until the drainage works and the building of surfaced roads in the twentieth century. Indications of the problems that were once involved in travelling in the area are given by the times taken to go from one point to another. Magnitos (1860) noted that Trikala was twelve hours travelling from Larissa and three hours from Kalambaka. Leake (1835) observed that 'the road from Larissa to Tirnavos might now be travelled in a wheeled carriage: it is one of very few distances of ten miles in Greece in that condition.' Inevitably, therefore, such commercial business that needed to be transacted with some frequency (especially the buying and selling of food) would be found in a relatively large number of places for the basic reason of the need to travel to and from the market in one day (c.f. Dickinson 1932).

It is questionable how much development took place in the region in the period between unification and the refugee influx and land reform of the 1920s. Although the main towns appear to have been rebuilt, there are few signs that the economic condition of their hinterlands showed any pronounced amelioration despite the building of the railway to Volos. Nevertheless, there are a few indications of development and the history of Kardhitsa and its trade as described by Samaropoulos in 1901 provides some testimony for this.

The town was established as a military centre to prevent incursions into the Thessalian plain by Greek nationalist guerrillas in the first half of the nineteenth century. Until then a simple Turkish village had occupied the

site. From the time of its foundation Samaropoulos observed that the settlement grew continually, acquiring both Christian (that is, Greek) and Turkish quarters. It became the centre for the southern part of the upper plain, a role which was reflected in its name (kardhia - heart), and it is clear that absentee owners of ciftliks in the region resided there. Even so, its stature did not quickly become similar to that of Trikala: in 1858 Heuzey (1927) described it as 'une petite ville thessalienne', and none of the other travellers' accounts which have been used in this study mention it.

Samaropoulos did, however, record a fairly constant expansion of trade. By the time of writing in 1901 the Thessalian railway from Kalambaka to Volos via Kardhitsa had opened. This would have assisted the transport of agricultural produce as well as leading to some concentration of activity on Kardhitsa as travel times along its corridor decreased: the journey from Kardhitsa to Sofadhes, for instance, was forty minutes by the new train compared to four hours by road. He mentioned the growing significance of the town as a storage point for local agricultural produce and the building of some mills 'whose smoke reveals the existence of an industrial future'. In 1900 the town became the seat of the new nomos of Kardhitsa (it had been an eparchy of Trikala nomos), and the location of local decision making may have acted as an additional stimulus to limited economic growth. Certainly, following the replanning of the town in 1895, and the acquisition of nomos status, Samaropoulos considered the place had entered a 'new period, a period of progress and transformation'. He provided a list of traders and there do appear to have been a substantial number of permanent shops

(for example, there were 35 grocers, 16 bakers, 11 butchers and 2 restaurants), most of which would be considered as low-order functions in the main analysis.

Subsequent economic development in the region up to 1951 does not appear to have been very great despite the radical change in rural society following the land reform of the 1920s. This must be attributed to both the shortage of capital for investment following the influx of refugees and the small numbers of refugees who were settled in Thessaly (especially in West Thessaly). At the time of the 1928 census, 35,288 refugees (3.1 per cent of the national total) were recorded in the region, the great majority in Larissa and Volos. Only 2,046 were in Kardhitsa nomos and 740 in Trikala nomos (N.S.S.G. 1933). In any case, the beneficial economic impact of the refugees was to take some considerable time to materialize, being hindered by the world recession of the 1930s. For the first fifteen years at least 'the spending power of the majority of refugees was extremely limited (and) they cannot be considered as having had an important impact as consumers' (Pentzopoulos 1962).

Writing in 1934, Sion did not notice any improvement in the rural economy of Thessaly following the land reform. Indeed he commented on an actual deterioration resulting from a number of years when the wheat harvest had been badly affected by rust, while the small number of refugees he considered insufficient to fire the spirit of progress amongst a long suffering population as had happened in Macedonia. Drainage and other work was neglected, and with no money for machinery, output was lower than prior to the reform. He

regarded the towns as nothing more than rural market centres in spite of their administrative importance. Trikala, for instance, had stagnated compared to its progress fifty years before when it had been a flourishing provincial centre.

The subsequent decade with the Civil War following the Axis Occupation saw no economic development. Thus the situation in 1951 regarding retail trade and the settlement system was probably little different from the pre-war one. In this respect Thessaly, and especially West Thessaly, may have been at a lower level than much of the rest of the country, and this may be sufficient to explain the lower level of retail provision in this area recorded in the 1951 census (Chapter 2B). The post-war development of the rural economy and the building of surfaced roads leading respectively to the growth of real incomes and a reduction in transport costs and times are sufficient to account for the notable relative increase in retail provision between 1951 and 1969, as well as the decline in the importance of small C-level settlements as central places: a weekly market in Leondari, for example, ceased to function in 1964.

SECTION H CONCLUSION

This chapter has shown that there exists a well developed structure in the settlement system of the plain region of West Thessaly. The two nomoi capitals stand out as the chief towns of this area. They are of similar ranking in terms of retail trade although Kardhitsa appears to occupy a rather lower position than Trikala with regard to non-retail functions. Below these two towns there are six smaller centres with Kalambaka differentiated from the other five by a greater non-

retail role. A third tier has also been identified although it is less well defined than the two higher ones, and below these comes the array of nucleated agricultural villages with minimal central functions. Regularities in aggregate relationships within the settlement system have been found which have been interpreted as indicating a well organised structure.

The next chapter considers the behaviour of the settlement system through a study of consumer movements. Because of the method of survey which was adopted, data were obtained from all of West Thessaly (that,is, the mountain areas as well as the plains), and it therefore seems desirable to attempt to gain some indication of the structure of the settlement system in the mountain areas to confirm the intuitive impression noted in Section C. The 1969 industrial and commercial establishment census provides data at the level of the koinotis on numbers of establishments in sub-categories 61 (wholesale trade), and 621 (retail, food and drink) and the rest of category 6. Using the latter two data arrays and the 1971 population data to calculate the Weighted Functional Indices, the results shown in Table 5:13 were obtained. Trikala and Kardhitsa have similar values and the B-level settlements are the next six, although precise rankings are different from those obtained in the detailed analysis. Below this some of the next ranked settlements are those classified as C-level such as Neochorion (Trikala nomos) and Leondari. Some mountain settlements are also included, however, but not so much because of their intrinsic importance as central places but rather because of data discrepancies between numbers of establishments recorded in the 1969 census and the 1971 populations: the ninth ~~seventh~~ ranked settlement by WFI is Kranea (Trikala nomos) with

five establishments in 1969 and a 1971 population of 22, and the ~~eighth~~ tenth ranked is Politheа (Trikala nomos) with 3 establishments and a population of 15. Such differences exaggerate the value of the WFI which is determined in part by the relationship of establishments to population, and in such cases there is an obvious inflation of the index. Nevertheless, the significant point is that there do not appear to be any centres equivalent

TABLE 5:13

First twenty communes (koinotes) ranked by WFIs calculated from 1969 census data

Commune	WFI
1 Kardhitsa	35.3
2 Trikala	34.1
3 Kalambaka	8.8
4 Mouzakion	8.3
5 Sofadhes	7.0
6 Farkadon	5.6
7 Pili	4.5
8 Palamas	3.6
9 Kranea	2.5
10 Politheа	1.8
11 Neochorion (Kard. nomos)	1.8
12 Neochorion (Trik. nomos)	1.7
13 Leondari	1.6
14 Mavrommation	1.6
15 Makrirrachis	1.3
16 Anavra	1.3
17 Elati	1.3
18 Aidhonochorion	1.3
19 Kalomoira	1.1
20 Kastanea	1.1

to those of the B-level ones in the plain. The mountain villages might be considered as forming an additional body of D-level settlements with perhaps some such as Elati more equivalent to

the C-level ones identified in the plains, and it is therefore within this context that the following chapter should be placed.

FOOTNOTES

1 The number of points awarded depended on the type of court: the higher the level, the more points that were given.

2 These terms were first defined by Thomas (1960) as follows: 'an establishment is essentially the physical manifestation of an activity and is generally the unit in which an activity is performed .... In contrast, the term 'function' refers to activities which are performed in the establishments. According to these definitions, it is possible for more than one function to be associated with a particular establishment. Each occurrence of a function constitutes one functional unit.' Since central place theory is primarily concerned with goods rather than establishments per se the use of the concept of the functional unit is an approach which reconciles this with the scale problem inherent in empirical central place studies (W. K. D. Davies 1965).

3 These reports are kept in the Department of Geography Seminar Library, University of Durham.

4 A description of the functions and establishments identified in West Thessaly is provided in Appendix A.

5 The ones excluded were primarily those in the larger urban settlements; the coverage in most places was almost certainly complete (see also Section F).

6 The most detailed historical studies of settlement evolution in Greece (Antoniadis-Bibicou 1965, Wagstaff 1977a and 1977b) are not made from a central place perspective.

Plate 5A

Trikala - town centre

Plate 5B

Trikala - street vegetable and fruit market

Plate 5C

Trikala - nomarchia (prefecture)

Plate 6A

Kardhitsa - town centre

Plate 6B

Kardhitsa - livestock market

Plate 6C

Kardhitsa - mill

Plate 7A

Kalambaka - main square
Pinnacles of Meteora in the background

Plate 7B

Farkadon - main square on market day

Plate 7C

Palamas - main street

Plate 8A

Leondari - one side of the central square

Plate 8B

Lazarina (Kardhitsa nomos)

Plate 8C

Paschalitsa (Kardhitsa nomos)
Track to Lefki

CHAPTER SIX

CONSUMER MOVEMENTS IN WEST THESSALY

The aims of studying consumer movements in West Thessaly were to attempt to gain a broad picture of the functioning of the settlement system which could be related to its structural characteristics, and, secondly, to provide same basic aggregative knowledge that might act as a starting point for more detailed investigation of the social, economic and perceptual influences on consumer movements in this kind of area. The study was not designed to produce data that could be incorporated either into gravity based interaction models or into models of consumer behaviour.

SECTION A DATA COLLECTION AND HANDLING

In deciding on the nature of the survey to be undertaken, three considerations were taken into account:

1 The desirability of covering the whole area of West Thessaly. It was thought advisable that the study should, if possible, include the mountain areas which had been excluded from the first part of the detailed fieldwork so that, in conjunction with the brief analysis of the 1969 Census data (Chapter 5H), a more accurate idea of the nature of the settlement system in the mountains could be obtained, and a comparison made with the functional regions delimited in Chapter 4.

2 The need to ensure accuracy of response to questionnaires.

3 The need to ensure the acceptability of the survey to

respondents and to the local authorities: in particular it was hoped to avoid the occasional awkward episodes with the police that arose during the earlier field-work.

The survey procedure that was finally adopted was to circulate simple questionnaires through the region via the secondary schools. This allowed the whole area to be reached without requiring personal visits, and, by giving the questionnaires only to 17-18 year old pupils for completion by their parents, it was considered the most suitable way of ensuring accurate replies. Acting through the schools also provided a semi-official aura to the survey, and this may have contributed to the generally high return rate.[1] The main disadvantage of this method of doing a survey was that it introduced some bias into the sample. The respondents would have all fallen into a similar age group and would be members of family units with at least one child in the late teens. There was also some spatial bias inherent in the method since high school attendance rates do seem slightly higher in those places which contain a school. However, given the limited aim of the survey, it was considered that these disadvantages were far out-weighed by the ease and coverage that this method gave.

The questionnaire was designed to be as simple and as unambiguous as possible. Respondents were asked to place an X in a matrix to indicate the settlement which they had last visited to purchase each of nine different goods, or make use of four different services: if they had not purchased a good or visited a service within the previous three years, or if there was any uncertainty, they were asked

not to reply. The purpose of the survey and instructions on how the questionnaires were to be completed were given, and the confidentiality and anonymity of all questionnaires, and the voluntary nature of the survey were emphasized. In addition, these facts were outlined verbally to the pupils when the questionnaires were issued. After completion by the parents, the forms were returned and collected from the schools. In the case of four small High Schools in Kardhitsa nomos and two in Trikala nomos located in the Pindos mountains, the forms were sent with a covering letter through the Secondary Education divisions of the prefectures, and they were returned by post.

The goods and services chosen were selected on the basis of the earlier study as being ones which clearly characterized particular hierarchical levels, and were as follows: sugar, meat, shoes, clothing, radio or television, watch or jewellery, cooking utensils, records, motor car, optician, chemist, doctor's surgery and dentist. The only unexpected point that emerged when the questionnaires were returned was that in a number of cases, especially of low-order goods, more than one place of purchase was indicated. As noted above, the intention had been to ask the last place of purchase so that only one settlement would be indicated for each item. The reason for the discrepancy was that the Greek word for last (adverb - teleftaios) also means recently. It might be considered, however, that this will not affect the validity of the study, and perhaps may even be an advantage by indicating the variety of consumer spatial behaviour.

It was intended that questionnaires should

be given to 15 per cent of the secondary school population as this would yield a sufficiently large number to ensure that most settlements had at least one respondent. In order to simplify the procedure, however, the numbers of forms that were sent by post to the smaller, remote schools was generally more than 15 per cent, and so altogether 2,164 questionnaires were issued, representing 15.2 per cent of the High School population. Of these, 1,646 were returned of which 49 were rejected either because the place of residence had not been filled in, or the name was illegible, or the place of residence was outside West Thessaly or, in one case only, the replies were obviously fabricated. The following analysis of consumer movements is therefore based on 1,597 questionnaires, 73.8 per cent of those issued (Table 6:1). The survey succeeded in covering all of West Thessaly, and questionnaires were returned from 246 settlements (Fig. 6:1 and Appendix D). Because Kardhitsa nomos has slightly better secondary school provision than Trikala, the coverage is relatively higher, but even within the two nomoi there are variations in the percentage cover between settlements. About 70 settlements are represented by only one questionnaire, and in the case of specific goods and services other settlements may only be represented by one reply, or by none at all. This generally precludes any firm conclusions to be drawn about consumer spatial orientation within individual settlements, but it does not hinder analysis at the regional scale.

A computer program was written to handle the data and to calculate various parameters. The data input for a run of the program was a n x 16 matrix of the movements for any given good or service, where n = number of settlements

TABLE 6:1

Consumer Movement Questionnaire Distribution and Response Rates, West Thessaly 1973

	a No. of Pupils (1973)	b Questionnaires issued	c Questionnaires returned	d Rejects	e Questionnaires used in Analysis	e/b x 100
KARDHITSA NOMOS						
Kardhitsa - A' Boys	861	129	90	6	84	65.1
- B' Boys	780	117	98	2	96	82.1
- A' Girls	936	138	101	5	96	69.6
- B' Girls	855	129	112	5	107	82.9
- Private	314	46	39	-	39	84.8
Mouzakion	670	100	95	-	95	95.0
Palamas	672	100	79	4	75	75.0
Sofadhes	751	112	88	3	85	75.9
Fanarion	334	49	21	-	21	42.9
Magoula	316	46	30	-	30	65.2
Leondari	370	55	55	1	54	98.2
Anthiros	66	15	14	-	14	93.3
Vrangiaka	77	15	15	-	15	100.0
Mesinikola	86	17	17	-	17	100.0
Petrilion	37	11	11	-	11	100.0
Proastion	176	31	30	-	30	96.8
TRIKALA NOMOS						
Trikala - A' Boys	949	142	52	5	47	33.1
- B' Boys	940	141	112	-	112	79.4
- A' Girls	1,197	180	119	9	110	61.1
- B' Girls	982	147	135	7	128	87.1
- Private	460	69	52	-	52	75.4
Kalambaka	996	150	106	1	105	70.0
Pili	667	100	81	1	80	80.0
Farkadon	578	87	57	-	57	65.5
Konistas	100	25	24	-	24	96.0
Panaghia	50	13	13	-	13	100.0
TOTAL	14,220	2,164	1,646	49	1,597	73.8

b/a x 100 = 15.2
c/b x 100 = 76.1
d/c x 100 = 3.0

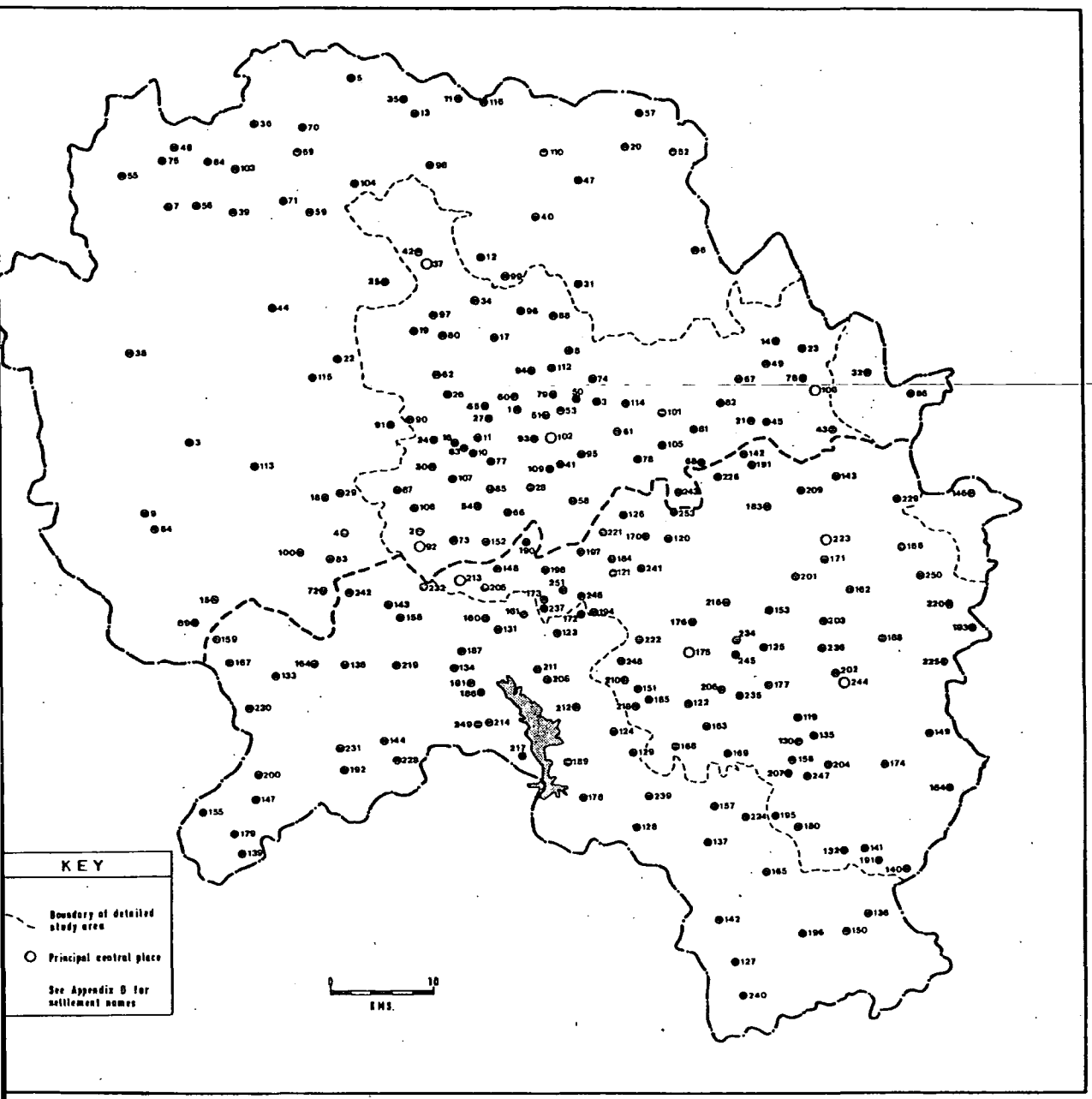


Figure 6:1 Settlements from which consumer movement questionnaires were returned.

with at least one purchase of the good or service recorded. In addition, the co-ordinates of all the settlements on a grid of kilometre squares were included.

The program calculated the percentage use of each central place by each settlement for the good or service in question, and the percentage of total movements which each central place accounted for. As well as this, the straight line distance of each individual movement in kilometres was calculated by substituting the co-ordinates in the Pythagorean formula

$$Dab = \sqrt{(Ea-Eb)^2 + (Na-Nb)^2}$$

where, Dab = straight line distance between points a and b

Ea, Eb = eastings of points a and b

Na, Nb = northings of points a and b

The mean distance of movement for each good or service was calculated, together with the standard deviation and standard errors of the mean and standard deviation. Using these parameters, it was then possible to calculate the range of each good or service by substituting the appropriate values in Tarrant's (1967) formula

$$Range = \bar{x} + (2.SE(\bar{x})) + (2.SD(x)) + (4.SESD(x))$$

where $\bar{x}$ = mean shopping distance

$SE(\bar{x})$ = standard error of the mean

$SD(x)$ = standard deviation of shopping distance

$SESD(x)$ = standard error of the standard deviation of x

Given a normal distribution, the range is therefore defined as the limit below which 97.5 per cent of the cases in a sample should fall.

A crucial part of the analysis of the data was to map them. To represent the movements it was decided to show percentage flows from each settlement to each central place. This had the advantage of overcoming the problem of drawing a large number of individual lines which would have been difficult not only because of the numbers involved but also because of the nucleated nature of population distribution. On the other hand, the disadvantage of this technique is that where the number of recorded movements from a settlement is small (perhaps only one), and those movements may be atypical, a distorted impression may be given of the consumer spatial orientation of the settlement. For this reason the maps need to be interpreted in terms of the general patterns which they show rather than any emphasis being placed on specific details.

SECTION B THE PATTERNS AND STRUCTURE OF CONSUMER MOVEMENTS

The thirteen goods and services chosen for the analysis were taken as being representative of particular hierarchical levels. If the well-developed hierarchical structure of the settlement system which has been found is reflected in its functioning, then clear differences should be observed in the mean distances of travel and the ranges of these goods, and in the proportion of consumer movements which are inter-settlement: the higher the order of a good or service then the higher should be all of these values. The parameters are shown in Table 6:2 where the goods and services are entered in order of median threshold population. A number of qualifications should, however, be noted.

TABLE 6:2

Consumer Movements: mean distances of movement, ranges, proportion of purchases which are outside place of residence.

	Threshold Pop.	No. of Purchases	$\bar{X}1$ (kms)	$\bar{X}2$ (kms)	Range (km)	% inter-settlement moves
Sugar	109	1,645	13.9	13.9	42.1	33.2
Meat	673	1,645	10.8	10.8	27.2	33.7
Doctor	1,045	1,548	21.6	15.7	44.2	55.7
Shoes	1,132	1,755	27.5	17.8	46.4	65.9
Clothing	1,251	1,820	30.6	18.9	47.5	69.4
Chemist	1,419	1,577	16.1	14.6	36.3	60.4
Cooking utensil	1,428	1,406	16.1	13.8	35.1	52.7
Radio/T.V.	1,846	983	28.9	17.7	46.5	62.4
Jewellery/watch	2,219	1,135	25.0	17.4	44.4	64.2
Dentist	2,219	1,410	14.8	14.6	37.7	57.8
Optician	15,569	955	26.2	21.2	49.1	77.0
Records	15,569	736	32.1	19.3	48.0	67.8
Car	15,569	160	84.9	31.4	87.6	82.5

(See text for definitions)

Firstly, the threshold populations for sugar, meat, cooking utensils and records are those for, respectively, general stores, butchers, hardware and music shops. These goods may be sold through other establishment types as part of a product mix which was not sufficiently specialized to be identified in the first part of this study. Secondly, the number of purchases of sugar, meat, shoes and clothing exceeds that of questionnaires used (1,597): as these can be regarded as the four most basic goods this might be expected, and that of these shoes and clothing are the goods with most recorded purchases could be explained in terms of the greater likelihood to purchase these from more than one settlement. Thirdly, various mean distances of movement could have been calculated, but those in Table 6:2 are for inter-settlement movements since the data which were collected did not permit any analysis of intra-settlement movements. The first mean ($\bar{X}1$) is that for all inter-settlement movements, and the second ($\bar{X}2$) is for those that are intra-Thessaly (that is, excluding primarily those to Athens and Thessaloniki). Fourthly, the value for the range of the goods and services is calculated only on the basis of intra-Thessaly movements since for all goods and services (except Cars) the great majority of purchases were made within Thessaly, and to have included purchases from other places in Greece would have given exaggerated values.

Fairly close rank relationships can be seen between the various parameters in Table 6:2, and on the basis of this table it is possible to consider an aggregation of the thirteen goods and services into sub-groups for the

purposes of further analysis as follows:

1 Sugar, meat (Food)

2 Cooking utensil (Low cost household good)

3 Shoes, clothing, radio/T.V., jewellery/watch, record (consumer durables)

4 Doctor, dentist, chemist (standard medical service)

5 Optician (specialised medical service)

6 Car (high cost luxury good)

1 Sugar and Meat

As food is the most basic of all commodities its provision is one of the lowest order retail functions: general stores have a threshold population of 109 while specialist butchers have a threshold population of 673. Consequently the expectation would be that a high proportion of movements to buy sugar and meat should be intra-settlement, and that those movements that are to central places would be relatively short. The data confirm both of these hypotheses. The numbers of intra-village or town movements for the purchase of sugar and meat were 1099 and 1091 respectively (both about 64 per cent of total), mean distances of movement to central places were 13.9 kms and 10.8 kms, and ranges were 42.1 km and 27.2 km. Only six and four purchases respectively were made outside West Thessaly (Tables 6:3, 6:4).

The maps of movements to buy these two commodities emphasize these results (Figs. 6:2, 6:3). In many villages, particularly those at some distance from the main central places, there is no outward movement recorded, and few long movements are found. However, from villages in the immediate vicinity of large centres, especially Trikala

TABLE 6:3

Movements for Sugar

CENTRES	Inc. movements originating in centres			Exc. movements originating in centres		
	N	%	S.E.	N	%	S.E.
Kardhitsa	347	21.1	1.0	149	27.3	1.9
Trikala	404	24.5	1.1	166	30.4	2.0
Kalambaka	107	6.5	0.6	59	10.8	1.3
Farkadon	24	1.5	0.3	11	2.0	0.6
Pili	54	3.3	0.4	27	5.0	0.9
Mouzakion	89	5.4	0.6	62	11.4	1.4
Palamas	73	4.4	0.3	20	3.7	0.8
Sofadhes	90	5.5	0.6	40	7.3	1.1
Village	445	27.1	1.1	-	-	-
Larissa	6	0.4	0.2	6	1.1	0.5
Volos	-	-	-	-	-	-
Elsewhere in Thes.	6	0.4	0.2	6	1.1	0.5
Athens	-	-	-	-	-	-
Thessaloniki	-	-	-	-	-	-
Elsewhere in Greece	-	-	-	-	-	-
Abroad	-	-	-	-	-	-

TABLE 6:4

Movements for Meat

CENTRES	Inc. movements originating in centres			Exc. movements originating in centres		
	N	%	S.E.	N	%	S.E.
Kardhitsa	361	22.0	1.0	164	29.6	1.9
Trikala	390	23.7	1.0	151	27.3	1.9
Kalambaka	110	6.7	0.6	60	10.8	1.3
Farkadon	25	1.5	0.3	12	2.2	0.6
Pili	56	3.4	0.5	28	5.1	0.9
Mouzakion	76	4.6	0.5	50	9.0	1.2
Palamas	82	5.0	0.5	28	5.1	0.9
Sofadhes	97	5.9	0.6	47	8.5	1.2
Village	434	26.4	1.1	-	-	-
Larissa	4	0.2	0.1	4	0.7	0.4
Volos	-	-	-	-	-	-
Elsewhere in Thes.	10	0.6	0.2	10	1.8	0.6
Athens	-	-	-	-	-	-
Thessaloniki	-	-	-	-	-	-
Elsewhere in Greece	-	-	-	-	-	-
Abroad	-	-	-	-	-	-

Figure 6:2 Movements for sugar

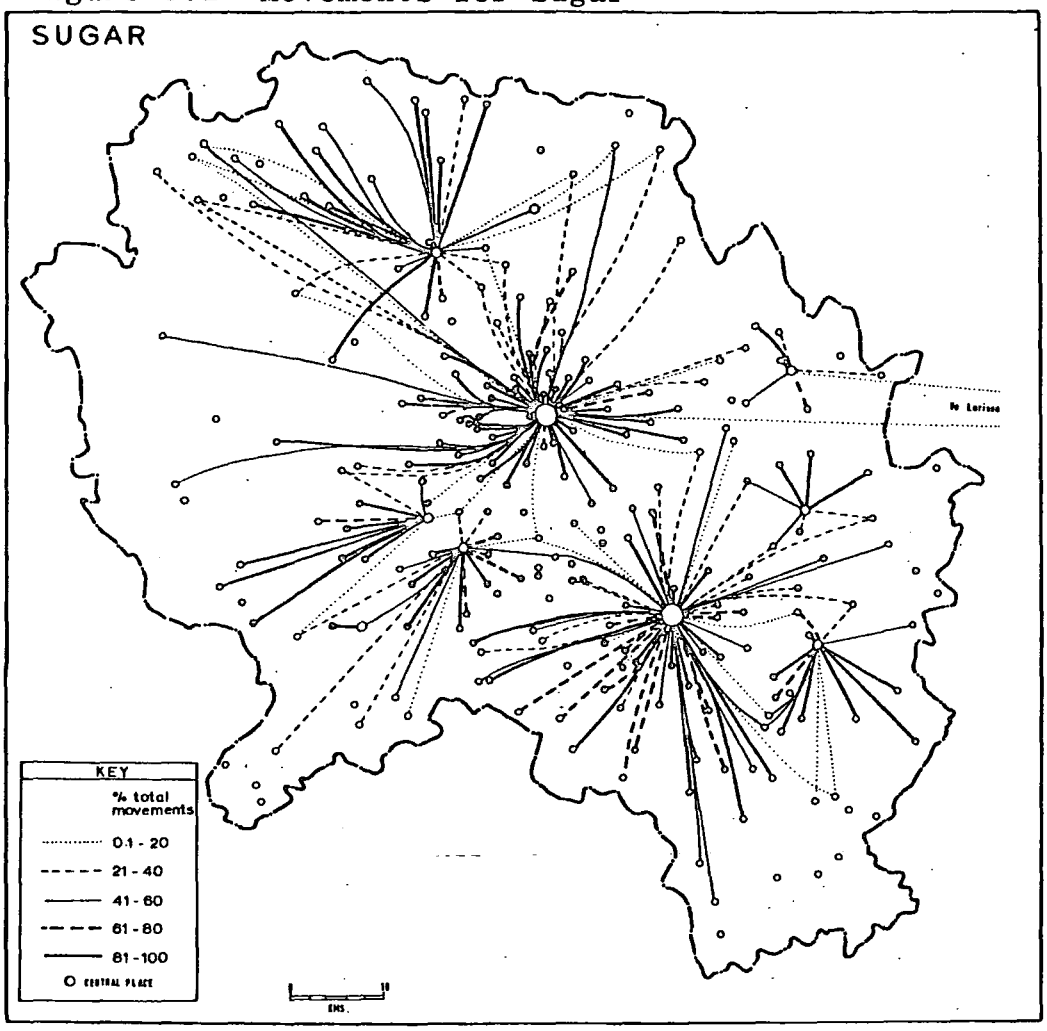
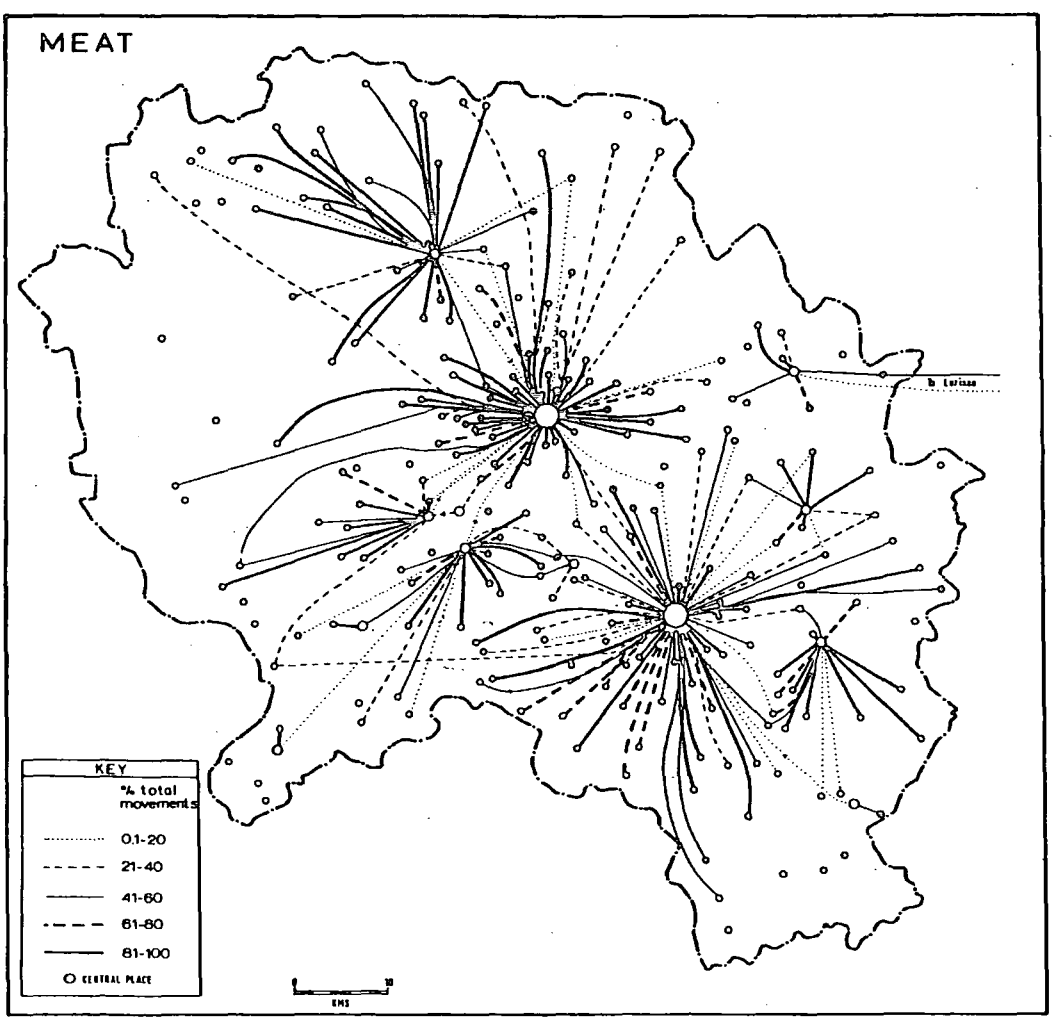


Figure 6:3 Movements for meat



Kardhitsa, a higher proportion of purchases were made outside the places of residence. While the A and B level central places are by far the most important foci of inter-settlement movements, it is interesting to note that some of the third level of settlements identified in the hierarchical analysis (for example, Fiki, Leondari) do act as centres for food provision. This is on a very limited scale, however, and the implication must be that their role as local service centres supplying low order goods is not a very significant one. The trade areas of the eight principal central places are generally clearly defined, and there is not much evidence of the two A centres extending their influence into areas beyond the B centres.

The nature of these products and their frequency of purchase mean that comparative shopping is not usually considered to be an important feature of consumer behaviour. This implies that large settlements do not have any special competitive advantage over smaller ones. Nevertheless, the fact that the major central places do act as foci for some inter-settlement movements suggests that this kind of purchase may often be made as part of a multi-purpose trip which perhaps is associated with a visit to a weekly market where rural buyers may also be selling some of their own produce such as vegetables, fruit, and eggs.

2 Cooking Utensil

This is a low cost household good which is available at low levels of the settlement hierarchy. The threshold population of 1,428 cited in Table 6:2 is that of specialist hardware shops, but these articles are frequently

TABLE 6:5

Movements for Cooking Utensils

CENTRES	Inc. movements originating in centres			Exc. movements originating in centres		
	N	%	S.E.	N	%	S.E.
Kardhitsa	441	31.4	1.2	265	35.8	1.8
Trikala	408	29.0	1.2	215	29.0	1.7
Kalambaka	88	6.3	0.7	50	6.8	0.9
Farkadon	26	1.9	0.4	16	2.2	0.5
Pili	57	4.1	0.5	35	4.7	0.8
Mouzakion	104	7.4	0.7	79	10.7	1.1
Palamas	63	4.5	0.6	19	2.4	0.6
Sofadhes	94	6.7	0.7	47	6.3	0.9
Village	110	7.8	0.7	-	-	-
Larissa	4	0.3	0.1	4	0.5	0.3
Volos	-	-	-	-	-	-
Elsewhere in Thes.	3	0.2	0.1	3	0.4	0.2
Athens	7	0.5	0.2	7	1.0	0.4
Thessaloniki	1	0.1	0.1	1	0.1	0.1
Elsewhere in Greece	-	-	-	-	-	-
Abroad	-	-	-	-	-	-

TABLE 6:6

Movements for Shoes

CENTRES	Inc. movements originating in centres			Exc. movements originating in centres		
	N	%	S.E.	N	%	S.E.
Kardhitsa	598	34.1	1.1	409	35.4	1.4
Trikala	595	33.9	1.1	359	31.0	1.4
Kalambaka	103	5.9	0.6	68	5.9	0.7
Farkadon	8	0.5	0.2	5	0.4	0.2
Pili	51	2.9	0.4	30	2.6	0.5
Mouzakion	109	6.2	0.6	94	8.1	0.8
Palamas	39	2.2	0.4	11	1.0	0.3
Sofadhes	91	5.2	0.5	53	4.6	0.6
Village	33	1.9	0.3	-	-	-
Larissa	65	3.7	0.5	65	5.6	0.7
Volos	2	0.1	0.1	2	0.2	0.1
Elsewhere in Thes.	3	0.2	0.1	3	0.3	0.2
Athens	45	2.6	0.4	45	3.9	0.6
Thessaloniki	9	0.5	0.2	9	0.8	0.3
Elsewhere in Greece	1	0.1	0.1	1	0.1	0.1
Abroad	3	0.2	0.1	3	0.3	0.2

Figure 6:4 Movements for cooking utensil

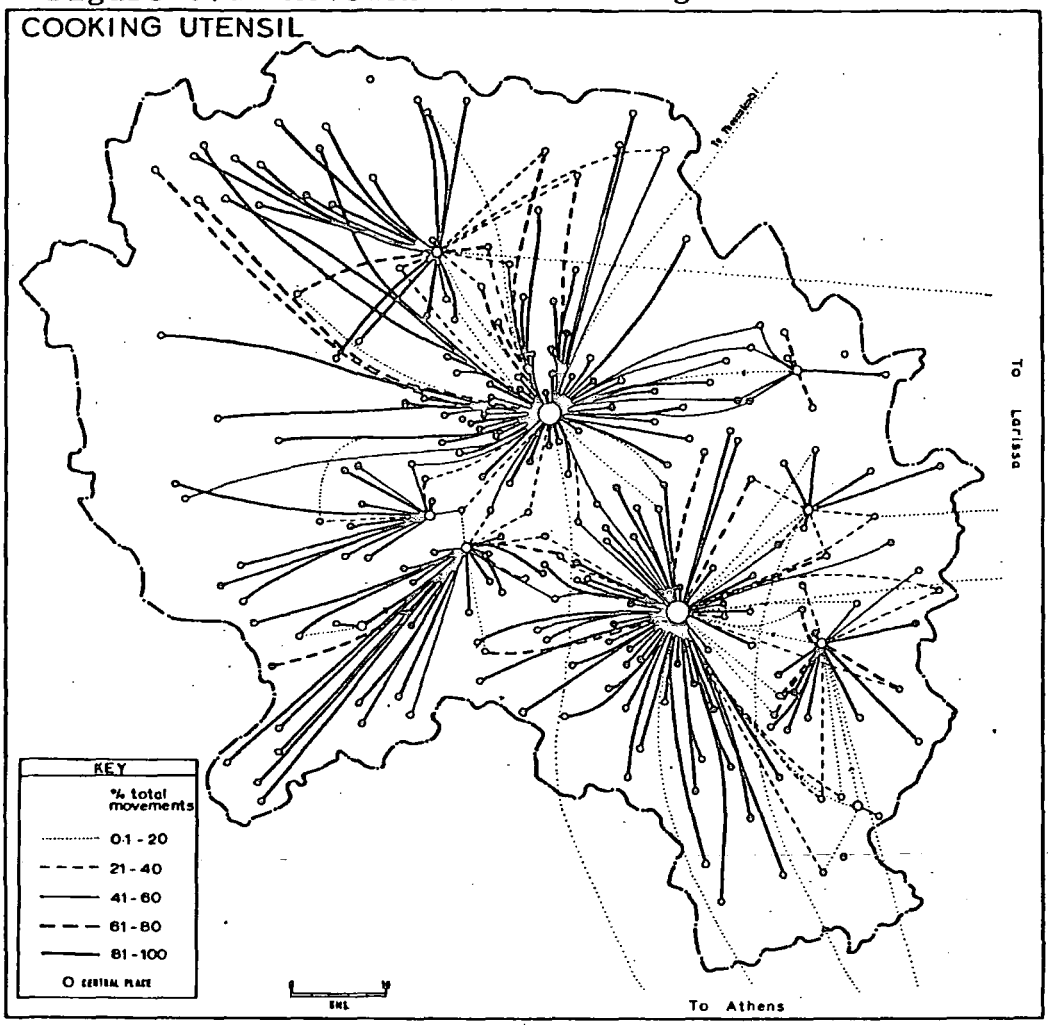
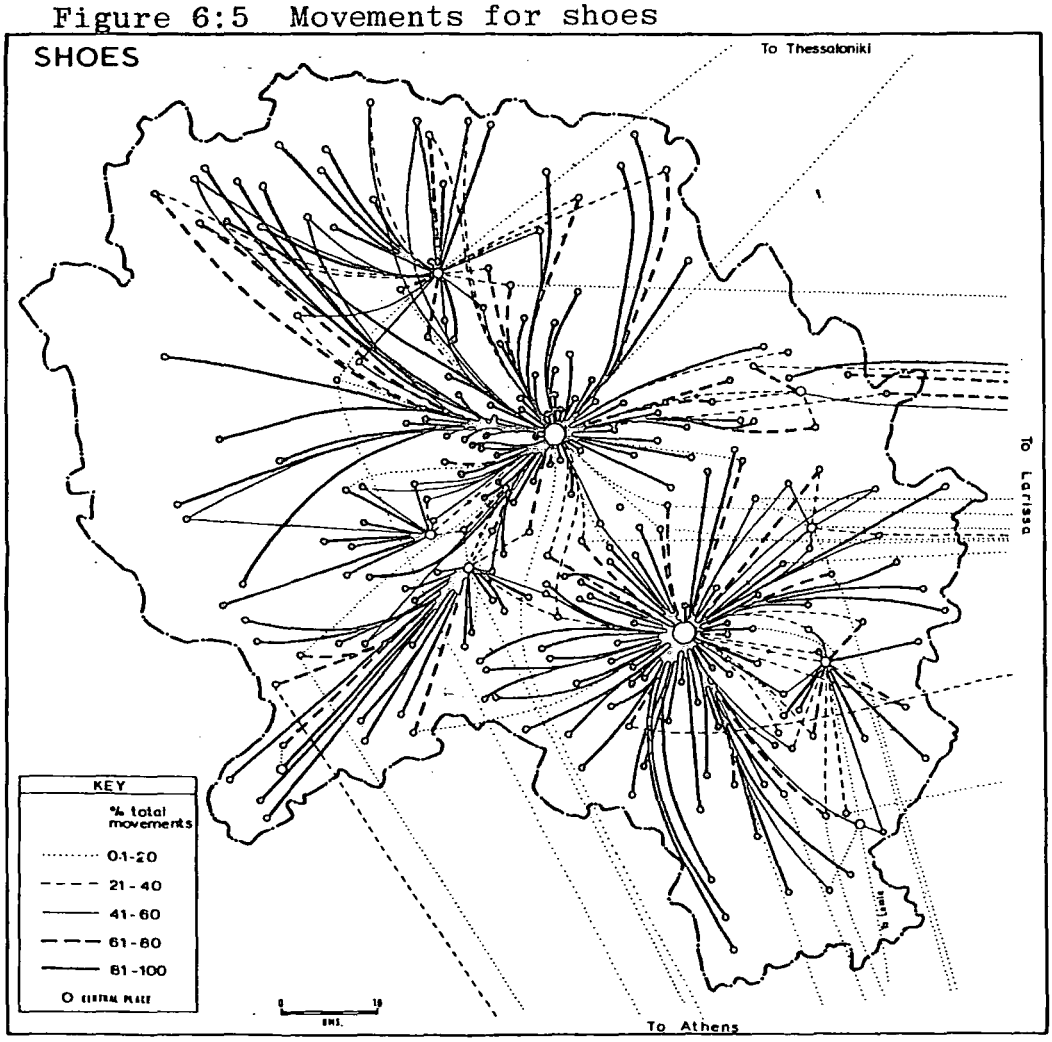


Figure 6:5 Movements for shoes



found as part of the assortment of goods in village general stores. Their relatively low cost and basic nature mean that distances travelled by consumers to buy them are unlikely to be very high and neither should there by any substantial competition between centres of different hierarchical levels for their provision. This is confirmed by the data (Table 6:5) and the map of movements (Fig 6:4). The proportion of recorded movements which are inter-settlement is the lowest after Sugar and Meat, and both the average distance of movement and the range are of similar rank positions.

The map of consumer movements (Fig 6:4) shows a similar structure to that for Sugar and Meat except that considerably more villages record purchases in central places. Even so, 8.0 per cent of all purchases were made in C or D - level settlements. Again, the hinterland areas of the eight principal central places seem to be fairly clearly defined. There is little overlapping and break points occur at approximately the half way point between competing centres. Of the B-level settlements, Farkadon and Palamas have the smallest hinterlands both in terms of area and population, and the number of purchases recorded in them by people living in other places is consequently lower than for the other four B-level centres. The specialized hardware establishment was identified as a hierarchical marginal function for C-level centres, but the map shows that in the detailed study area only Leondari acted as a very localized focus for this good (c.f. Meat), while one settlement in the Pindos acted similarly. Less than one per cent of purchases were made outside West Thessaly.

3 Shoes, Clothing, Radio/T.V., Jewellery/Watch, Records

These are the five consumer durables amongst the goods. The first four are functions which are diagnostic of B-level centres, while music shops are confined to A-level centres. Nevertheless, records are sold in some shops in B-level centres even though they were insufficiently prominent to be considered as separate functional units in the earlier analysis. They do, however, have a higher mean distance of movement and range than the other four goods which is indicative of their higher order status. In all five cases comparative shopping is likely to be an important element of consumer behaviour. This should therefore favour the larger A-centres rather than those below because of the greater number of shops selling these items which they have, even if there are no significant differences in the size and organization of the shops. The data appear to confirm this hypothesis because the mean distances of movement and the ranges are all higher than for the three standard medical services (below) which are similarly diagnostic of B-level centres but where the comparative element is less likely to arise in patronization of them. The proportionate share of purchases/visits in A-level centres is also higher (Tables 6:6 to 6:10).

The number of recorded purchases of clothing and shoes is considerably higher than for the other three goods. Given that these are basic items and their greater frequency of purchase by a family unit, this is to be expected. The general pattern of movements, however, show broad similarities (Figs. 6:5 to 6:9), although those for records do show greater concentration on A centres than the other four. Even for these

TABLE 6:7

Movements for Clothing

CENTRES	Inc. movements originating in centres			Exc. movements originating in centres		
	N	%	S.E.	N	%	S.E.
Kardhitsa	614	33.7	1.1	429	34.0	1.3
Trikala	645	35.4	1.1	414	32.3	1.3
Kalambaka	104	5.7	0.5	70	5.5	0.6
Farkadon	8	0.4	0.2	4	0.3	0.2
Pili	45	2.5	0.4	24	1.9	0.4
Mouzakion	104	5.7	0.5	94	7.4	0.7
Palamas	27	1.5	0.3	7	0.6	0.2
Sofadhes	90	4.9	0.5	51	4.0	0.6
Village	13	0.7	0.2	-	-	-
Larissa	86	4.7	0.5	86	6.8	0.7
Volos	5	0.3	0.1	5	0.4	0.2
Elsewhere in Thes.	-	-	-	-	-	-
Athens	57	3.1	0.4	57	4.5	0.6
Thessaloniki	13	0.7	0.2	13	1.0	0.3
Elsewhere in Greece	3	0.2	0.1	3	0.2	0.1
Abroad	6	0.3	0.1	6	0.5	0.2

TABLE 6:8

Movements for Radio/T.V.

CENTRES	Inc. movements originating in centres			Exc. movements originating in centres		
	N	%	S.E.	N	%	S.E.
Kardhitsa	323	32.9	1.5	208	33.9	1.9
Trikala	330	33.6	1.5	196	32.0	1.9
Kalambaka	44	4.5	0.7	21	3.4	0.7
Farkadon	4	0.4	0.2	2	0.3	0.2
Pili	20	2.0	0.5	9	1.5	0.5
Mouzakion	74	7.5	0.8	59	9.6	1.2
Palamas	39	4.0	0.6	8	1.3	0.5
Sofadhes	80	8.1	0.9	41	6.7	1.0
Village	-	-	-	-	-	-
Larissa	28	2.9	0.5	28	4.6	0.8
Volos	2	0.2	0.1	2	0.3	0.2
Elsewhere in Thes.	1	0.1	0.1	1	0.2	0.2
Athens	26	2.7	0.5	26	4.2	0.8
Thessaloniki	6	0.6	0.3	6	1.0	0.4
Elsewhere in Greece	2	0.2	0.1	2	0.3	0.2
Abroad	4	0.4	0.2	4	0.7	0.3

Figure 6:6 Movements for clothing

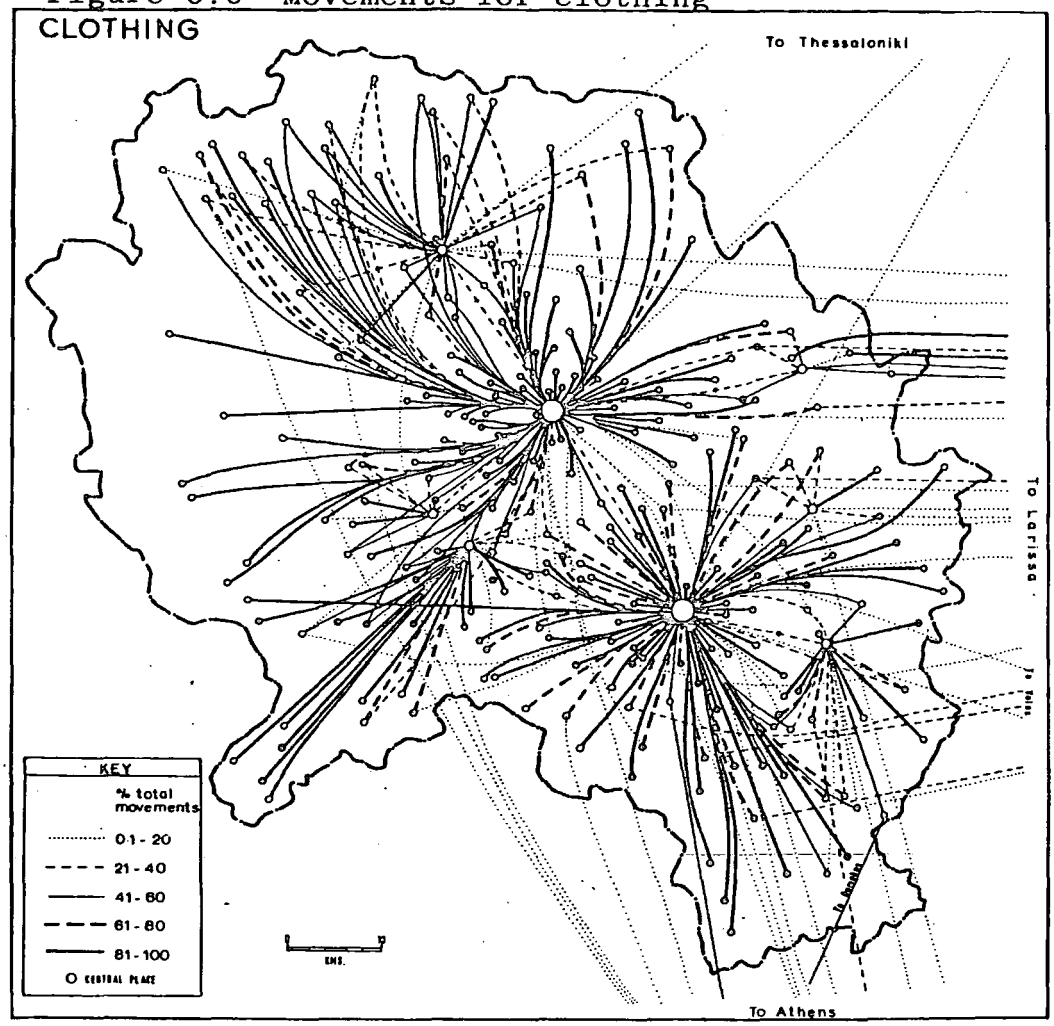


Figure 6:7 Movements for radio or television

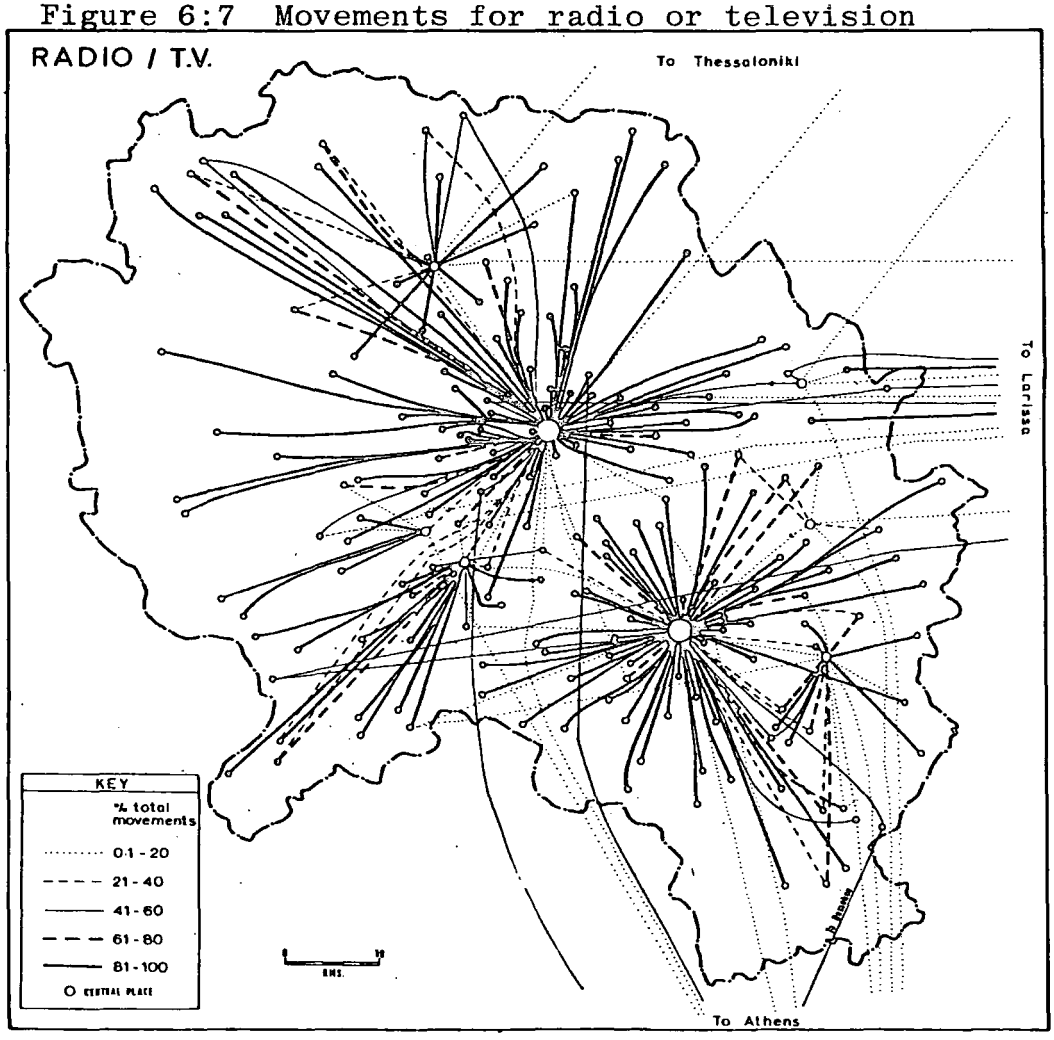


TABLE 6:9

Movements for Jewellery/Watch

CENTRES	Inc. movements originating in centres			Exc. movements originating in centres		
	N	%	S.E.	N	%	S.E.
Kardhitsa	392	34.5	1.4	255	35.0	1.8
Trikala	409	36.0	1.4	264	36.2	1.8
Kalambaka	66	5.8	0.7	33	4.5	0.8
Farkadon	5	0.4	0.2	4	0.6	0.3
Pili	16	1.4	0.4	7	1.0	0.4
Mouzakion	57	5.0	0.7	48	6.6	0.9
Palamas	37	3.3	0.5	10	1.4	0.4
Sofadhes	89	7.8	0.8	47	6.5	0.9
Village	3	0.3	0.2	-	-	-
Larissa	29	2.6	0.5	29	4.0	0.7
Volos	-	-	-	-	-	-
Elsewhere in Thes.	-	-	-	-	-	-
Athens	25	2.2	0.4	25	3.4	0.7
Thessaloniki	2	0.2	0.1	2	0.3	0.2
Elsewhere in Greece	1	0.1	0.1	1	0.1	0.1
Abroad	4	0.4	0.2	4	0.6	0.3

TABLE 6:10

Movements for Records

CENTRES	Inc. movements originating in centres			Exc. movements originating in centres		
	N	%	S.E.	N	%	S.E.
Kardhitsa	282	38.3	1.8	184	36.9	2.2
Trikala	302	41.0	1.8	198	39.7	2.2
Kalambaka	18	2.5	0.6	9	1.8	0.6
Farkadon	1	0.1	0.1	-	-	-
Pili	8	1.1	0.4	6	1.2	0.5
Mouzakion	27	3.7	0.7	24	4.8	1.0
Palamas	16	2.2	0.5	3	0.6	0.4
Sofadhes	19	2.6	0.6	12	2.4	0.7
Village	-	-	-	-	-	-
Larissa	29	3.9	0.7	29	5.8	1.1
Volos	1	0.1	0.1	1	0.2	0.2
Elsewhere in Thes.	-	-	-	-	-	-
Athens	25	3.4	0.7	25	5.0	1.0
Thessaloniki	5	0.7	0.3	5	1.0	0.45
Elsewhere in Greece	1	0.1	0.1	1	0.2	0.2
Abroad	2	0.3	0.2	2	0.4	0.3

Figure 6:8 Movements for jewellery or watch

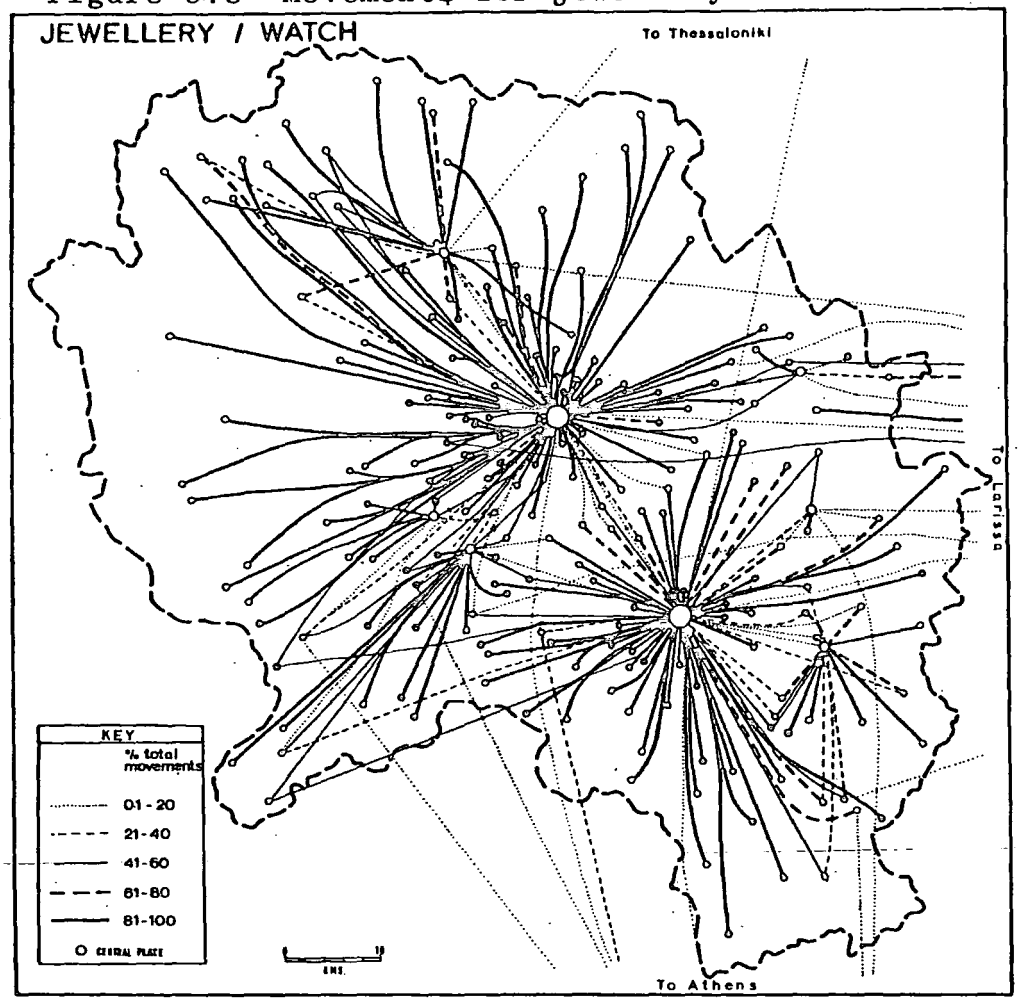
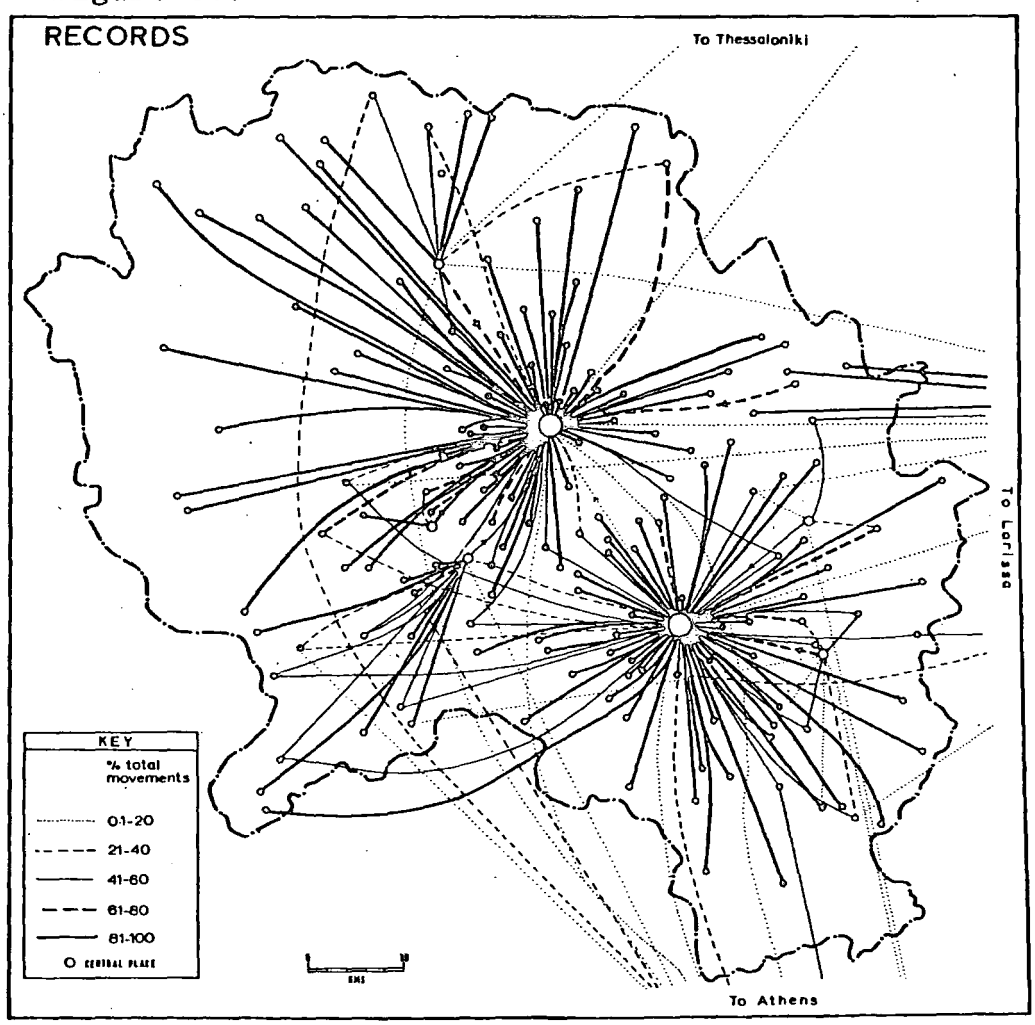


Figure 6:9 Movements for records



four, however, Trikala and Kardhitsa extend their influence into B centre hinterlands, perhaps most notably in the cases of Farkadon and Palamas but also into those of the other centres as well. Larissa appears to be the dominant centre in the south-eastern part of Trikala nomos. Athens and Thessaloniki are the place of three to five per cent of purchases. This is perhaps not insignificant, particularly if these purchases are of higher value than those made within the region. It seems unlikely that most purchases for these goods in either Athens or Thessaloniki are made on specific shopping trips; rather, advantage may be taken of visits to relatives or holidays in these cities to do some shopping since the variety of available goods is inevitably larger than in the provinces.

4 Doctor, Dentist and Chemist

These are the three basic medical services. All occur in B-level centres and Doctor's surgeries are found in C-level as well as some settlements which did not specifically emerge as central places in the hierarchical analysis. Because of the basically non-commercial nature of the first two activities and the specialised nature of the third, the expectation would be that centres are not competitive with each other, and relatively low mean distances of movement as well as clearly defined hinterlands should be characteristic. Generally this is the case although visits to Doctor's surgeries do form a slight anomaly. In terms of threshold population, this is the lowest order function but its range and mean distances of movement are higher than those of both Chemists and Dentists. This can be explained by the existence within the category of Doctor of a wider variety of types, ranging from the village

TABLE 6:11

Movements to Doctor's Surgery

CENTRES	Inc. movements originating in centres			Exc. movements originating in centres		
	N	%	S.E.	N	%	S.E.
Kardhitsa	476	30.8	1.2	295	34.2	1.6
Trikala	484	31.3	1.2	275	31.9	1.6
Kalambaka	110	7.1	0.7	66	7.7	0.9
Farkadon	21	1.4	0.3	12	1.4	0.4
Pili	41	2.7	0.4	17	2.0	0.5
Mouzakion	69	4.5	0.5	51	5.9	0.8
Palamas	57	3.7	0.5	20	2.3	0.5
Sofadhes	97	6.3	0.6	51	5.9	0.8
Village	118	7.6	0.7	-	-	-
Larissa	23	1.5	0.3	23	2.7	0.6
Volos	3	0.2	0.1	3	0.4	0.2
Elsewhere in Thes.	25	1.6	0.3	25	2.9	0.6
Athens	22	1.4	0.3	22	2.6	0.5
Thessaloniki	2	0.1	0.1	2	0.2	0.2
Elsewhere in Greece	-	-	-	-	-	-
Abroad	-	-	-	-	-	-

TABLE 6:12

Movements to Dentists

CENTRES	Inc. movements originating in centres			Exc. movements originating in centres		
	N	%	S.E.	N	%	S.E.
Kardhitsa	428	30.4	1.2	262	32.1	1.6
Trikala	419	29.7	1.2	205	25.2	1.5
Kalambaka	109	7.7	0.7	66	8.1	1.0
Farkadon	36	2.6	0.4	23	2.8	0.6
Pili	56	4.0	0.5	37	4.5	0.7
Mouzakion	143	10.1	0.8	116	14.2	1.2
Palamas	86	6.1	0.6	37	4.5	0.7
Sofadhes	110	7.8	0.7	61	7.5	0.9
Village	15	1.1	0.3	-	-	-
Larissa	7	0.5	0.2	7	0.9	0.3
Volos	-	-	-	-	-	-
Elsewhere in Thes.	-	-	-	-	-	-
Athens	1	0.1	0.1	1	0.1	0.1
Thessaloniki	-	-	-	-	-	-
Elsewhere in Greece	-	-	-	-	-	-
Abroad	-	-	-	-	-	-

Figure 6:10 Movements to a doctor's surgery

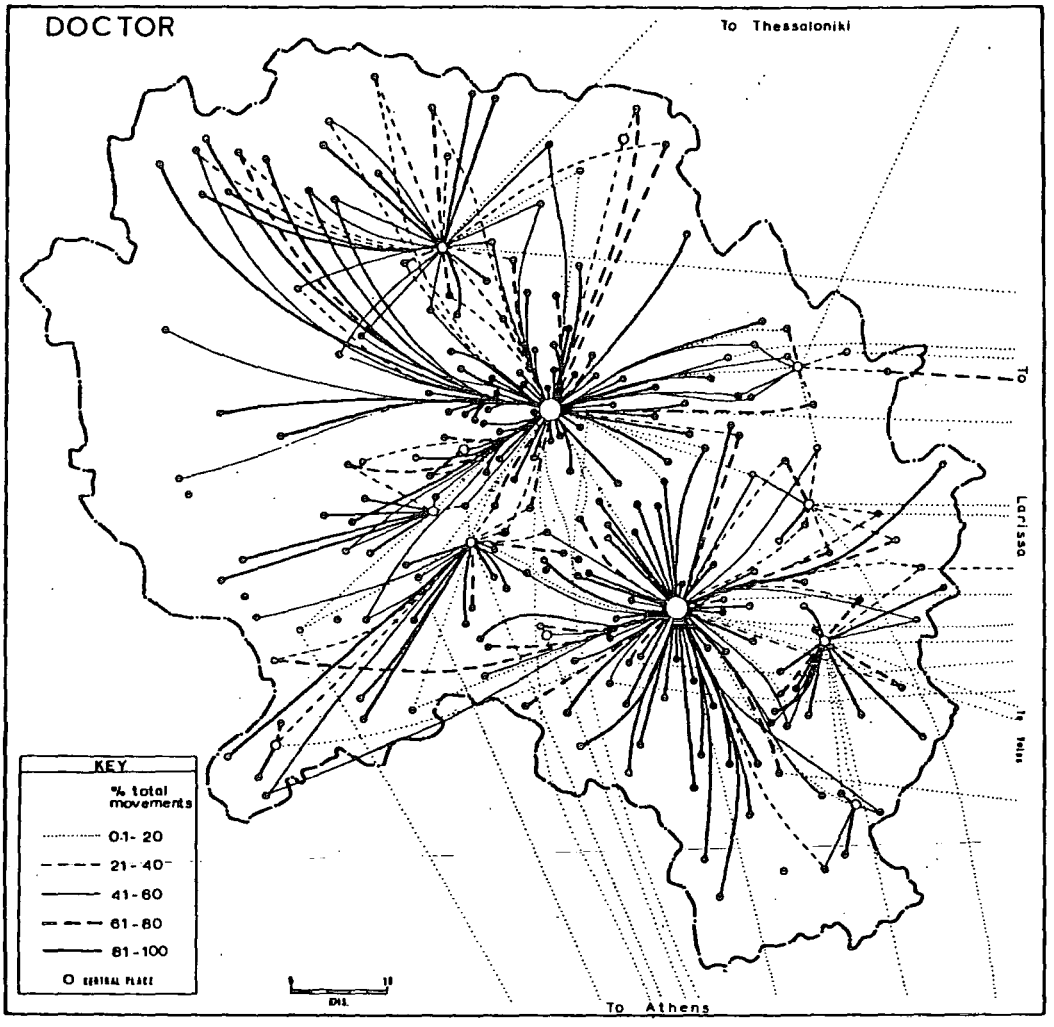
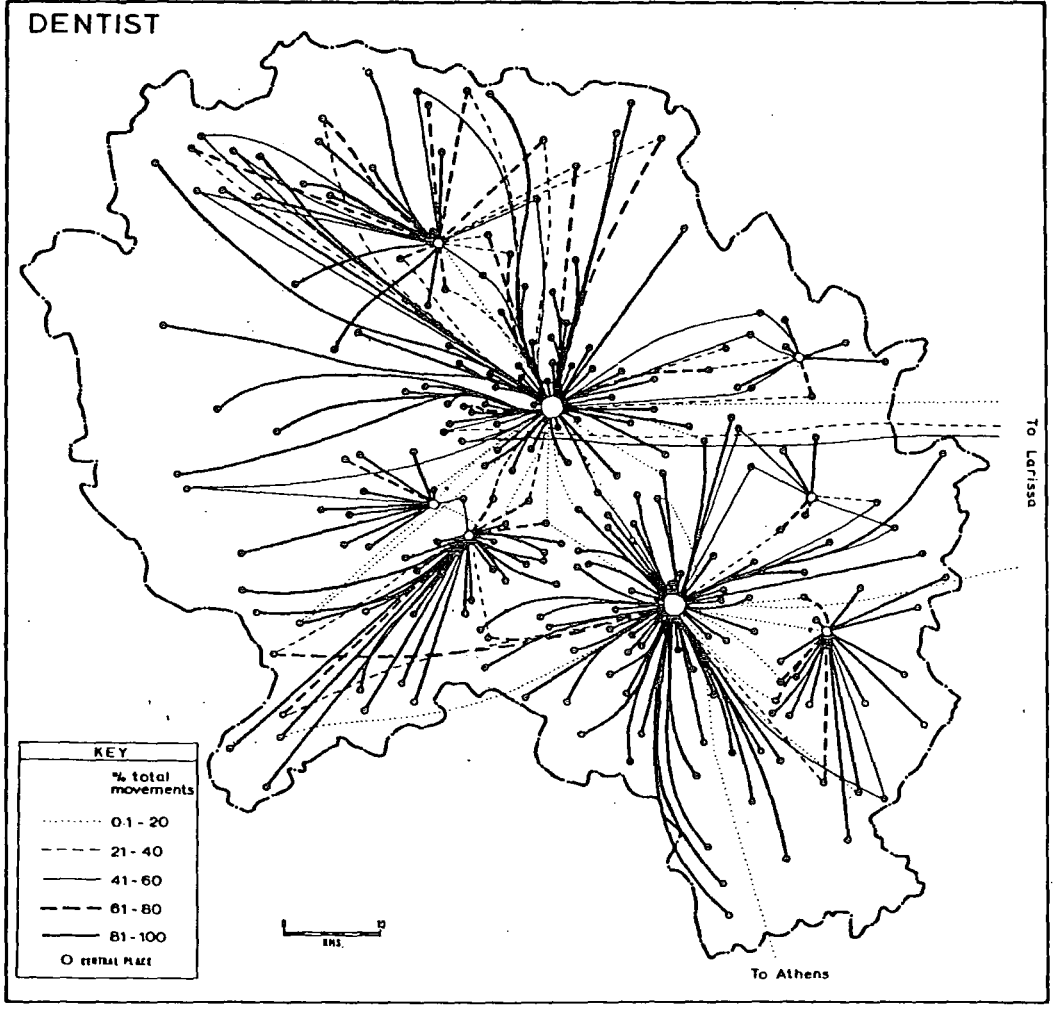


Figure 6:11 Movements to a dentist



doctor through to specialists. While movements to the former are obviously going to be short, those to specialists will be longer (c.f. Opticians, below). Hence, despite the high ranges and mean distances for Doctors, the proportion of movements that are inter-settlement is lower than for either Dentists or Chemists, while the proportion of movements to places outside West Thessaly is higher. The proportion of visits to Trikala and Kardhitsa are similar for all three activities (Tables 6:11 to 6:13), but at the next level differences can be seen. Over 7 per cent of visits to Doctors' surgeries are within villages, while this is not a significant feature of the other two activities. On the other hand, the use of B-level settlements for Doctors is relatively lower than for either Chemists or Dentists, and this can be interpreted in terms of the more uniform character of these two functions.

Overall, the patterns of movements (Figs. 6:10 to 6:12) shows the expected clearly defined areas for each central place although there is a slightly higher degree of overlap than for Meat and Sugar, particularly by Trikala into Kalambaka's hinterland. In most cases, however, the hinterland boundaries seem clearly defined at the approximate mid-points between settlements. For Dentists and Chemists, movements are almost exclusively to A and B-level settlements, but for Doctors some of the C-level centres do act as centres as well as a small number of settlements which fall or would fall into the D category. It is for this function, as well as policing, that these small settlements most clearly fulfil a central place role.

TABLE 6:13

Movements to Chemists

CENTRES	Inc. movements originating in centres			Exc. movements originating in centres		
	N	%	S.E.	N	%	S.E.
Kardhitsa	487	30.9	1.2	300	31.5	1.5
Trikala	491	31.1	1.2	265	27.8	1.5
Kalambaka	124	7.9	0.7	78	8.2	0.9
Farkadon	38	2.4	0.4	25	2.6	0.5
Pili	62	3.9	0.5	35	3.7	0.6
Mouzakion	150	9.5	0.7	123	12.9	1.1
Palamas	78	5.0	0.6	26	2.7	0.5
Sofadhes	126	8.0	0.7	79	8.3	0.9
Village	-	-	-	-	-	-
Larissa	13	0.8	0.2	13	1.4	0.4
Volos	-	-	-	-	-	-
Elsewhere in Thes.	1	0.1	0.1	1	0.1	0.1
Athens	7	0.4	0.2	7	0.7	0.3
Thessaloniki	-	-	-	-	-	-
Elsewhere in Greece	-	-	-	-	-	-
Abroad	-	-	-	-	-	-

TABLE 6:14

Movements to Opticians

CENTRES	Inc. movements originating in centres			Exc. movements originating in centres		
	N	%	S.E.	N	%	S.E.
Kardhitsa	376	35.2	1.6	255	34.7	1.8
Trikala	574	60.1	1.6	435	59.2	1.8
Kalambaka	-	-	-	-	-	-
Farkadon	-	-	-	-	-	-
Pili	-	-	-	-	-	-
Mouzakion	-	-	-	-	-	-
Palamas	-	-	-	-	-	-
Sofadhes	-	-	-	-	-	-
Village	-	-	-	-	-	-
Larissa	19	2.0	0.5	19	2.6	0.6
Volos	8	0.8	0.3	8	1.1	0.4
Elsewhere in Thes.	-	-	-	-	-	-
Athens	18	1.9	0.4	18	2.5	0.6
Thessaloniki	-	-	-	-	-	-
Elsewhere in Greece	-	-	-	-	-	-
Abroad	-	-	-	-	-	-

Figure 6:12 Movements to a chemist

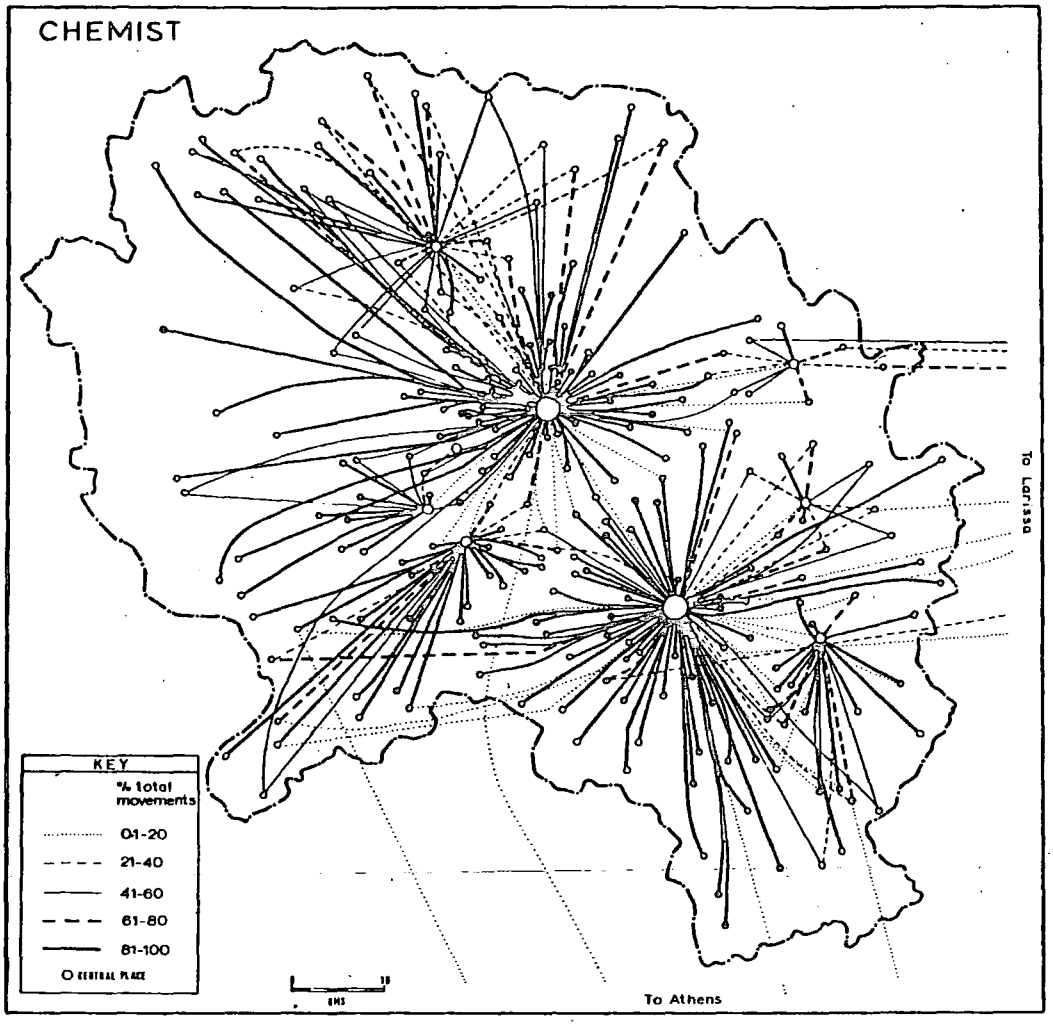
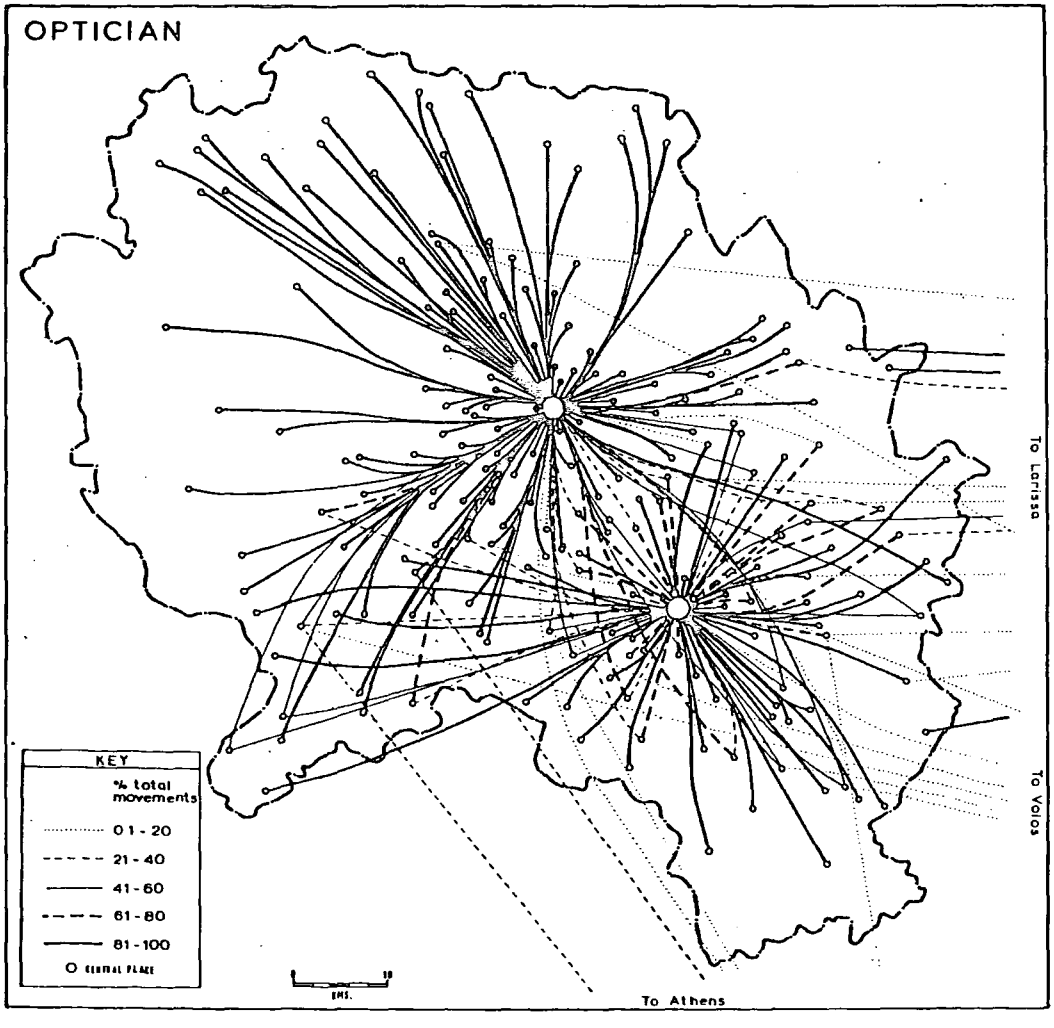


Figure 6:13 Movements to an optician



5 Optician

This service is performed by someone with professional training. The scarcity of suitably qualified persons together with the social desire of most professional people to live in a major town or city are factors in addition to the concept of threshold which explain the location of opticians within West Thessaly solely in the towns of Trikala and Kardhitsa. The nature of the activity means that consumers are unlikely to make any kind of comparative trips, and that they will tend to go to the nearest optician to their place of residence. The data suggest this by indicating that relatively few people go outside West Thessaly to an optician (Table 6:14), and the mean distances of movement and range are less than for Cars, which have the same threshold population.

As Fig. 6:13 shows, the pattern of movements within West Thessaly is not quite as symmetrical as may have been expected. Although both Trikala and Kardhitsa dominate their respective nomoi, Trikala's influence does extend into Kardhitsa nomos. This is not only into the mountainous area which forms Mouzakion's hinterland for lower order goods and services but also into the plain area. As this is the only one of the thirteen goods and services in which Trikala does appear to exercise some superiority over Kardhitsa in its central place function, it lends some credence to the notion that Trikala acts as a sub-regional medical centre for West Thessaly below the level of Larissa. Its hospital is rather larger than Kardhitsa's and it contains more private clinics. Larissa and Athens act as the main centres outside West Thessaly, attracting a similar number of visits as Doctors, and Volos

may act as a secondary centre within Thessaly.

6 Cars

Although Cars have the same threshold population as Opticians, the nature of the good and the costs involved produce a very different pattern of movements. Cars are almost exclusively an imported commodity and the setting up of a dealership inevitably requires much more capital than for a small retail shop. In addition, the high purchase costs (which include a substantial import duty) together with low average incomes in this part of Greece means a low demand for them. A concentration of dealers in Athens with branches in the major regional capitals is therefore the main character of the distributive organisation. The influence on consumer movements is apparent with a large proportion outside West Thessaly, mainly to Athens, Larissa and Thessaloniki (Table 6:15). The mean distances of movement and the range are the highest of all thirteen goods or services.

The map showing the pattern of movements (Fig. 6:14) reflects the aggregated statistics. The fairly well structured patterns that occur with the other goods and services do not apply here where the relevant scale of movements is at a higher level. Trikala and Kardhitsa do act as the foci for some movements, particularly those that originate within their own nomoi, but the attraction of the larger centres outside West Thessaly does not show any significant variations within the region. The nature and cost of the purchase means that trips to buy a car are probably single-purpose, and comparative shopping may be a significant feature of consumer behaviour.

TABLE 6:15

Movements for Cars

CENTRES	Inc. movements originating in centres			Exc. movements originating in centres		
	N	%	S.E.	N	%	S.E.
Kardhitsa	41	25.6	3.5	30	22.7	3.7
Trikala	41	25.5	3.5	24	18.2	3.4
Kalambaka	-	-	-	-	-	-
Farkadon	-	-	-	-	-	-
Pili	-	-	-	-	-	-
Mouzakion	-	-	-	-	-	-
Palamas	-	-	-	-	-	-
Sofadhes	-	-	-	-	-	-
Village	-	-	-	-	-	-
Larissa	39	24.4	3.4	39	29.6	4.0
Volos	-	-	-	-	-	-
Elsewhere in Thes.	1	0.6	0.6	1	0.8	0.8
Athens	27	16.9	2.7	27	20.5	3.5
Thessaloniki	8	5.0	1.7	8	6.1	2.1
Elsewhere in Greece	2	1.3	0.9	2	1.5	1.1
Abroad	1	0.6	0.6	1	0.8	0.8

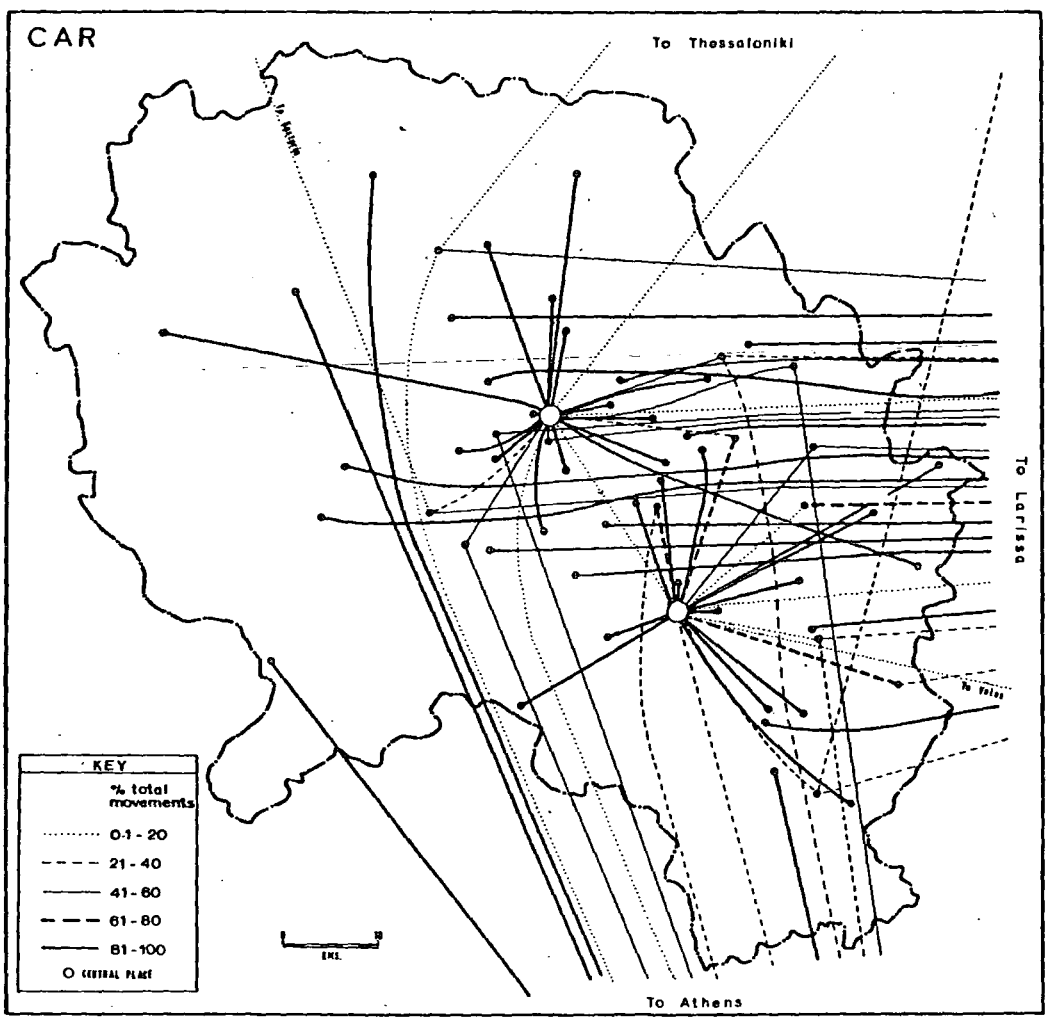


Figure 6:14 Movements for a car

SECTION C CONCLUSION

This examination of consumer movements in West Thessaly had a limited aim - namely, to give a broad indication of the behaviour of the settlement system in the area and, in particular, the extent to which settlements identified as central places in Chapter 5 did indeed act as centres for their surrounding rural populations. In this it has succeeded but, of course, many fundamental questions regarding both the structural and behavioural characteristics of consumer movements in the region remain to be answered.

The simple hierarchical structure which was identified in Chapter 5 appears from this study to be clearly reflected in the functioning of the settlement system since the provision of functions at different hierarchical levels is reflected in different patterns of movements. The A-level centres extend their influence throughout their respective nomoi, especially in administrative functions but also in high order goods and services. They are not, however, so dominant in lower order functions, and for these their hinterlands are more localized.

The B-level settlements are active centres for predominantly mountainous hinterlands. Sofadhes is an important focus for plain villages in the south-eastern part of Kardhitsa nomos, but both Palamas and Farkadon have much more limited spheres of influence (see Chapter 7B). The B centres all provide a wide range of goods and services. Their role as weekly market centres may be a vital one in maintaining this situation while the absence of change in the organisational structure of retail trade is another factor in its continuation.

The existence of credit ties such as Campbell (1964) has described for the Sarakatsan shepherds may be another important element in maintaining the viability of these centres as places for the buying and selling of both agricultural produce and consumer goods and services.

The C-level settlements appeared to have a very limited role as central places, particularly in retailing, and this would support the notion in Chapter 5G that they are relicts of a time when transport within the region was both relatively more expensive and difficult. They do, however, still have significance as local non-retail centres, especially for local health and administrative functions. On the other hand these functions are not just confined to those settlements specifically identified as C-level in Chapter 5 but are also found in a number of larger D settlements, suggesting a blurring of the functional distinction between C and D level settlements.

Outside West Thessaly Larissa acts as a regional centre for high order goods and services. It is perhaps most important in the fields of administrative and non-retail commercial functions, but it is clear that it acts as a more local A type centre for settlements in the extreme east of Trikala nomos as well as providing goods and services in a more limited degree to the rest of the western region. Although in proportional terms the number of visits made to Larissa for goods (except Cars) and services was fairly low, its significance as a regional centre should not be underestimated since the types of functions which it provides at this level are not ones which generate substantial volumes of movement of people; rather, information flows may be more important, and

it has not been possible to consider these here. Volos does not appear to act as an alternative competitive regional centre to Larissa, but its role as the region's port is perhaps complementary to it.

Athens also provides the focus for some movements for all except the lowest order goods. It was suggested that for consumer goods (except Cars) this may largely reflect purchases made in the city while visiting for other purposes. The role of Athens in the provinces is most apparent in its function as the seat of a highly centralized government while in the specific case of the distributive trades it may be more significant in wholesaling and transhipment. Nevertheless, it is conceivable that the value of retail purchases is proportionately higher than the number of purchases recorded and this provides an additional dimension to the dominating position of the city in Greek life (Chapter 8A).

Classical central place theory predicts a series of discrete nested trade areas. In this study, the existence of nucleated rural settlement as well as the small number of responses from most individual villages does not make it particularly meaningful to produce maps showing precisely defined hinterland boundaries. The general picture is the aim of analysis here and the maps of consumer movements are sufficient to compare the patterns of trade areas against those of the theory. For low order goods and non-retail services, the hinterlands of A and B level centres are very well defined, while for administrative functions they would obviously be clear-cut. Similarly, for goods and services available only in the towns of Trikala and Kardhitsa the pattern of movements

to Opticians suggests a fairly well defined division corresponding closely to nomos boundaries, although those for Cars showed less ordering since the scale of distribution is more properly national rather than local or even regional. For common consumer durables, however, some overlapping of the hinterlands of B centres by those of A was found. This was explained by the greater importance of comparative shopping for those goods which favour the A centres with their greater number of shops.

The findings of this study will be integrated with those of the structural analysis in the following chapter and the theoretical implications outlined. At this point, however, it should be repeated that the aims of this study were limited and time and resource constraints did not permit a more thorough study based on detailed questionnaire survey work involving personal interviews. Thus, such very important subjects as the detailed functioning of the commercial system and the social and economic characteristics and influences on consumer behaviour in provincial Greece remain to be investigated. Nevertheless, it is hoped that this part of the research may have helped to provide an appropriate background for such future research activity.

FOOTNOTES

1 An official permit was needed from the Ministry of Education and Religion in Athens. This ensured the active co-operation of all the head teachers in West Thessaly and the assistance of the prefectures in Trikala and Kardhitsa.

C H A P T E R S E V E N

A COMPOSITE AND COMPARATIVE ASSESSMENT OF THE CENTRAL PLACE SYSTEM OF WEST THESSALY

In this chapter an attempt will be made to integrate the results of the three preceeding chapters and relate them to the theoretical framework which was outlined in Chapter 1. This composite assessment of the central place system of West Thessaly will then be followed by a comparison between the weighted and unweighted functional indices, and then between the classification of the settlement system made here with the other classifications which were summarized in Chapter 5B, and classifications of settlement systems in other parts of Greece.

SECTION A A COMPOSITE ASSESSMENT

Marshall (1969) p.23 lists seven fundamental characteristics of the 'ideal' central place system, which provide a useful basis for making a composite assessment of the central place system of West Thessaly. They are as follows:

(1) spatial interdependence of centres
(2) functional wholeness of the system
(3) discrete stratification of centrality
(4) interstitial placement of orders
(5) incremental baskets of goods
(6) a minimum of three orders
(7) a numerical pyramid in order membership

The first two refer to the functional behaviour of the system and the other five to its structure.

Taking the latter, the analysis in Chapter 5 showed that the central place system of West Thessaly possessed all these five characteristics, appearing to display a high degree of organization. Four orders of settlements were identified, the A and B levels quite clearly, the C-level less so, and below this the spectrum of D-level settlements within which no further distinctive divisions could be discerned. A numerical pyramid in order membership was found and the existence of incremental baskets of goods was verified. The fourth characteristic, the interstitial placement of orders, was fulfilled to an extent, particularly if cognizance is taken of large centres outside the study area. Thus, while there is no B-level settlement between Kardhitsa and Trikala, there are between Kardhitsa and Larissa (Palamas) and Trikala and Larissa (Farkadon). Similarly, in some cases a C-level settlement was found between A and B-level ones: for example, Fanarion between Mouzakion and Kardhitsa, and Fiki between Pili and Trikala (Fig. 5:3).

The hierarchical structure identified in the central place system suggests that the criterion of spatial interdependence of centres is met, and the examination of consumer movements in the region confirms this. The consumer movement study also indicated that the system was functionally whole, or more exactly, that in West Thessaly there are two separate systems centred on the towns of Kardhitsa and Trikala, with some interconnections, the spatial limits of which coincide closely with the nomos boundaries. Within these two systems functional sub-regions centred on the B-level settlements might be identified which correspond closely to those identified in Chapter 4 using the single criterion

of bus flows. There was also some supporting evidence in terms of these flows to indicate that Larissa does act as a higher order centre, although the absolute frequency of use, especially for commercial functions, is low.

Of the theoretical models described in Chapter 1B, the hierarchical structure of Christaller's k=4 (transportation principle) model accords closest with the structure of the settlement system of West Thessaly as revealed in this study. Taking the Kardhitsa and Trikala systems separately, then in each one the A-level centre is complemented by three B level centres as well as having its own bundle of B level functions. At the regional level, if Larissa is taken as the regional capital, then the three nomos seats of Kardhitsa, Trikala and Volos come below it. Beyond this, however, the numeric ordering of settlements does not correspond so closely with the Christaller model, at least partly because their functional role as central places is now very limited.

The spatial pattern of B and C centres in West Thessaly was shown to display a pattern that tended towards regularity. In terms of their position relative to each other and to A-level centres, it has been noted that some interstitial placement of orders can be discerned. This tends to occur along the main roads connecting higher order settlements although the limited spatial extent of the systems (and the study area), as well as the contrast between plain and mountains, are factors which would preclude the full development of such a pattern.

Precisely defined and nested hexagonally

shaped trade areas were not, of course, found in the study of consumer movements. Nevertheless the patterns that were found did show a substantial degree of regular spatial ordering. For the low order goods and for services, fairly clear trade areas could be discerned for each centre with dividing boundaries close to the mid-points between the centres. For higher order consumer goods, the trade areas of the A-level centres did overlap those of the smaller ones, the degree related in part at least to the threshold population of the good in question and therefore the number of outlets supplying that good. It was suggested that the frequency and nature of consumer behaviour were important elements which needed to be taken into account to explain these patterns. In addition, variations in the quality levels of retail establishments providing the same kind of goods are another element in this. Although no attempt was made to measure qualitative differences between establishments, it is true that the higher quality ones are found primarily in Trikala and Kardhitsa since their thresholds are higher (Garner 1966, p.118).

The Christaller model certainly seems more appropriate here than the Lösch one since the structure of the settlement system is simple. The existence of a hierarchy of central places rather than a continuum has been demonstrated. This question has been the source of some debate but Beckmann (1958) has shown that the addition of a random element to the Christaller model can produce a size continuum of centres rather than discrete stratification. Moreover, it has been suggested that the existence of a continuum or hierarchy of centres is related to the scale of analysis: taking a large

area such as a whole country would lead to the identification of a continuum (cf. rank-size rule) whereas at the scale of study used here, a hierarchy is more likely to be identified (Berry and Barnum 1962). This study has also been made in an area and a country where few towns possess a large industrial base to their economy and where the distortions in the location and size of towns produced by localized raw material sources and the influence of agglomeration economies is limited. The consumer movements study also suggests that the Christaller model is a more appropriate conceptualization than Lösch since the patterns revealed by goods of similar range and threshold were alike.

All this is not to say, however, that the original Christaller k=4 model is necessarily the best generalization. Qualifications have already been noted and it is possible that refinement of this model could be made. In the first place, the environmental and behavioural assumptions of the Christaller model are unlikely to be fulfilled in the real world although in some respects West Thessaly may come closer to this than many other areas. For example, the plain where the detailed structural study was undertaken does not have uniform population densities but there is probably fairly uniform per capita income. The introduction of the threshold concept permits the ready incorporation of both this fact and the lower densities and income of the mountain areas within the conventional model (Fig. 1:9). At least one of the conditions of perfect competition might also be fulfilled here: namely, free entry of suppliers into the economy and a situation where no one buyer or supplier can influence the market. On the other

hand, a major departure from the behavioural assumptions of the model is the unlikelihood of perfect knowledge amongst suppliers and buyers, and the dubious validity of accepting either profit maximizing behaviour by suppliers and cost minimization behaviour by buyers.

These discrepancies from the ideal Christaller model can in large part be accommodated conceptually by adopting the notions of some of the later developments in the theory which were described in Chapter 1B. Although the environmental conditions may be fairly uniform, such variations that do exist can be accommodated within a classical economic framework by incorporating elements of the model of Mitchell et al. (1974), notably the concept of an aggregate demand surface. This modification also allows the incorporation of a dynamic element: the increase in real incomes and the decline of transport costs is reflected in a changing demand surface which produces changes in the relative hierarchical status of settlements.

The study of hierarchical structure showed that the basket of functions which characterized A-level from B-level settlements appeared to be relatively small. In part, of course, this was because some central functions were not incorporated in the analysis. These, however, were overwhelmingly non-retail functions, and it is for retail activities that the limited difference between A and B centres is most noticeable. An explanation of this can be provided by Funnell's (1973) consideration of the modifications that need to be made to central place theory for low income economies. Limitations on movement provide a basis for the provision of high order

goods at relatively low levels in the hierarchy. The corollary is high margins to enable the distributive system to extend itself. In the area Funnell was concerned with, this lead to the appearance of general stores with a very wide range of stock. To an extent this also happens in Thessaly although general stores of this type are confined primarily to the villages. In the towns more specialized shops are found, but, as Chapter 2B has shown, their size is characteristically small and there is little difference in size between hierarchical levels. This allows the provision of a wide range of goods within any centre and, from the viewpoint of retailing, the differences between A and B level settlements are more in the numbers and perhaps quality levels of shops than the goods which are available (cf. Funnell's hypothesis that stock size will be larger in higher order settlements).

Periodic markets, the other feature of the distributive sector of low income economies, are also found in West Thessaly. Their role in the past was seen to be crucial but a decline took place as real incomes rose and travel times and costs decreased. This study has not examined the spatial and temporal periodicity of markets since the relevant scale of analysis probably should be that of the whole region of Thessaly. However, confined now within West Thessaly to settlements of dhimos status, their role is likely to be complementary to that of fixed retail establishments in the type and quality of goods offered, and is now more similar to that performed by markets in Western Europe. Nevertheless, even if the relative amount of expenditure channelled through them is of less significance than previously,

market day remains by far the busiest time of commercial activity in the towns.

It has been noted that the trade areas of the central places are fairly well defined for low order goods and non-retail activities. For higher order goods the two A centres in West Thessaly extend their influence into the hinterlands of the B centres. This phenomenon can, however, be viewed in terms of interaction theory and Rushton's (1971) concepts on consumer spatial preferences. Even if no attempt has been made here to calibrate a gravity model because of time and data constraints, visual inspection of the maps of consumer movements would suggest the potential validity of a probability model such as Huff's in providing a generalized description of the movements which would be more in accordance with the actual patterns. Rushton's notions regarding consumer spatial behaviour might provide an explanation of the greater importance of A-level centres for higher order goods where comparative shopping is more important, while the continued viability of B-level centres might be seen in terms of the need to combine normal consumer activity with business connected with agriculture (selling or buying produce, livestock, fertilisers etc). It needs to be mentioned, however, that there has been growing dissatisfaction with conceptualizations of aggregate consumer behaviour such as these, and increasing emphasis is being placed at the level of the individual (see Golledge and Rushton 1976, for example). On the other hand, major difficulties arise in attempting to fuse the two approaches and it may be necessary to continue to treat them separately (Hudson 1976).

SECTION B COMPARATIVE ASSESSMENT

(a) The Weighted Functional Index

The Weighted Functional Index which was developed to measure settlement centrality in this study would appear to be a more accurate and appropriate index than the original. Its purpose was to yield a measure of relative centrality rather than nodality. Examination of the differences in the values of the weighted indices and Davies' functional indices (Table 7:1) in relation to patterns of consumer movements confirms that it fulfils this aim. Table 7:2 shows the rank correlation coefficients between the indices and their retail and non-retail components for all the 153 settlements with central functions. Retail, non-retail and total functional indices all have high correlations with their weighted equivalents and the lowest correlations are those which are not directly comparable. More important, however, than similarities or differences in the ranking of settlements arising from application of the weighted functional index are differences in the relative values of the indices.

As the analysis of consumer movements indicated, in West Thessaly the first eight settlements ranked by functional index are the only ones which clearly act as central places for a wide range of functions. The weighted index gives a more accurate indication of the centrality exercised by these settlements: this is particularly apparent when considering retail functions which tend to be more uniformly distributed than non-retail ones. Thus, Trikala and Kardhitsa have unweighted retail functional indices of 1843.4 and 1608.1 respectively, reflecting the larger

TABLE 7:1

Functional Indices and Weighted Functional Indices for First Twenty Settlements Ranked by ~~Weighted~~ Functional Index

	1971 Popn	Functional Indices			Weighted Functional Indices		
		Total	Retail	Non-retail	Total	Retail	Non-retail
Trikala	34,749	2955.7	1843.4	1112.3	2384.5	1451.3	933.2
Kardhitsa	25,685	2471.2	1608.1	863.1	2072.0	1416.5	699.5
Kalambaka	5,453	628.4	323.1	305.3	813.3	370.2	443.1
Sofadhes	4,505	403.7	289.5	114.2	468.1	364.5	103.6
Palamas	5,318	325.2	211.2	114.0	271.3	186.1	89.2
Mouzakion	2,626	286.2	201.6	84.6	483.3	360.9	122.4
Pili	1,759	203.8	170.4	33.4	381.6	338.7	42.9
Farkadon	2,175	155.0	108.6	46.4	184.1	134.3	49.8
Neochorion	3,089	89.3	62.9	26.8	79.3	57.6	17.7
Leondari	1,435	84.7	45.1	39.6	117.6	57.1	60.5
Fanarion	1,310	80.1	30.2	49.9	136.0	45.2	90.8
Itea	1,445	61.0	37.4	23.6	73.6	41.4	32.2
Proastion	1,971	54.7	27.9	27.2	56.7	28.4	28.3
Megala Kalivea	2,333	46.9	10.1	36.8	71.0	6.2	64.8
Fiki	1,057	46.2	24.8	21.4	79.0	40.6	38.4
Kedhros	1,131	32.7	19.8	16.9	52.1	24.3	27.8
Mataranga	1,832	20.3	23.5	6.8	22.5	18.2	4.3
Mavrommation	1,689	26.8	22.7	4.1	21.3	19.4	1.9
Megalochorion	1,860	26.7	9.3	17.4	23.2	5.3	17.9
Metropolis	1,504	23.8	15.2	8.6	29.3	21.6	7.7

TABLE 7:2

Rank Correlation Coefficients

		1	2	3	4	5	6
1	Functional Indices	1.0					
2	Retail Functional Indices	0.94	1.0				
3	Non-retail Functional Indices	0.86	0.71	1.0			
4	Weighted Functional Indices	0.85	0.78	0.77	1.0		
5	Retail Weighted Functional Indices	0.86	0.94	0.61	0.85	1.0	
6	Non-retail Weighted Functional Indices	0.39	0.22	0.66	0.64	0.29	1.0

With 151 degrees of freedom all correlations are significant at the 0.01 level or above.

population of Trikala, while their weighted indices of 1451.3 and 1416.5 indicate their similar positions as central places of retail functions. Similarly, Kalambaka, Sofadhes, Mouzakion and Pili have unweighted retail indices ranging from 323.1 to 170.4, but the weighted indices range only from 370.2 to 338.7, reflecting their identical roles as local retail centres below the two nomos seats. Equally significant, the much lower weighted indices of Palamas and Farkadon indicate the much more limited centrality of these settlements: it was shown in Chapter 6 that they attracted customers from much more circumscribed areas than the other four.

Although there are high correlations between the weighted and unweighted indices, this is not altogether surprising considering the dominantly agricultural nature of the study area. It would be interesting to see whether a greater discrepancy is found in an area where industry has distorted the settlement pattern and size distribution. Even so, however, R.L. Davies (1970, p.60) has compared a number of indices of centrality, finding close rank correlation coefficients between virtually all of them. He concluded that 'for many broad scales of enquiry general indices from census data are just as suitable criteria for measurements of hierarchic rank importance as other more specific types of functional indices.' Nevertheless, it could be argued that even in an area like West Thessaly the use of the weighted index is preferable to other indices since it does appear to give a more accurate measurement of settlement centrality, a useful advantage if this is the focus of the study.

(b) Comparison with Previous Classifications in Thessaly

The study of the structure and behaviour of the settlement system of West Thessaly which has been made here contrasts with those of the Regional Development Service (Y.P.A.T. 1968), Sivignon (1971, 1975) and the National Polytechnic (1971) in at least two important respects. Firstly, it has been rather narrower in its approach, being based primarily on a consideration of tertiary activity, and, secondly, it has adopted rather more rigorous and objective methods of analysis. It also, of course, has been largely confined to two nomoi whereas the first two covered the whole region, and the third was concerned only with the Pindos mountain area of both Thessaly and Epirus.

The Y.P.A.T. classification was based on nine criteria which, it can be inferred from the groups' nomenclature, were intended to categorize places on their importance as centres. The allocation of settlements to the three levels identified (Table 5:1) seems nevertheless to have been made on a rather arbitrary basis, and there are some notable discrepancies between the classification and the one developed in this study. The most significant difference is the allocation of some B-level settlements to the highest category which includes the nomos seats: Palamas with Kardhitsa and Kalambaka with Trikala. Neither are the remaining B settlements in West Thessaly all in the same category: Pili is placed below Farkadon, for example. From the specific viewpoint of functional equipment and centrality, the analyses made in Chapters 5 and 6 suggests that there is little validity to this categorization.

Sivignon also specified particular criteria for his classification but there is a degree of vagueness in their application. Thus, for example, there are rather arbitrary percentage limits - a 'town' has less than 25 per cent of its active population employed in agriculture - while there is a lack of rigour in others (for instance, a 'village centre' nearly always has a weekly market or annual fair) which suggests some preconception about the classification. The 'mathematical evaluation' is based on an apparently rather random selection of criteria while the point allocation is completely arbitrary. Nevertheless, there is closer accord between Sivignon's classification and the one developed in this study than with the Y.P.A.T. one. The A-level nomos seats correspond to Sivignon's 'towns'. Similarly, most of the B centres correspond to Sivignon's 'village centres' except Kalambaka which is a 'small town' (and this was regarded in Chapter 5 as being different from the other B settlements because of its greater provision of non-retail functions). Sivignon does not, however, identify anything equivalent to the C-level settlements identified in Chapter 5D. While these did appear to emerge as a group in terms of their functional provision, Chapter 6 showed that their present day role as centres is limited, and that they may be regarded in some sense as relicts from a period when transport costs and times were higher.

The intuitively derived National Polytechnic classification is the closest to the one developed in this study. Although the areas being considered do not overlap greatly, where they do the classificatory groupings are the

same for A and B settlements. Moreover, it is interesting that two further levels are identified between the B settlements and the spectrum of undifferentiated villages.

Thessaly is now the region of Greece where most work has been done on settlement classification. Yet, as this sub-section has indicated different workers derive different groupings, a problem that is common to most central place work. This makes wider comparisons of the results of work in other areas with this study not a very productive exercise. It is necessary, however, to compare the studies of Thessaly with those made elsewhere in Greece to derive a composite picture of the national settlement system.

(c) Comparison with Other Classifications in Greece

At the national scale only one attempt has been made to derive a multi-variate socio-economic classification of Greek towns (Vlachos 1966), and only one classification of the settlement hierarchy has been proposed (K.E.P.E. 1967).

Vlachos's study was simplistic, not using any of the multi-variate statistical techniques with which such classifications as Moser and Scott's of British towns (1961), Ahmad's of Indian cities (1965) and Berry's of the Chilean urban system (1973) were made. The intention of Vlachos was to establish a basis for the classification of Greek towns according to their socio-economic structure. Using 1961 census data for the 29 Greek towns with a population of more than 20,000, he ranked them on six variables: the

proportion of population between 15 and 64, the proportion married, the proportion illiterate, the proportion of economically active population engaged in agriculture, the proportion of households with home industry, and an index of ageing. The ranks of each town on each of these variables were summed to produce an 'urban score', a low value of which indicated a high degree of 'urbanization'. The results were difficult to interpret and no typology of Greek towns was suggested. The conclusion was that 'Greek towns are mixed entities in a variegated spectrum of socio-economic characteristics, lacking at the present the neat ordering of urbanization according to size. The only exception to the above generalization are the two metropolitan regions of Athens and Salonika which seem to be more consistent to expected patterns of urbanization.'

The Centre for Planning and Economic Research (K.E.P.E.) produced a report on Planning the Development of the National Network of Urban Centres in 1967. So far this has remained the only report by a government organization on this subject. The empirical basis to the work is not described in any detail but it appears to be rather weak: for example, it used the National Statistical Service's definition of a town as a place with a population of more than 10,000 rather than any functional criterion.

Three hierarchical categories of urban centres are identified:

(1) the Capital (Athens),

(2) metropolises and regional centres (Thessaloniki, Patras, Volos, Iraklion, Chanea, Larissa, Kavala), and

(3) the remaining towns (47 centres with a population between 10,000 and 44,000 in 1961).

The towns of both the second and third tiers are considered to be lacking development potential. Thus, except for Thessaloniki, the second level settlements do not have 'the economic base, the urban character, the size of population, and services.... of the proper level.' Moreover, the territories over which they are expected to exercise their influence are 'excessively large'. The third level settlements are noted to have the following undesirable characteristics: (a) most do not have sufficient urban equipment to satisfy the demand from themselves and their hinterlands; (b) many of them are located off-centre within the surrounding area; (c) many areas of influence are excessively large; and (d) the networks of connection of the centres within their areas of influence are in most cases defective. The report indicated that the most progressive regions of the country lie along an S-shaped axis from Kavala to Athens to Patras. Apart from in this axis 'the most important natural and human resources of the rest of the country are not sufficiently exploited, technical infrastructure, and equipment in the social services are defective etc.'

Despite the rather arbitrary nature of the classification system adopted in this study, the intuitive assumption of a three tier hierarchy in the national urban system is not without validity. Furthermore, as a first consideration of the Greek urban system it might be unfair to level too much criticism at its weaknesses; more serious, perhaps, is the fact very little has subsequently been done to develop the ideas and suggestions which it makes.

The only other classification of settlement systems to have been made in Greece is one of Peloponnesia as part of a comprehensive study of the economy and population of the region produced for the Ministry of Co-ordination (National Polytechnic 1973). Four main categories (with sub-divisions) of settlements were defined on the basis of population size and the extent of hinterland areas. The latter were derived from questionnaires which appear to have been conducted in a random, arbitrary and unsystematic fashion. Below the four categories of settlements with some urban functions come the majority of rural settlements.

In drawing a picture of the Greek urban system, a combination of the national network study, that on Peloponnesia and the studies of Thessaly (including this one) can be used to suggest a basic classification despite the obvious differences in methodology. Given the findings of these various pieces of work, the urban system of Greece might therefore, in fairly general terms, be conceived as consisting of four levels:

1 Athens: the administrative, commercial and industrial centre of the country.

2 Regional capitals: commercial centres with some regional administrative functions. By virtue of its size, industrial and administrative roles, Thessaloniki might be legitimately considered as a special case.

3 Nomos seats: local administrative and commercial centres. A sub-group of ports and small industrial centres could possibly be identified.

4 Rural service centres: small towns offering mainly low and middle order commercial servicesto their hinterlands.

There are two principal dimensions to this classification. In the first place, there are administrative and other government related functions such as education and health. The hierarchy of these is well defined. Athens is the seat of government and the location of most of the major institutions in the country. Thessaloniki has a similar range of functions and acts as a regional capital for northern Greece. It even has a Ministry for Northern Greece although this acts as an arm of the central government rather than in any autonomous or semi-autonomous fashion. The regional centres (see Chapter 8B) form another group even if their current role in day-to-day administrative and other functions is rather limited. Next come the nomos seats. Varying considerably in size, the administrative functions they perform are nevertheless identical. Below these come the eparchy seats although their administrative functions are limited and depend to some degree on the size of the town and the population of the eparchy.

The second dimension to the classification is commercial retail and non-retail activity. Most of this activity is, of course, concentrated locally, and this study has suggested that at this scale two principal hierarchical levels may be identified: an A-level which in West Thessaly, and probably elsewhere, corresponds to the nomos seats, and a B-level where the size of settlements is related in part to the size of their hinterlands but where all the centres are subordinate in functional terms to the A-level. The difference between the two levels lies more in the number rather than the range of types of establishments, and perhaps also in their quality. In Thessaly it was found that Larissa acted as a focus

for some commercial activity for the people of the western nomos, and it may be that a similar region-wide role is performed by larger towns in other parts of the country. Athens and Thessaloniki were also found to exert some influence in West Thessaly: in terms of expenditure their relative position is probably greater than that indicated simply by the volume of consumer movements.

The classification of the national urban system which has been suggested here is only on the basis of tertiary activity. Even here, however, additional dimensions could be considered: in particular, the tourist industry has produced a considerable number of small, specialized settlements oriented to this function. These might intuitively be regarded as a fifth group although no research work has yet been done on them.

In terms of secondary industrial activity, a general classification of towns would probably not differ substantially from that for tertiary activity. Greater Athens and Thessaloniki are the first and second industrial centres of Greece, and below these come the provincial towns whose industrial sectors are dominated for the most part by small scale, local raw material-oriented industry. Ports may form a sub-group of these.

CHAPTER EIGHT

THE SETTLEMENT SYSTEM AND PLANNING STRATEGIES

In this study of the structure and functioning of the settlement system in part of provincial Greece, the adoption of a central place systems framework for the analysis has been useful in both dictating the organization of the research and in understanding the observed patterns. It can be taken further, however, since there is a potential practical application of this work in economic and regional planning, and it is this subject which will be explored in this chapter.

The dominance of Athens in the space economy of Greece had already been indicated at a number of points in this thesis. A more detailed examination of the nature and causes of this phenomenon will be made in the first section. Secondly, a review of the policies which have been used to alleviate the problem will be made, and, finally, the implications of this research for future planning strategies will be considered.

SECTION A THE GREEK REGIONAL PROBLEM

The extent to which migration has been occurring away from Thessaly in particular, and provincial Greece in general, was outlined in Chapter 3D. The prime focus of these movements has been the Athens region although Thessaloniki now exerts considerable attraction within northern Greece. A number of studies have shown that in the post-war period the major generating force of these internal population movements (and also of emigration) has been the rise in the material aspirations of people and the difficulties of fulfilling these

aspirations virtually anywhere but in the large cities. The breakdown of traditional rural society and adverse attitudes to the whole nature of rural life are important contributory factors. This migration has resulted in the very fast growth of Athens (an increase of 84.3 per cent since 1951 to a total of 2,540,241 in 1971), so that in 1971 it contained 29 per cent of total population and 56.3 per cent of 'urban' population. During the same period Thessaloniki grew by 62.3 per cent (1971 population, 482,361). In contrast, the majority of provincial towns did not grow at a rate much greater than that of the total population of the country: overall, the growth of the 53 other towns with a population of more than 10,000 in 1951 was only 18.4 per cent.

The relationship between the capital and the provincial regions of Greece was characterized by Hoffman (1967) as 'Greater Athens .... versus the rest of the country'. It is most obvious in the economic differences that exist between the city and elsewhere which are summarized clearly in differences in per capita G.D.P. (Table 2:4). The disparities in resource consumption which these data suggest can be 'in their most dramatic form.... encapsulated in such brief statements as:

- Athens has more than half the hospital beds;
- Athens has more than 85 per cent of the specialist medical practitioners in the country;
- Athens has 70 per cent of the Greek students enrolled in higher education;
- Athens has one car for every 55 inhabitants versus 436 for the rest of the country;
- Athens accounts for 60 per cent of the power consumed in the country as a whole.' (Vlachos 1976).

Taking industry, the Athens region contains about 60 per cent of firms employing more than 100 people; in terms of service provision it contained almost all the Large Stores found in Greece in 1969. In non-economic fields the city also dominates. Politically, it is the seat of a highly centralized government of which the local government machinery is little more than an appendage (see Appendix A). Socially, it is the only true international centre in the country and it is the base of the Greek political and entrepreneurial elites.

Although not as great as in many Third World countries, the primacy of Athens in simple population terms is of a much higher degree to that found in the other Balkan countries, and the census data from 1920 show it to be increasing (Bennison 1970, Lagopoulos 1971). The consequences of this for both the city itself and for the rest of Greece are considerable.

The rapid growth has produced many social, economic and environmental problems for Athens. The continuing growth of the city is tending to intensify these difficulties and nullify attempts to alleviate them. In 1966 the 5th congress of Greek Architects stated in its conclusions 'that Athens was threatened from ten dangers: urban sprawl, heavy traffic, centralization and concentration, lack of umbilical services, horizontal rather than vertical building, destruction of limited greenery, irreversible destruction of natural resources, intensifying pollution of all forms and types, lack of recreational areas for children, and the destruction of archaeological and legal (sic) resources.' Eleven years on, there are few signs of improvement in any of these areas.

The physical growth of the city has matched that of its population. The tendency has been for continual outward expansion of housing at relatively low densities, some of it being built without official authorization. Although extensive areas of shanty housing are not found,[2] the standards of facilities may not be very high by western European standards even if overall they tend to be better than in the rest of Greece (especially rural Greece). Thus, 27 per cent of dwellings in 1971 had no separate room for the kitchen, 31 per cent had no bathroom and 23 per cent had no W.C. with a plumbing system.

Perhaps a more serious matter than the quality of new housing is the frequent non-provision of community infrastructure such as sewage and drainage systems, street lighting and surfaced roads and pavements. At the same time, the limited physical planning that is done has no influence on the aesthetic quality of the townscape. This has resulted in very large areas of singularly unattractive suburbs which are virtually unbroken by any large public open spaces.

Traffic congestion on the roads and inadequate public transport produce circulation difficulties within the conurbation. The traffic is also a major source of the atmospheric pollution which is now damaging the ancient monuments of the city as well as causing a potential health hazard and serious noise nuisance. Other forms of pollution arise from the absence of sewage treatment plants (much is discharged raw into the Bay of Phaleron) and the inadequate drainage system which produces flooding after any heavy rainfall. Heavy industrial developments, especially in the Elefsis area, magnify the problems of waste disposal.

That the quality of life for the average Athenian in terms of physical environment may not, therefore, be too high does not appear to constitute a major disincentive to movement to the city. Rather, it seems to be tolerated as the price for higher incomes and material standards of living. Nevertheless, the continuing lack of effective intervention to attempt to reduce the rate of growth on the one hand, and to accommodate the growth on the other, does not encourage unqualified optimism for the future of the city.

For much of provincial Greece it is the problems consequent to depopulation which are most evident. It was noted in Chapter 3D that there is a tendency for inter-regional migration to be concentrated within younger age groups, and within these to the better educated. This creates a social imbalance within communities, especially in rural areas, which has potentially adverse economic implications since the migrant group probably includes many of those people who would be most likely to introduce or adapt new ideas in agriculture, while in the towns the people who leave may include those with potentially the greater entrepreneurial and business expertise.

Government measures to improve agriculture are of three principal types: the development of the physical resource base (for example, drainage, irrigation, flood protection), land consolidation, and extension services. Each is dependent, to a greater or lesser extent, on the co-operation, willingness and commitment of farmers to development. Land

consolidation, for instance, is done partly on a voluntary basis and farmers' suspicions towards the intentions of the government have been one factor in the relatively slow pace of the programme: these fears 'were derived from 'traditional' norms such as an emotional attachment to family property and a fear of economic loss that had not been sufficiently allayed - namely that good land would be exchanged for land of inferior quality and that the value of lasting crops (mainly olive and fruit trees) would be lost' (Weintraub and Shapira 1975, p.52). Taking innovations, agricultural research in Greece is fairly advanced, and its impact has already been felt. There is a state extension service which employs agents who attempt to assess and improve the agricultural potential of their areas. Their influence is beneficial where there is a readiness by the population to absorb change, but their efforts are not institutionalized and no attempts are made to develop village leadership and to initiate projects of community interest. Hence, the more traditional people are less easily persuaded to adopt innovations.

Sociological studies of Greek industrial entrepreneurs have shown that the average level of education is considerably higher among this group than in the population as a whole. Alexander (1964) found that 44 per cent of industrialists had graduated from at least high school, and a further 35 per cent were university graduates (compared to only 4 per cent of the Greek male population at the time). This higher level of education applied equally to those who came from a rural or small crafts background as to those from an industrial one: 'it is ...striking that 35 per cent of the industrialists born in communities of less than 2,000 graduated

from universities. These are generally poor communities producing the highest proportion of self-made industrialists ..... Our data suggest that there must have been a considerable number of individuals whose drive to get educated was sufficient to overcome the handicaps of humble origins. It was the same drive which eventually led them to business success.' A later study of small industrialists in three towns of northern Greece by Negreponti-Delivanis (1974) p.43 also revealed higher levels of educational attainment than the national average: 55 per cent of the sample of 494 had graduated from at least high school.

The impediment to indigenous regional development which is posed by the departure of many of the group who would be considered most likely to respond to opportunities for economic growth in strengthened by the movement of capital with migrants outside the region. In large part this is invested in housing and/or a small business in the new place of residence. Another common feature is for migrants to retain ownership of agricultural land since it can provide some additional income and acts as an insurance against failure. This hinders more efficient cultivation and the creation of economic farm units. Sivignon (1975) p.493 noted, for example, the tendency of migrants to favour crops such as olives or wheat which need attention only at crucial periods. Overall, therefore, rural depopulation can mean that scarce resources are not being exploited to their full potential (Lowenthal and Comitas 1962, Wagstaff 1968), and this has consequences for provincial towns.

It was seen in Chapter 2A that the majority

of the economically active urban population of every region is employed in the Service sector. This was found more specifically in Thessaly where the towns have economies which are based largely on the processing of local agricultural produce and on the provision of services to their hinterlands. The effect of maintaining an agricultural system which does not maximise production must therefore be detrimental. By failing to provide an active stimulus to agriculture-based industry and by keeping real disposable incomes low with a consequent depressing effect on service activity, the result is stagnant urban economies with an associated absence of new employment opportunities. The existence of large numbers of small service and industrial establishments at low margins which results from this may in itself act as a discouragement to the setting up of productive new enterprises.

In a number of ways, therefore, movement from a region will tend to generate further movement, and there is a potential danger of downward cycles of a cumulative nature beginning on more than a localized scale. Certainly, the complete depopulation of extensive upland areas with a very limited resource base has been unavoidable, but it is not a fate that should overcome those many lowland areas where an adequate physical basis for further development exists. The continuing social and economic attractiveness of the Athens region for migrants and entrepreneurs makes such regional development harder to achieve and it is therefore in this field that government needs most to act to redress the balance in favour of the provinces. Nevertheless, the forces which have produced this situation are powerful and by no means are they easily counteracted.

Basically, three groups of factors might be identified which have led to the development and continuation of the dichotomy between Athens and the rest of Greece. These are, firstly, the inadequacy of alternative growth points; secondly, economic forces which favour Athens as the location of new enterprises in industry or services; and, thirdly, political factors related partly to Athen's function as the seat of a very centralized government and partly to the dominance of right-wing political philosophies which historically have opposed large scale government intervention in the economy on either a sectoral or regional basis. These factors have already been touched upon at various points in the thesis and they have been considered in more detail elsewhere (Bennison 1973). It would be useful, however, to summarize them at this stage.

The stagnant performance of the economies of most Greek towns is partly a function of low productivity in agriculture (see above) but also partly a function of the relative absence of large scale basic industry. Most industry in Greece is small scale and strongly market oriented (Chapter 3C) which means that the impact of a new firm locating in a town will be fairly small in most cases since it neither creates any strong multiplier effects nor sets up strong backward and forward linkages. There are thus relatively few towns in the country where industry is the raison d'être. In many of the towns where industry does have a more significant role, particularly those in northern Greece with tobacco and textile industries, the situation has been little better because of the relative or absolute decline of these industries. Most of the towns where industrial expansion has been taking place are

either part of Greater Athens or are near the city. In the provinces Thessaloniki has been the major and important exception with considerable industrial development during the last fifteen years. Ptolemais in Western Macedonia is the only small provincial town whose rapid growth since 1951 can be attributed primarily to industrial development (based on a lignite field).

The tertiary sector of urban economies does not generate a large amount of new employment - tourist developments are a possible localized exception - and, as already noted, its growth is strongly related to the performance of the primary and secondary sectors of towns and their hinterlands. Furthermore, this study has suggested the existence of a substantial degree of under-utilization of existing commercial service establishments: the number of outlets of various functions is generally rather higher per unit population than that found in the higher income countries of Western Europe and North America although employment levels are not so different. It seems probable therefore that a substantial expansion could take place in tertiary economic activity in many Greek towns without necessitating any new outlets or employment.

Two main types of economic force are operating which favour the growth of Athens rather than provincial towns. Firstly, there are the scale, localization and urbanization economies associated with the agglomeration, and, secondly, there is the process of circular and cumulative causation. The former have a direct influence on the cost structure of firms and the opportunities to tap these economies is greatest

in Athens which forms the largest market, is the centre of national communication networks, and has the best provision of social and economic infrastructure. The latter is the process suggested by Myrdal (1957) and applied to metropolitan growth by Pred (1965) which acts to increase rather than decrease the inequalities between regions. This theory provides the basis for an historical examination of the development of the dichotomy by Evangelinides (1975).

The centralized nature of Greek government and administration was derived from the French system (Argyriades 1968). It has influenced the growth of Athens in two ways: firstly, a very large number of people are employed either directly or indirectly in the business of government, and, secondly, it has encouraged the congregation in Athens of those people with the greatest initiative for economic enterprise in order that they may be near the decision-making centre.

The domination of post-war Greek politics by conservative philosophies has meant that state intervention in the economy has been primarily on a sectoral basis and not much effective action has been made in the field of regional planning. The net result has been that very little has been done to counteract the growth of Athens and stimulate substantive development in most regions. Since the role of government is crucial in this problem, the next section examines regional development policies in more detail.

SECTION B REGIONAL DEVELOPMENT POLICY IN GREECE

The degree of intervention by a government in an economy is dictated strongly by its political stance.

Following the Civil War, Greece underwent a period of very conservative government up to 1963. Less reactionary forces became more widespread in the mid-1960s but were suppressed by the military government which took power in 1967 and retained it until 1974. Since then and the establishment of a democratic republic, government has remained fairly conservative. From the specific viewpoint of planning all this has meant fairly limited intervention in the economy on either a sectoral or, more especially, regional basis. Most policies have been directed towards the establishment of private industry, the encouragement of foreign investment and the maintenance of high growth rates. In this they have been generally successful, especially since the late 1950s, and Greece had a growth rate of about 7 per cent per annum until the recession of 1973/4.

As far as regional development policies are concerned, the realization of the problems that were being created by the rapid growth of Athens and the depopulation of extensive rural areas only came slowly. Even then it was the influence of outside agencies such as O.E.C.D. and E.E.C. which were as instrumental in drawing them to the attention of government as domestic pressures.

The first regional policies were aimed at the decentralization of industry from Athens. Tax and tariff relief were the incentives used to attract industries to the provinces. They were first introduced in a decree of 1952 and subsequently formlized in Acts in 1955, 1959 and 1961. Coutsoumaris (1963) considered that such measures were unlikely to be successful, criticizing them from a number of aspects:

1 Some of the incentives were of little monetary value.

2 There was no specific provision at all regarding the regions to which decentralization should have been directed. The only broad distinction was for industries which were to be established outside the Athens region and either in the provinces or in the Islands.

3 The policies implied that the establishment of a firm outside Athens involved diseconomies because of location and/or that establishment in the provinces was not attractive to Greek entrepreneurs. A higher rate of profit was therefore assumed necessary to lure them away from Athens.

4 No distinction was made regarding the type of industries which should be pushed towards the outlying regions.

5 Only to a limited extent did the benefits affect the cost structure of firms.

As well as these largely ineffectual measures some localized small welfare programmes were initiated in a number of places during the late 1950s. The first systematic regional development programme was established in 1958/59 for Epirus, the poorest of the Greek regions. It was initially an 'experimentation and demonstration zone' and was incorporated into the first five year National Development Plan (1960-64). Some general regional development objectives were also proposed in this Plan although no specific measures for achieving them were suggested. Neither was there any institutional framework for implementing any kind of regional development policies.

During the early 1960s some organizational measures were introduced which provided a basis for future regional planning. The administrative innovation was the setting up in the Ministry of Co-ordination of a special section to deal with regional development policy and to co-ordinate the new Regional Development Services in the regions of Epirus, Peloponnesia and Crete. The purpose of these Services was to examine the problems and potential for development in their respective regions, formulate plans, and co-ordinate local projects. Without financial assistance, however, most programmes were not implemented. In 1965 and 1966 Regional Development Services were created for Thessaly and Northern Greece, and in 1967 for the Aegean Islands and Central Greece (Chiotis 1972).

The second National Development Plan for 1966-70 included some firmer proposals for regional development and these were retained in the military government's 1968-72 National Development Plan which replaced it (Ministry of Co-ordination 1968). A plan for the period 1973-77 was prepared but was never published. After the return of parliamentary democracy in 1974 a formal application was made by Greece to accede to full membership of the E.E.C.[3] and, as part of the preparations for this, detailed economic plans are in the process of being drawn up. At the time of writing these were not yet available, but it seems that as far as regional development policy is concerned the general approach will not differ greatly from the 1968-72 Plan.

The basic objectives of regional development policy were seen in the 1968-72 Plan as follows:

'(a) Exploitation of resources and development of each regional economy according to its comparative advantages in the dynamic sense within the framework of the long term perspective concerning the locational pattern of the Greek economy. This aim is closely related to the need to increase the competitiveness of the economy on the national and regional scale in view of the country's association with the E.E.C.....

(b) Development of complementarities in each regional economy and re-adjustment of its overall socio-economic structure.... This will accelerate the reduction of disparities in incomes and standards of living among the various regions and increase their resilience in the face of economic crises.

(c) Rational distribution of activities and population throughout the country, and provision of the required social services and facilities through a graduated and fully equipped system of urban and rural centres. This fundamental objective requires that henceforth every effort be made to contain the excessive outflow of population from areas where sufficient economic resources are available but are not being exploited because of defective operation of the market mechanism. Areas that lack such resources and do not have any special national significance must be abandoned.

(d) Reduction of the disparities existing among the various regions, especially between Athens and the

rest of the country in terms of income and standards of living.' (Ministry of Co-ordination 1968, pp 39-41).

In order to implement policies concerned with these aims the Plan also suggested a number of organizational measures which were required. These involved the definitive delineation of planning regions and the adjustment of other administrative boundaries to those of these regions. The re-organization of the Regional Development Services and the establishment of effective co-ordination between the central planning authorities and regional administration was also proposed. As well as these recommendations the public investment programme was envisaged to lay stress on certain categories of economic and social infrastructure, as follows:

'1 Carefully selected industrial areas and zones will be provided with transport and communication facilities, electric power, water supply and sewerage systems, technical schools and workers' housing. Encouragement will also be given to the establishment of banking and financial institutions and other specialized services which, together with decentralized administrative services, will meet the needs of provincial industries adequately and on the spot.

2 Regional transport and communications facilities will be improved .....

3 The educational system will be improved .....

4 Regional urban centres and small towns will be provided with the necessary social services such as medical care and hospitals, proper housing conditions, social and cultural activities, and other facilities which are

> indispensable if it is intended to discourage the outflow and attract an inflow of population, businessmen and managerial personnel into the various regions.' (Ministry of Co-ordination 1968, pp. 42-43).

Since the Plan was published a number of its proposals have been implemented. In 1970 a new regional delimitation of the country was proposed and was realized in 1971. This divides the country into seven regions for the purposes of regional development planning as well as for wider administrative functions (Fig. 8:1). The proposals in the Plan for a greater degree of co-ordination between the central and regional administrations have also been implemented although the degree of local autonomy remains very low.

Considerable progress has been made in the provision of infrastructure in the regions. In particular, the electrification of many rural areas, the building of surfaced roads, and tourist developments have been occurring on a large scale since 1968. Industrial zones at Thessaloniki, Volos, Patras and Iraklion have also been established.

Certain reservations can, however, be expressed about the efficacy of these kinds of policies in leading to any fundamental change in the spatial imbalance which exists in the country. In the first place, there is some contradiction in the stated aims of regional planning. Thus, the desire to increase national output and productivity as fast as possible to make the country's economy competitive enough for E.E.C. membership is at odds with the desire to create balanced regional economies, reduce regional out-migration and minimize regional disparities in income and living standards.

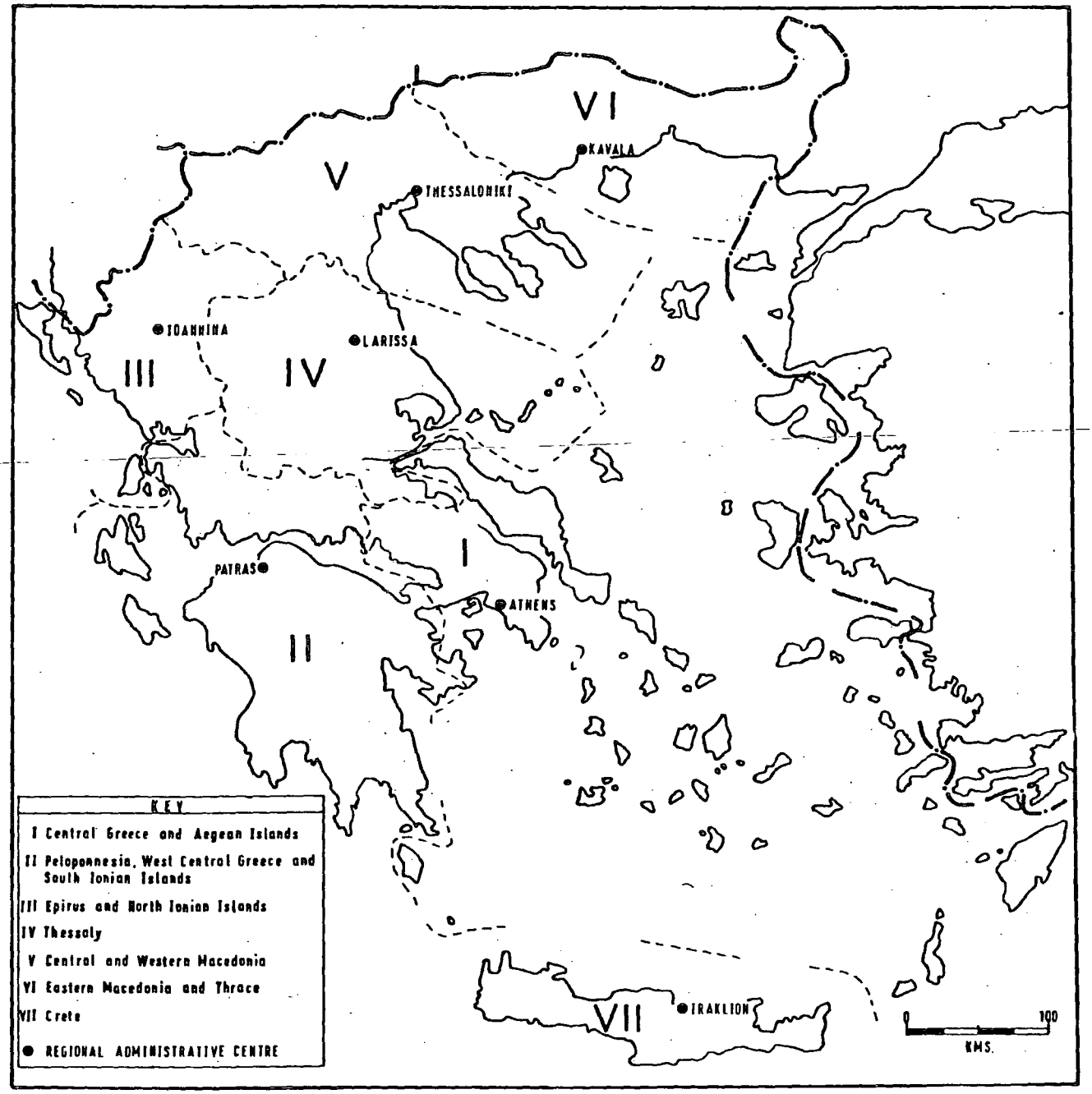


Figure 8:1 Planning regions and regional administrative centres.

The Athens region already has many advantages for the industrial and commercial entrepreneur while in the provinces there are considerable inter-regional differences in the resources available and the means to exploit them. The amount of intervention that would be required to eliminate the comparative advantages of one area over others would be incompatible with improving national productivity since it would require the diversion of resources from productive investment to the subsidization of uneconomic enterprises. Such a policy is unlikely within the existing political and economic environment of Greece; even in Yugoslavia such policies have been subject to major revision (Hamilton 1968).

The adoption of a growth pole approach to the encouragement of regional industry is one with both theoretical and empirical validity. Yet it must be doubted whether it is sufficient simply to provide facilities in a selected number of industrial zones and hope that these will in themselves attract industry. Experience in Turkey, for example, showed that even where new growth poles could be shown to be economic locations, private entrepreneurs preferred the perceived security of established industrial areas, and only a limited amount of state-owned industry was located in the new poles (Rivkin (1965)). There is also a need to differentiate between different types of industry and link specific industries with specific locations, a deficiency common to the earlier policies as well.

As far as tertiary activity is concerned, there is even less specific consideration given in the Development Plans to this sector than to the development of

regional industry. Neither has mention been made in these Plans of the roles that different levels of the settlement system should play in the space economy of the country. The most detailed statement by a government organization remains that in the 1967 K.E.P.E. study of the national urban network. This report suggested that the settlement system of Greece would be most effective in promoting regional and sub-regional development if it were based on a four-tier hierarchical system. The levels suggested are as follows:

1 National Level: Athens, with the whole country as its area of influence.

2 Metropolitan Level: Thessaloniki (and Athens). The role of this level is to limit the growth of certain categories of activities in the capital and to create new possibilities for urban and regional development.

3 Regional Level: regional poles of development which act as centres for development below Athens and Thessaloniki.

4 Local Level: centres which offer to their hinterlands administrative services at nomos level, vocational training, health services and a great variety of basic commercial goods and personal services within the distance of a comfortable trip.

The report concluded by outlining a number of general policy measures for the implementation of the recommended scheme. For the most part they are rather unspecific. For example, it is recommended that the following categories of manufacturing activities be oriented towards the regional poles of development: labour intensive industries, industries

of high growth rate, city building industries and industrial poles creating industrial complexes (sic).

SECTION C THE SETTLEMENT SYSTEM AND FUTURE PLANNING STRATEGIES

This study of the settlement system of Thessaly is the most detailed such investigation to have been made in Greece. An outline of other research work done in Greece pointed to the rather subjective methodologies used and the arbitrary classifications derived from them although the basically simple structure of the Greek settlement system means that, where comparable, the groupings were not substantially different from each other. However, the use of a framework derived from central place theory does allow attention to be directed specifically to the forces which organize tertiary activity in space. As the creation of an efficient spatial structure is a major element in maximising social and economic welfare, the application of the principles of central place theory is a valuable aid to the creation of a policy framework which will avoid wasteful locational strategies and achieve a more efficient allocation of resources. Although used widely in many places, the potential of this approach is only gradually being appreciated in Greece (Andreadhis 1966, Thessaloniki University 1975) and still remains to be applied in practice. Compared to many countries in the world, the relatively unsophisticated state of Greek planning in general is, of course, not unusual (Gilbert 1976), but in a European context it does contrast unfavourably with the systems operating in most countries.[4] Given the eventual accession of Greece to the E.E.C., the problem of regional inequalities within the country also becomes part of the problem of regional

inequalities within the community. The optimum allocation of resources, both internally and externally provided, therefore becomes a concern for more than the Greeks alone.

The preceding section did show that there has been some recognition in Greece of the fact that regional development requires sectoral economic development policies to be related to the settlement system but also that much work still needs to be done in refining and actually applying these principles. Not least among the problems of doing so is the paucity of information and research work on many of the relevant aspects of this question. From one viewpoint this thesis can be considered as an attempt to improve knowledge of one of these aspects - the structure and behaviour of the Greek settlement system - and this section will explore the implications of the research for future planning strategies.

1 Implications for planning research and administration

The basis for any effective formulation and implementation of regional planning policies is good knowledge of the physical, economic and social characteristics of the region(s). Because of this obvious need, and the lack of centrally collected and published data, the activities of most of the Regional Development Services were initially concentrated on providing such information: the work produced in Thessaly has already been used in this research (Y.P.A.T. 1968). It was seen in Chapter 7B, however, that as far as the specific topic of settlement classification was concerned that derived in Y.P.A.T. (1968) was the one which differed most from that which emerged in this study from the detailed analysis of relevant data. Since it would not be worthwhile to replicate

studies of settlement systems on the scale of this one if classification is the main aim, it is useful to consider in the light of this research the extent to which a simpler but more accurate means of describing the structure and behaviour of settlement systems in Greece may be developed. Taken in conjunction with the detailed results of this research, such an approach may be both precise and economic in time and resources.

Close relationships were found between population size and functional status, and the former could therefore be taken as a crude indicator of the latter. The use of the 1969 commercial census data (and later ones as and when they become available) would provide a more accurate picture, particularly if used with a centrality or nodality index (cf Chapter 5H). An additional diagnostic of higher order settlements is simply the presence of dhimos status.

The close relationship that was found between the functional regions delimited by bus traffic flows and the trade areas of A and B centres found in the analysis of consumer movements suggests that bus traffic alone would be a very appropriate indicator of urban hinterlands (cf. Green (1950) in England). The ready availability of the relevant information and its value in functional regionalization suggest that it may also be useful in deriving functional regions at the national level. This has implications for the delimitation of administrative boundaries since it is normally considered desirable for administrative spheres of influence to coincide with economic. In Thessaly this seemed in large part to be so and, considering the close relationships between

bus routes, consumer movements and nomos boundaries, not unexpected. Even here, however, there were strong indications from the consumer movement study that the mountain villages in the hinterland of Mouzakion looked more towards Trikala than Kardhitsa for higher order functions. It might therefore be that a revision of nomos boundaries which took into account the changing sectoral and spatial structure of economic activity is at least worthy of some examination. Similarly at the national level, the planning regions which are now used might be modified in the light of a more thorough consideration of their boundaries. The inclusion of the nomoi of Fthiotis, Grevena and Evritania within the planning region of Thessaly, for example, does not seem justifiable since their links with the other nomoi of the region are at best tenuous.

Implications for sectoral planning

The analysis of retail trade in Chapter 2B highlighted the traditional organizational structure of this activity in Greece. It was concluded that outside of Athens (and perhaps Thessaloniki) there were few signs that any fundamental changes were likely in the future. The detailed study of the structural and behavioural characteristics of the settlement system in West Thessaly confirmed this picture and led to the hypothesis that the provision of high order goods and services from small centres was only possible through the existence of high margins. The relative inefficiency which this produces in the distributive system - and it is probably symptomatic of complete channels - is an additional hindrance to economic (more particularly, industrial)

development. Coutsoumaris (1963) considered that 'the absence of an articulated and well functioning distributive system is a major deterrent to industry's development', and such a conclusion is probably still valid today, especially for consumer oriented manufacturing. Considering the emphasis placed on the development of a modern, indigenous manufacturing sector in national economic planning, and its significance in the light of E.E.C. membership, it is surprising that so little emphasis has been given to the improvement of the distributive system. A more efficient system would lower the costs of goods to consumers and would also improve the flow of information between consumers and producers so that new products could be introduced more effectively and changes in the market responded to more quickly.

If additional investigations were to provide support for these conclusions then policies to encourage the reorganization of retail trade (and perhaps also wholesale trade) could be implemented in two directions. Firstly, fiscal and other measures designed to penalize the low margin operator and/or encourage mergers and expansions could provide an institutional framework for encouraging more efficient operations. Secondly, physical planning policies to restrict the building of new retail establishments and control the use of existing ones might have a longer term impact. At the moment there are few restrictions on new building beyond controls on height (except factories). The inevitable result is undifferentiated and haphazard urban sprawl. As far as retail trade is concerned, this may be an additional factor in accounting for the high growth rates in establishment

numbers in Greece when compared with countries with planning controls where attempts are made to assess future retail floorspace requirements and control the numbers and/or size of new shops accordingly. The implementation of such policies would have to be made within the context of a framework for urban land use planning in general. This is only in its initial stages in Greece and even for the specific case of retail trade, a great deal of basic data collection and technique development will still be necessary. Nevertheless, by controlling entry into retail trade through restricting building and zoning land uses, physical planning could potentially have an important role in encouraging change in this sector.

In the future E.E.C. membership may introduce another element which will encourage change. There are considerable variations in retail structure between the various member states but Community regulations make it easier for firms to set up in countries outside their home base (N.E.D.O. 1973). The prospect therefore opens of experienced innovatory retail companies establishing branches in Greece although the risks may be similar to those of an indigenous firm expanding (Chapter 2B) and distribution lines would be long if servicing took place from Western Europe.

It has been assumed up to now that major improvements in the efficiency of the distributive trades are a desirable objective. Certainly, it can be argued that they are an important element in a national programme of industrialisation. On the other hand, some arguments can be forwarded for maintaining the status quo or, at least, not

actively encouraging change. The existing system substitutes labour for capital, and in a country which is undergoing fairly rapid economic development it might be argued that industry or agriculture would be more appropriate directions in which to channel investment. This assumes that distribution is an additional cost of production rather than a wealth creating activity in its own right. A more powerful social argument can be applied: namely, the distributive sector does provide employment for a large number of people and in places where more productive employment opportunities are few, it is perhaps better that there should be underemployment rather than unemployment. In rural areas, of course, many shops are run only as supplementary sources of income and so it would be difficult to stimulate changes here in any case. Moreover, the perserverence of small family owned and operated businesses under difficult economic circumstances would also act against rapid changes.

Implications for regional and sub-regional planning

The spatial perspective can never be removed from sectoral planning considerations and it is here that central place principles can be most clearly applied. As Dawson (1973, p.155) noted, the 'description and explanation of the relative marketing importance of the settlement centres in a region, together with the retail/wholesale structure of these centres, is vital to any attempt to produce a regional development plan.' In many developed and developing countries this is already recognized. In some places the main aim is to establish service centres either in newly settled areas or in regions where a subsistence economy prevails (Johnson 1970). In the Greek

context the value to be drawn from central place theory is, firstly, an insight into the structure and behaviour of the existing settlement system which may be of use in formulating new regional and sub-regional planning strategies, and, secondly, it can form a basis for making decisions about the future provision of retail and non-retail service activities.

The significance of the service sector in the economy of Greek provincial towns and the orientation of industry to localized raw material sources (especially agricultural) means that the future prosperity and growth or decline of most towns is closely tied to changes in the economy of their hinterlands. Changes in the national economy influencing the output of large scale industry, or in the international economy influencing tourism, will be confined in their impact to a relatively small number of provincial settlements. As such, a closer understanding of the relationship between town and country is a prerequisite to effective regional and sub-regional planning, and planned interventions in either rural or urban economies cannot be divorced from each other, nor from physical planning activity.

The kind of analysis which has been made in this research can provide a general framework and insight for the formulation of policies within which more specific work may have to be done. Thus, for example, it could be said that in the West Thessaly plain improvements in agricultural productivity brought about by the further extension of irrigation or by land consolidation would most likely benefit the main towns of Trikala and Kardhitsa rather than those smaller centres located on the edge of the plain. In contrast, these

latter settlements may see the erosion of their economic base as the depopulation of the mountain areas which they serve continues. The future of these areas is not encouraging: the expansion of forestry remains the main long-term hope and the further development of wood-based industries in small towns like Pili and Mouzakion may offer the best prospects for them. Similarly, it can be hypothesized that if real incomes do rise in this region then there should be a tendency for increased concentration of service activity on the larger centres since transport costs form a lower proportion of expenditure and personal mobility increases. This would be emphasized if some organizational changes were to occur in retail trade and larger shops were established in the main towns.

By providing this kind of interpretation of settlement systems central place analysis can provide pointers to future planning strategies. The detailed quantification of relationships for predictive purposes, however, ideally needs the application of techniques like regional accounting and input-output analysis such as Papageorgiou (1973) has attempted but in applying these at the regional level, and even more at the sub-regional, major methodological and data difficulties occur. It may therefore be that the less precise indication provided by this kind of central place analysis will have to suffice.

The identification of future trends in town-country relationships is complemented by the more common use of central place concepts as a basis for locating new retail and service establishments. As far as retail units are

concerned, application of this kind of research can be made either by entrepreneurs to assess locations for new shops or by physical planners to determine the amount of new shopping development that should be permitted or provided for in any particular place. At the moment in Greece shop location decisions by the independent entrepreneur are probably largely intuitive, while physical planning intervention is, as already indicated, minimal. In the case of non-retail services, central place principles can also be usefully applied, especially for educational, health, administrative and other similar functions.

There are a number of elements involved in the decision about where to locate a new shop. One of the most crucial is accessibility to consumers and this, of course, is the focus of both central place analysis and interaction theory. This research has provided information on the types of centres found in provincial Greeee and their characteristic functions, the threshold populations of functions and the way in which the pattern of consumer movements varies between goods. It has also provided an assessment of the general features of the structure and dynamics of retail trade. As such it should provide potentially useful background information for any person or organization actively interested in this field even if some additional research more specific to their circumstances may be necessary to take into account other influences on store location and assessment (see R. L. Davies 1976). From the viewpoint of planning for future retail provision, the kind of information provided here would form a useful basis for estimating future retail requirements in new suburbs or in existing centres even if again more specific

additional information may be needed.

The development of local centres through the planned provision of additional service activities (especially non-retail commercial and non-commercial ones) may produce a net increase to the real income of the centres and of the regions served by them, particularly if they are government financed when they can be regarded as agents of the transfer of wealth from the richer regions to the poorer. Moreover, certain activities may act as stimuli to further social and economic change and/or assist the reduction of regional emigration. The information provided by this research might be used in a similar way for these functions as its application in retail trade although in the case of centrally financed social services economic criteria are by no means the only ones to be taken into account.

Local centres have a more specific role to play in encouraging the expansion of agricultural output in their hinterlands (Johnson 1970). A service centre can perform three functions in this respect (Funnell 1976). It may

(1) act as a local market or collecting point for the produce of local farms destined for consumption within the region;

(2) act as a collection centre for produce exported out of the region either to other parts of the country or overseas; and

(3) provide specific agricultural inputs or services to encourage the rural population to introduce technical changes in production.

The decisions about the location of market and storage facilities for agricultural produce can be made in a similar context to those for retail and non-retail service activities since the constraints of threshold and accessibility apply with equal force.

SECTION D CONCLUSION

This research may be viewed as a contribution to the empirical methodology of central place studies as well as to the urban and economic geography of Greece.

There continues to be considerable research effort into the theoretical development of central place theory (for example, Beavon 1977, Marshall 1977 and Parr 1977) but there has not been the emphasis on empirical studies of central places as there once was. To a large extent this may be due to the increased attention paid to the field of Marketing Geography where central place models are but one part of the spatial study of the distributive trades. It may also be due to the fact that many empirical studies were made in the 1960s and in a sense the topic may have been felt to have been exhausted of research potential. However, the presentation of another empirical study can be justified. Beavon (1977) suggested that many of the findings of empirical studies were open to doubt because of a (probably unconscious) desire by workers to 'prove' the theory, while Rowley (1974) has postulated the influence of metaphysical factors on the frequent empirical findings of structural regularities in central place systems. It may be argued in the light of these opinions that there is still a need to develop and refine the methodology of empirical research in this field, and this is where this work

may provide a contribution.

The adoption of a systems approach which has placed emphasis both on the inter-relationships between the components of the settlement system, and on their links with their external social and economic environment, has provided a useful framework for the analysis. Although by no means an innovation in central place studies, the use made here of this framework was more extensive than most since it included a consideration of the characteristics of retail trade and an attempt to delimit the spatial boundaries of the system. In addition, the weighted functional index which was developed as a measure of settlement centrality may offer a suitable technique for comparative studies of systems where the focus is on centrality rather than nodality.

It was considered in Section A of this chapter that one important element in the creation and maintenance of the great spatial inequalities in wealth and living standards that exist in Greece was the relatively poor performance of provincial urban economies. The regional policies that successive governments have formulated were outlined in Section B where their ineffective nature was noted both in terms of their concentration on attempting to attract new industries to a relatively small number of centres and the lack of attention paid to the tertiary sector. The third section drew some implications from the research that would be relevant in the formulation and implementation of more effective policies. It needs to be emphasized, however, that central place models provide a simplified view of reality, in particular thorugh the assumptions that are made on entre-

preneurial and consumer behaviour, and the exclusion from consideration of the social, political and economic environment of the system. Although these shortcomings were covered in part in the thesis, they do point the direction in which future research effort in this field in Greece could be most profitably concentrated. Thus, for example, within the specific field of retail trade it is clear that there is very substantial scope for work on both the nature and costs of distributive channels. Similarly, in examining the role and behaviour of the settlement system, for instance, more sophisticated regional and sub-regional studies might be made, looking particularly at migration and the performance of local economies although data problems remain a major hindrance to any research in the country.[5] The practical application of either this or any additional research, however, can only be realised within the context of an effective planning machinery and a political readiness to intervene: neither of these conditions really exists at the moment.

In undertaking this work it was probably inevitable that as many questions should have arisen as have been answered. Nevertheless, it is hoped that it has demonstrated within the Greek context some of the potential contribution that modern geographical analysis might make to the understanding and alleviation of social and economic problems which have a significant spatial dimension.

FOOTNOTES

1 Quoted by Vlachos (1976)

2 The 1971 census recorded only 1,420 households living in 'irregular' dwellings - 0.2 per cent of the total.

3 Greece has been an associate member of the E.E.C. since 1961 and it was intended to become a full member in 1983. The process of assimilation was, however, suspended during the period of military rule. Current negotiations are being aimed at full membership by 1980.

4 Comparisons of regional planning machinery and policies between Greece and the other Balkan countries are provided by Hoffman (1971, 1972). Summaries of the machinery and policies in Western Europe are provided by Clout (1976).

5 This problem has been in part recognized and was highlighted by Arrow (1965); however, the absence of detailed spatially disaggregated data is still a problem for quantitative geographical research.

APPENDIX A

THE CHARACTERISTICS OF FUNCTIONS AND ESTABLISHMENTS IN WEST THESSALY

The principal characteristics of the functions identified in the field data collection in West Thessaly are described in this appendix, and common combinations of functions within one establishment are indicated. Many retail and non-retail establishments indicate their type in prominent lettering on the front of the building (c.f. Britain, for example, where the firm or business owner's name is usually dominant). The most frequent occurring of these are indicated in the text in Greek letters.

Although based on the fieldwork in Thessaly, the descriptions of functions and establishments apply to virtually any part of Greece.

A RETAIL FUNCTIONS

1 Food/Drink: the most widely found functions in this group are Baker, Butcher and Coffee shop, which are found at all hierarchical levels.

The Baker (Αρτοπωλεῖον) is, with few exceptions, found in mono-functional establishments consisting of small businesses selling directly to the customer. Since not every family in Greece possesses an oven, a subsidiary activity performed by them is to cook meat in their ovens; the sight of people carrying roast meat in a 'tapsi' to the bakers is a common one (especially on Sundays).

The Butcher (Κρεοπωλεῖον, pop. Χασάπης) is a similar low order function which is frequently combined in smaller settlements with fish selling. Occasionally they may have their own small slaughter house. Some have roasting spits and grills for souvlakia, kokoretsi etc.

The most ubiquitous retail function is the Coffee shop (Καφενεῖον) which plays a major role in the social

life of both rural and urban Greece (Photiadis 1965). Traditionally the clientele consists of men only, and card playing, backgammon and conversation are more important activities than the simple drinking of coffee or other drinks. They usually only sell drinks and no food except snacks (mezedhes). They are frequently combined in smaller places, and less often in larger, with a general store (forming a Καφενοπαντοπωλεῖον). No distinction was made in the survey between a coffee-ouzo shop (Καφεουζοπωλεῖον) and a coffee shop, and neither was one made between the coffee-shop-bar (Καφέ -Μπάρ), since the distinction is largely one of name, and in the latter case the shops are far different from the Bars found in large cities and tourist centres. Ouzo shops (Οὐζέρι) are sometimes found, but they were included as coffee shops for this study.

A complement to the social functions of the coffee shop is exercised by the Confectionary shop (Ζαχαροπλαστεῖον). Confectionary is sold either over the counter or, in most shops, may be eaten on the premises with coffee, soft or hard drinks. Their clientele is more family-oriented and in the large towns there is a tendency for them to be concentrated along the streets and squares where the evening volta (stroll) occurs: this is their busiest time.

Found also principally at intermediate and higher levels of the hierarchy, shops selling Dairy Produce (Γαλακτοπωλεῖον) specialise in the sale of milk and milk products, usually sold over the counter. In some, however, they can be consumed on the premises with, for example, bread and honey. They are sometimes combined with the sale of confectionary (forming a Γαλακτοζαχαροπλαστεῖον).

Mono-functional establishments selling fish (Ἰχθυοπωλεῖον), fruit and vegetables (Λαχανοπωλεῖον ; Ὀπωροπωλεῖον ; _____ ; pop. Μανάβης) and wines or drinks (Οἰνοπωλεῖον ; Ποτοπωλεῖον) are mainly confined to the two highest hierarchical levels. They can be found in smaller settlements but they are usually combined with other functions; fish in butchers, and fruit and vegetables with groceries. The weekly markets which are held in all places of dhimos status provide a considerable supplementary outlet for fruit and vegetables. Here much selling is direct from producer to consumer with no intermediary. Street

sellers may be found in the towns of Trikala and Kardhitsa on other days as well as the market day.

The most specialised food function was Sweets. No mono-functional shop was found in the study area, and usually they are sold as part of the range of goods available in Confectionary shops or kiosks, and were not therefore distinguished. However, in a few grocery shops which specialised in nuts and dried fruits they appeared to form an important element of the function mix, and here they were distinguished.

There are a number of different kinds of establishments where meals can be bought, but definition of this function is not difficult. Classified as Restaurants were all establishments where meals were served at a table: this includes all those called Εστιατόριον and Μαγειρεῖον, as well as a number known as Ψητοπωλεῖον and Ψησταρία which sell only roasted or grilled food. Excluded from this category (and from the survey) are establishments which cater for passing trade, selling roasted meat on small spits or wrapped in pitta bread. Included as Restaurants were establishments which called themselves Tavernas (Ταβέρνα), but whose main (and often only) function was the provision of meals. The kind of establishment that was classified in the survey as a Taverna were those specializing in the sale of wine for consumption on the premises, and which often provide musical entertainment. It must be recognised, however, that the distinction between Restaurants, Tavernas and Coffee shops is sometimes blurred.

2 Clothing: in the majority of clothing shops, men's, womens' and childrens clothing are combined and specialist shops only appear in the larger towns. As far as women's and childrens clothing are concerned the full range generally occurs, but with men's clothing there is a notable absence of 'off-the-peg' suits, jackets and non-casual trousers which are instead usually obtained from tailors. In fact, the tailor's shop (Ραφεῖον) is an ubiquitous and low order function and contrasts with the absence of women's dressmakers. Often combined with non-specialist clothing shops is the Textile Goods function

(Υφάσματα): which sell cloth for the making of clothing at home. The relative frequency of this function is an indication of low income levels. Shoes (Υποδηματοπωλεῖον) are another common function, sometimes found in large villages, and combination with other functions is rare. Included within the category were establishments where shoes were both produced and sold, but shoe repair and shoe-shine shops were excluded. Of the specialist clothing shops, the most common are those selling Bridal Wear (Νυφικὰ Εἴδη). The only function with which this was found in conjunction was Photography where there is a clear association. The other specialist clothing functions are confined to Trikala and Kardhitsa, although Sports Clothing/ Equipment is not found in mono-functional units, a reflection of the relative unimportance of organised sport on either a professional or amateur basis.

3 Household Goods: most of the functions in this category are found primarily in the first two levels of the hierarchy and only occasionally in the larger settlements of the lower levels. Certain of the functions are almost always found in combination with each other; Clocks/watches with Jewellery, Chinaware with Glassware and often Household Appliances. Another common combination is Electrical Goods with Radio/T.V., and sometimes these two are found with other functions. Excluded from the Electrical Goods category were electrical workshops and shops selling electrical accessories for cars and other vehicles (classified under Car Accessories). The other two functions under this heading, Furniture and Hardware, are both characterised by a substantial number of outlets where the goods themselves are produced. Of the hardware shops, the most common type is that producing tin articles (Φανοποιεῖον), and rarer is that producing copper goods (Χαλκοπωλεῖον). Classified as Furniture, perhaps unsatisfactorily so, were establishments selling carpets. The manufacture of woollen rugs (flokates) is significant in parts of the area, and many of the small factories have salerooms.

4 Vehicles: private cars are still the preserve of a minority in this part of Greece (Table 4:1), and it is perhaps not surprising to find their sale confined to Trikala and Kardhitsa,

and the situation is the same for commercial vehicles. However, the main distributors are in Athens and Thessaloniki and many sales are made directly from them. Much more widespread are bicycle and/or motorcycle shops although they are still confined primarily to the upper levels of the hierarchy. Shops dealing solely with bicycles are the most common outlet and they engage in three types of activity: sales, repairs and hiring although not necessarily all three are present, and establishments specializing in only one of these can be found. Two main types of outlet were included in the Vehicle Accessories category; these selling a wide range of generally small-sized accessories, some specializing in electrical accessories only, and those selling tyres for cars, lorries, tractors etc., although these two types are not mutually exclusive. The most common type of establishment under the Vehicles grouping are those dealing in Vehicle Repairs: small workshops (Συνεργεῖον) which repair all types of vehicle (and machinery) are found at all levels of the hierarchy.

5 Personal Services: two common functions which are found at all levels of the settlement hierarchy are the Barber and the Hairdresser. Barbers (Κουρεῖον) are characteristic of all but the smallest settlements, and invariably occur in mono-functional units. In the villages the barber may, in common with other village traders, own some land which he cultivates on a commercial or subsistance basis, and this explains why some villages have a number of barbers in excess of what might otherwise be expected. Hairdressers (Κομμωτήριον) are not quite as numerous as Barbers, but they too are found at all but the lowest levels of the settlement system although in the villages the likelihood of there being a specialist shop is small, and the hairdresser is usually a woman who does this as a part-time activity in her own home.

Dry cleaning/laundry (Καθαριστήριον / Πλυντήριον) is found in the upper levels of the hierarchy and in some of the larger settlements of the lower levels. All the establishments did both wet and dry cleaning on the premises: the receiving shop that is more a characteristic of this activity in Britain, for example, is not found.

6 Other Retail Functions: a considerable range of functions[5] falls under this general heading, and most tend to be confined to the upper levels of the hierarchy. Most of them can be found in establishments which are similar in size and nature to those found in Britain, and it does not seem necessary to describe each individually. The exceptions which should perhaps be made are Religious Goods (Ἐκκλησιαστικὰ Εἴδη) and Candles (Κεροπωλεῖον). Religion continues to play a major role in provincial Greek life, and the Greek Orthodox faith requires the use of many concrete representations of spiritual beings and events both in church and elsewhere. Consequently, there is a demand for such items as icons, candles and incense, and this is met by a number of shops specializing in the sale of such religious goods. Often associated with this function, although also found in mono-functional units, is the manufacture and sale of candles.

7 Multi-functional Units: the kiosk and general store are a basic component of retail provision in Greece and since the range of goods which they can sell makes the distinction of functional units completely impractical, it is felt justifiable to regard them as single units for purposes of this study.

The kiosk (Περίπτερον) is an ubiquitous establishment found in all towns and in the majority of villages. They are located along the main streets and in the squares, primarily in the central areas. Within their small space, they manage to accommodate a very wide varity of goods, and many also have a public telephone. General stores (Παντοπωλεῖον) are with coffee shops, with which they are often combined, the commonest retail function, and they are to be found in all but the smallest settlements. In smaller villages particularly, the variety of goods they sell can be very wide, spanning most of the food, clothing and household goods groupings, as well as such things as vehicle accessories, stationery and toys.

B NON-RETAIL FUNCTIONS

1 Administrative: Greek local government consists of three tiers: the region (dhiamerisma), the nomos and the koinotis

(commune). Larissa is the regional seat of Thessaly, but Trikala and Kardhitsa are both the main towns of a nomos. The nomos is the most important tier, and the best parallel is with the French département on which it is originally based (Argyriades 1968). The prefect (Nomarchis) is the central government's representative and he heads the prefecture (Νομαρχία) which consists mainly of local offices of all the central ministries. In addition to the main offices in Trikala and Kardhitsa there are a number of associated offices in a few other places of dhimos status.

The koinotis is the smallest administrative unit although all places which have a clear urban character are of dhimos status, which indicates a wider range of responsibilities than the koinotis. Both are directly responsible to the local prefect. Most villages have a commune office through which the villagers have their main contact with the government machine. In koinotes which contain more than one settlement, the commune office is almost always sited in the largest village (which usually gives its name to the whole koinotis), and the people in the subsidiary villages must operate through this. The position is the same for those villages which form part of a dhimos; any contact with the government machine is through the town-hall (Δημαρχεῖον).

Within Thessaly itself there are three categories of courts. The highest is found only in Larissa, the next in the four nomos capitals and some of the eparchy seats while the lowest is found in all settlements with higher courts in the remaining settlements of dhimos status and in several of the larger koinotes.

There are police headquarters in Trikala and Kardhitsa for their respective nomoi and under them a network of police stations in the towns and villages, each police station being responsible for between three and six other villages. Police headquarters were identified as a separate function to emphasize the dominant administrative functions of the nomos capitals, and should be regarded as one of several possible rather than the sole example of other governmental functions that are associated with these towns.

2 Professions: although there are a fairly large number of people practising in some professions, there is a very strong tendency for the majority to be located in the nomos capitals. This is particularly true for accountants, dentists, lawyers and opticians. In contrast, some doctors' surgeries (Ἰατρεῖον) are found in some of the large villages and may serve several others. These are invariably, however, 'Agricultural Doctors' who are government employees and provide a free health service for farmers and their families. Most other doctors are in private practice, usually as individuals rather than partners. Specialists are found only in the towns of Trikala and Kardhitsa.

Printing establishments were counted and might perhaps be put under the heading of 'Professions'. The data include presses producing daily and weekly local newspapers as these do undertake other printing work as well as establishments specialising in ad hoc orders.

3 Institutions: there are two main types of medical institution: the private clinic (Κλινική) and the Hospital (Νοσοκομεῖον). Both are high order functions confined to Trikala and Kardhitsa. Both towns have only one state hospital (which in Kardhitsa is rather small) while the clinics are private establishments which supplement the state institution.

Libraries (Βιβλιοθήκη) are usually a high order function, although a small number of settlements in the lower ranks do possess one. They are not very large and in this part of Greece do not merit a purpose built building to themselves, usually sharing with local government offices.

Post Offices (Ταχυδρομεῖον) are found primarily at high and intermediate levels of the hierarchy, although some larger villages support one. Most villages are served a number of times each week by a postman who comes from one of the places with a post office, and who distributes the letters in the village square.

Operated separately from the Post Office are the offices of the Greek Telecommunications Organization (O.T.E.) which are used for the sending of telegrams and for long distance telephone calls.

Included in the category of social institutions were orphanages (Ὀρφανοτροφεῖον) and old people's homes (Γηροκομεῖον). Both are higher order functions and are found, with one exception, only in towns of Trikala and Kardhitsa. The exception is an old people's home run by the Church in the village of Megala Kalivea, about seven kilometres south of Trikala.

Five kinds of educational establishment were identified in this study. Kindergardens (Νηπιαγωγεῖον) are a faily low order function. They take children for one year (5-6 year old) before they enter primary school. They usually occupy small buildings, often not built specifically as a school. The Primary School (Δημοτικὸν Σχολεῖον) is the most common non-retail function in West Thessaly. They are found in the majority of villages where they generally occupy one of the most dominant buildings in these settlements. Children are taken from the ages of 7 to 12. The size of the school obviously varies with the size of the settlement; they may have between one and six or seven teachers, with even larger schools in the bigger towns.

Three main types of secondary school are found in Greece; the High School (Γυμνάσιον), the Technical School (Τεχνικὴ Σχολὴ) and the Private School (Λυκεῖον, Ἰδιωτικὴ Σχολὴ). Of the three, High Schools are the most common and the other two types are found only in the towns of Trikala and Kardhitsa. The former are located mainly at the intermediate and higher levels of the hierarchy although in Kalambaka some villages, especially in the mountains, have a small one. All these schools form an important element in the urban landscapes. A shortage of buildings in Trikala and Kardhitsa means that some schools share the same building: one school operates in the morning and the other in the afternoon, with separate headmasters and teaching staff.

Inadequacies in the state educational system and the need to pass highly competitive examinations for university entrance are the reasons for the existence of a considerable number of private colleges or institutions (φροντιστήριον). These provide private tuition over a wide range of subjects, although since most only have one or two teachers, individually they tend to specialize. Most common

are those teaching foreign languages, and mathematics and technical subjects. They do not occupy purpose built buildings, and they are found at both intermediate and high levels in the hierarchy.

Larissa is the main centre for higher education within Thessaly (although there is no university), but Kardhitsa and Kalambaka both have Agricultural Colleges (Γεωργική Σχολή), which were included in this survey.

Two kinds of banks (Τράπεζα) were distinguished in the study. The first are the ordinary commercial banks which occur only at intermediate and upper levels of the hierarchy. They are all branches of banks found throughout Greece, the most common one being the National Bank of Greece. The other important kind of banking establishments are those of the Agricultural Bank of Greece. This plays an important role in the rural economy of Greece (Chapter 3C), and branches are found in all the largest towns and many of the smaller. Its function is not only to provide credit for agricultural improvements but also to supply seed, fertilisers, etc. at reasonable prices in conjunction with the co-operative movement.

Insurance agencies (Πρακτορείων Ασφαλείας) are a high order function confined to the towns of Trikala and Kardhitsa.

4 Others: Cinemas are a popular form of entertainment in Greece where television is a relatively recent, if rapidly expanding, phenomenon. Only permanent establishments showing films daily were included in the data; many villages have a weekly or twice weekly film show presented by peripatetic specialists in this activity. Cinemas are both open-air or enclosed. Most enclosed cinemas have an open-air auditorium for use in summer (June-September).

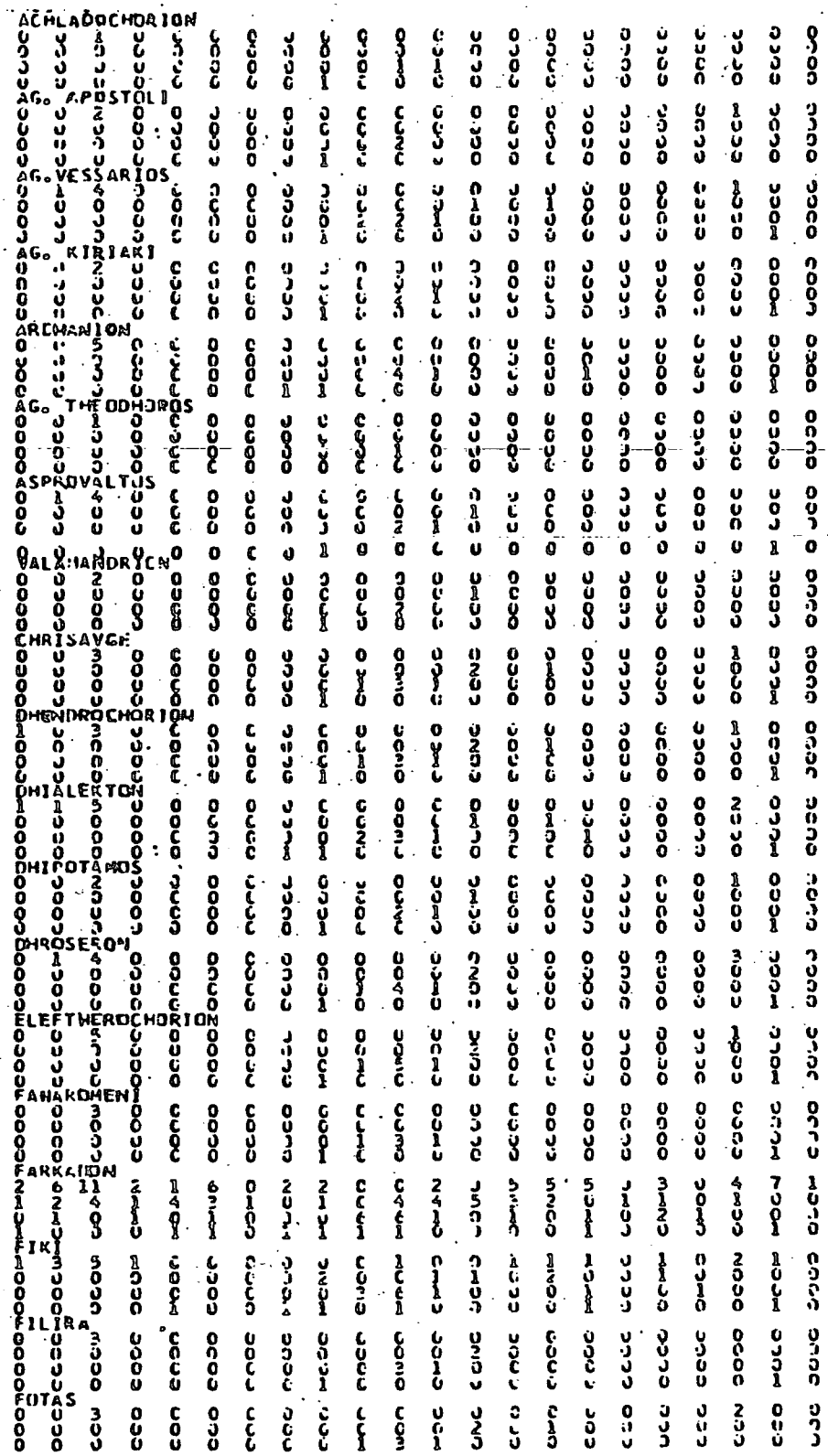
Most of the remaining functions - Driving Schools, Electricity Offices (D.E.H.), Travel agents, Trucking and Undertakers - are confined to Trikala and Kardhitsa and some of the B-level settlements. However, the last function, Agricultural Co-operative (Συνεταιρισμός) is very widespread, and most villages now have one. They are affiliated

to a national organisation and in collaboration with the Agricultural Bank assist in the provision of seeds, machinery etc, although they are less active in the marketing of produce.

APPENDIX B

FUNCTIONAL UNITS BY SETTLEMENT

The number of functional units of each of the 88 functions identified in this study in each of the 153 settlements with at least one function are listed here. The functions are in the same order of entry as in Table 5:3 and read in the listing from left to right across the rows.



PANAGITSA				0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
PARAPOTAMOS																						
	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
PATOULIA																						
	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
PERISTERA																						
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	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
PETROPOROS																						
	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
PETROTON																						
	1	2	7	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	3	7	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
PIALETA																						
	0	1	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
PIGHI																						
	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
PILI																						
	2	5	7	2	1	2	4	4	2	0	0	3	2	4	4	5	0	7	0	3	6	1
	3	4	5	3	7	6	3	0	0	0	1	1	0	1	2	0	0	0	0	1	0	1
	0	1	1	1	7	2	0	0	0	5	0	0	0	0	0	1	0	1	1	0	1	0
	1	1	0	0	1	0	0	1	1	1	0	0	0	0	0	1	0	0	0	0	1	0
PLATANOS																						
	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
PRINOS																						
	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
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RAXA																						
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	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
RIZARETON																						
	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
RIZOMA																						
	0	5	6	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
RENGIA																						
	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
SARAKINA																						
	0	1	5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
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SERVOTA																						
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	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
SOTIRA																						
	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
TAXIARCHAI																						
	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	6	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
THEOPETRA																						
	1	2	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	8	1	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
TRIKALA																						
	24	43	91	20	9	5	26	72	13	3	6	15	9	45	10	51	6	23	2	47	18	15
	11	43	54	13	48	23	24	18	20	13	30	44	21	13	17	1	11	17	1	16	[illegible]	2
	1	8	4	5	4	5	6	5	[illegible]	41	22	9	1	5	1	2	40	25	45	75	[illegible]	10
	10	9	1	1	1	1	2	7	20	5	12	0	5	1	10	8	5	1	5	5	1	5
VALTINON																						
	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
	0	0	0	0	0	0	0	0	0	0	0	1	2	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
VASILIKI																						
	1	1	6	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0
ZELEFTI																						
	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	3	1	0	0	0	0	0	0	1	0	0	0

	ACHLADEA	AG.ANARYIROI	AG.VESSARION	AG.DHIMITRIOS	AGNANTERON	AG. PARASKEVI	AGHIUPIGHI	AG.THEODHOROS	AG.TRIAS	AMBELA	AMBELOS	ANAVRA
ANOGEIHU												
ARTESIANON												
ASIMJCHORION												
ASTRITSA												
CHARMA												
ERMETSION												
FANARIUN												
FILIA												
FILLON												
FRANGUN												
GEFIRIA												
GELANTHI												

GEORGIKOU			0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
0	1	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
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GORGOVITES																					
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0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
GRAMMATIKON																					
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ILIAS																					
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KALIVAKIA																					
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0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
KALLIFONION																					
1	2	8	1	0	2	1	1	2	0	1	1	0	1	1	1	0	2	0	5	1	0
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0	0	0	0	0	0	0	0	0	4	6	1	0	0	0	1	0	0	1	0	0	0
0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
ITEA																					
1	1	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	1	6	1	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
KALLITHEA																					
0	2	5	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
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0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
KALOGRIANA																					
0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
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KAPPADOKIKON																					
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KAPPAS																					
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KARDHITSA																					
19	29	89	15	12	10	25	94	17	2	7	25	8	45	45	49	3	38	1	51	41	20
13	29	29	14	34	29	21	4	24	7	16	25	31	18	20	1	9	10	1	20	2	4
1	8	4	7	1	3	4	6	2	45	34	1	1	3	1	1	32	17	45	53	2	4
9	6	1	1	1	1	2	9	14	7	10	1	3	1	4	8	2	1	4	4	1	3
KARDHITSOMAGOULA																					
1	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
0	0	0	0	0	0	0	0	0	0	0	0	4	1	2	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
KARPOCHORION																					
0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
KEDHROS																					
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0	0	0	0	1	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	1	7	1	0	0	0	1	0	0	1	0	0	0
0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
KIPSELI																					
0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
KORDHA																					
0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
KOSKINAS																					
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0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
KRANIA																					
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KRIA VRISI																					
0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
LEFKI																					
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0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
LAZARINA																					
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LEONDARI																					
1	3	4	1	1	1	1	0	2	0	0	0	0	2	2	2	0	1	0	0	2	0
1	1	1	1	1	1	1	0	2	0	4	0	1	0	0	0	0	0	0	0	0	0
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0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
LOXADHA																					
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Poutaoi			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
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0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
MAKRON																					
0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
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0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
MAGOULA																					
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MAGOULITSA																					
0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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MAKRICHORION																					
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MARATHEA																					
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PATARANGA																					
1	2	12	0	0	0	1	0	0	0	0	0	0	1	1	1	0	0	0	4	1	0
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MAVRACHADHES																					
0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
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MAVROMATTION																					
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MELISSA																					
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MELISSOCHORION																					
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MERINA																					
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0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
METROPOLIS																					
1	7	9	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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METAMORPHOSIS																					
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MOSCHOLOURION																					
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0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
MOUZAKION																					
3	6	12	3	3	2	2	4	4	0	2	8	0	12	12	12	0	8	0	4	12	2
4	3	2	4	5	6	3	0	1	0	0	2	5	2	4	0	2	2	0	1	0	2
0	1	0	2	0	2	0	0	0	1	12	1	0	1	0	1	0	3	3	1	0	0
2	0	0	0	1	1	0	1	2	2	2	0	1	1	0	1	0	0	0	0	1	0
NEON IKONION																					
0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
ORFANA																					
0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	2	4	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
PALAIOCHORION																					
0	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	1	5	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
PALAIOKKLISION																					
0	1	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	1	6	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
PALAMAS																					
4	5	18	3	2	3	1	4	2	0	0	2	2	9	5	9	0	5	0	8	7	2
5	3	8	6	6	4	2	3	2	0	2	6	9	4	8	0	2	1	0	2	0	1
0	2	0	2	0	1	0	0	0	15	10	1	0	1	0	1	0	2	4	3	0	1
4	0	0	1	1	1	0	1	3	1	1	0	1	1	0	2	0	0	0	1	1	0
PASCHALITSA																					
0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	7	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
PEDHINON																					
0	1	10	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	1	10	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
PETRINON																					
0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0

PIRGOS ITHOMIS
PIRGUS KIERIOU
PRODHROMOS
PROASTION
PSATHOCHORION
PTELOPOULA
RIZAVOUNION
ROUSSON
SOFADHES
STAVROS
VLOCHOS
XINOVERION
ZAIRIDA
ZARCHANADHES
EXECUTION TERMINATED

$SIG

APPENDIX C

NUMBERS OF FUNCTIONS, FUNCTIONAL UNITS AND 1971 POPULATION OF SETTLEMENTS IN DETAILED STUDY AREA

Settlements are ranked by weighted functional index (c.f. Table 5:4).

SETTLEMENTS	1971 Population	Functions	Func. Units	SETTLEMENTS	1971 Population	Functions	Func. units
1. Trikala	34,794	87	1,515	51. Magoulitsa	971	9	31
2. Kardhitsa	25,685	88	1,306	52. Paschalitsa	695	8	22
3. Kalambaka	5,453	70	285	53. Krini	1,075	12	24
4. Mouzakion	2,626	56	194	54. Charma	426	6	15
5. Sofadhes	4,505	63	243	55. Anogeiou	217	7	11
6. Pili	1,759	52	133	56. Peristera	298	7	10
7. Palamas	5,318	61	231	57. Palaismonastirion	1,283	5	11
8. Farkadon	2,175	51	129	58. Kalogriana	937	11	26
9. Funarion	1,310	29	52	59. Achladhea	610	10	15
10. Leondari	1,435	38	54	60. Dhendrochorion	651	10	15
11. Fiki	1,057	26	42	61. Pialeia	865	10	22
12. Neochorion	3,089	33	71	62. Makrichorion	1,252	11	32
13. Itea	1,445	34	62	63. Ag. Dhimitrios	237	6	10
14. Meg. Kalivea	2,333	17	41	64. Kallithea	1,074	9	21
15. Proastion	1,971	25	73	65. Grizanon	1,572	12	24
16. Kedhros	1,131	18	37	66. Ermetsion	490	8	15
17. Merina	1,048	8	12	67. Klokotos	800	12	19
18. Metropolis	1,504	16	45	68. Rizovounion	551	8	16
19. Parapotamos	230	6	12	69. Chrisavge	537	9	14
20. Anavra	1,133	18	45	70. Servota	638	10	17
21. Megalochorion	1,860	17	27	71. Asimochorion	407	6	16
22. Mataranga	1,832	27	53	72. Makron	784	9	16
23. Kastraki	1,242	10	30	73. Melissochorion	467	10	12
24. Mavromattion	1,689	20	49	74. Ag. Trias	990	11	26
25. Dhialekton	833	13	21	75. Kardhitsomagoula	2,413	12	24
26. Ardhanion	711	7	14	76. Grammatikon	397	7	15
27. Pedhinon	957	12	33	77. Georgikon	539	11	17
28. Fillon	901	12	27	78. Dhipotamos	275	7	9
29. Agnanteron	2,263	17	44	79. Frangon	522	10	15
30. Magoula	1,119	12	26	80. Kappas	306	6	10
31. Valtinon	743	11	26	81. Gelanthi	569	7	19
32. Gefiria	658	11	22	82. Kranea	850	8	18
33. Xinonerion	699	11	20	83. Petroporos	650	8	13
34. Ag. Vessarios	266	6	9	84. Ilias	155	4	6
35. Rizoma	1,416	12	31	85. Lefki	339	6	12
36. Theopetra	742	11	27	86. Gomfoi	1,250	9	24
37. Metamorphosis	622	8	19	87. Megarchi	899	9	19
38. Marathea	906	14	35	88. Aghiopighi	511	6	9
39. Vasiliki	1,422	14	26	89. Moscholourion	614	7	13
40. Petroton	1,170	13	30	90. Lazarina	512	8	15
41. Georganadhes	462	9	18	91. Eleftherochorion	599	8	17
42. Neon Ikonion	216	6	8	92. Ligaria	602	9	14
43. Kappadhokikon	476	9	14	93. Koskinas	741	8	16
44. Kallifonion	1,372	14	27	94. Meg.Kefalovrison	662	8	15
45. Orfana	446	9	19	95. Zarchanadhes	579	7	11
46. Asprovaltos	198	7	11	96. Karpochorion	1,200	8	21
47. Sarakina	519	8	16	97. Nomi	474	9	15
48. Pighi	1,306	13	25	98. Petrinon	459	9	13
49. Fotas	468	9	15	99. Ag. Vessarios	266	6	9
50. Dhroseron	510	10	19	100. Patoulia	636	8	12

APPENDIX C Cont'd

SETTLEMENT	1971 Population	Functions	Func. Units	SETTLEMENT	1971 Population	Functions	Func. Units
101.Astritsa	271	5	7	127.Longos	394	5	8
102.Panagitsa	467	9	12	128.Ptelopoula	446	6	10
103.Kipseli	896	9	18	129.Zaimion	493	6	11
104.Ag. Theodhoros	822	9	17	130.Melissa	377	9	21
105.Artesianion	1,457	7	12	131.Ag.Kiriaki	378	5	7
106.Filia	719	9	15	132.Pirgos Kieriou	658	6	11
107.Filira	473	6	11	133.Gorgovites	541	8	12
108.Keramidhion	452	6	13	134.Ambela	196	3	7
109.Mikro Kefalovrison	928	9	16	135.Raxa	707	7	12
110.Prinos	652	9	15	136.Ambelos	753	7	13
111.Platanos	848	9	16	137.Sotira	333	5	7
112.Glinos	532	6	12	138.Krinitsa	427	5	7
113.Vlochos	808	7	14	139.Kordha	354	5	7
114.Kalivakia	346	5	9	140.Mavrachades	820	7	12
115.Mouria	698	8	16	141.Loxadha	302	4	6
116.Taxiarchai	1,197	8	20	142.Leptokaria	155	6	12
117.Achladhochorion	189	4	4	143.Palaiopirgos	1,040	6	14
118.Pirgos Ithomis	304	5	9	144.Rousson	641	6	10
119.Palaiochorion	635	8	16	145.Faneromeni	673	6	10
120.Ag.Paraskevi	569	7	12	146.Psathochorion	370	4	8
121.Palaiokklision	873	8	19	147.Loutron	443	4	7
122.Valamandrion	160	4	6	148.Rizareion	772	5	11
123.Prodhromos	1,042	8	17	149.Rengia	272	3	5
124.Zelefti	714	7	13	150.Ag. Apostoli	446	5	7
125.Kria Vrisi	439	6	10	151.Karaia	247	1	1
126.Stavros	974	8	15	152.Ag.Theodhoros	128	2	2
				153.Ag.Anaryiroi	221	2	2

APPENDIX D

NUMBER OF CONSUMER MOVEMENT QUESTIONNAIRES RETURNED BY SETTLEMENT

The numbers of questionnaires from each settlement which were used in the analysis of consumer movements in West Thessaly (Chapter 6) are given in this Appendix. The code numbers for the settlements correspond to those in Fig. 6:1.

Code No.	Settlement	No. of Questionnaires used	Code No.	Settlement	No. of Questionnaires used
	Ag. Apostoloi	1	51	Leptokaria	1
	Ag. Vessarion	9	52	Longas	3
	Ag.Nikolaos	1	53	Longaki	1
	Ag. Prokopios	1	54	Ligaria	4
	Aghiofillon	2	55	Malakasion	4
	Agrelia	3	56	Matonerion	1
	Ambelochorion	3	57	Mavreli	3
	Ardhanion	2	58	Meg. Kalivea	9
	Armatolikon	2	59	Meg. Kerasia	1
0	Asprovaltos	1	60	Meg. Kefalovrison	1
1	Asprokklisia	5	61	Megalochorion	4
2	Avra	8	62	Megarchi	3
3	Achladea	6	63	Meligos	4
4	Achladochorion	2	64	Mesochora	2
5	Valkano	2	65	Mikro Kefalovrison	2
6	Valtino	6	66	Mouria	3
7	Vasiliki	4	67	Neochorion	19
8	Vronteron	5	68	Nomi	2
9	Vitoumas	2	69	Xirokambos	2
0	Gerakarion	6	70	Oxineia	7
1	Georganadhes	2	71	Orthovounion	1
2	Glikomilia	1	72	Palaiokaria	2
3	Grizanon	4	73	Palaiomonastirion	12
4	Dhendrochorion	2	74	Palaiopirgos	4
5	Dhiava	4	75	Panaghia	6
6	Dhialekton	2	76	Panagitsa	2
7	Dhipotamos	2	77	Parapotamos	7
8	Dhroseron	2	78	Patoulia	2
9	Elati	4	79	Perdhikorrachi	1
0	Eleftherochorion	4	80	Peristera	2
1	Ellenokastron	3	81	Petroporos	3
2	Zarkon	7	82	Petroton	6
3	Zilefti	5	83	Petrochorion	1
4	Theopetra	3	84	Pevki	2
5	Theotokos	1	85	Pighi	5
6	Kakoplevri	1	86	Pineias	4
7	Kalambaka	51	87	Pialeia	1
8	Kalliroi	1	88	Platanos	5
9	Kalomoira	1	89	Polinerion	1
0	Kalochorion	1	90	Prinos	1
1	Karies	2	91	Prodhromos	2
2	Kastraki	5	92	Pili	27
3	Keramidhi	4	93	Pirgetos	4
4	Kleinos	7	94	Raxa	2
5	Klokotos	2	95	Rizario	6
6	Koniskos	9	96	Rizoma	2
7	Kotronion	1	97	Sarakina	7
8	Krini	3	98	Skeparion	2
9	Krinitsa	1	99	Spathadhes	7

APPENDIX D Cont'd

Code No.	Settlement	No. of Questionnaires used	Code No.	Settlement	No. of Questionnaires used
100	Stournaraiika	6	161	Ellenopirgos	3
101	Taxiarchai	3	162	Ermitsion	4
102	Trikala	253	163	Zaimion	3
103	Trigona	1	164	Therinon	1
104	Tsougouron	1	165	Thrapsimion	3
105	Faneromeni	5	166	Itea	5
106	Farkadon	14	167	Kali Komi	1
107	Fiki	1	168	Kallithiron	2
108	Filira	4	169	Kalliphonion	3
109	Flamaulion	2	170	Kalograiana	3
110	Flambouresion	3	171	Kalivakia	4
111	Fotadha	1	172	Kanalia	8
112	Chaidhemeni	1	173	Kappa	2
113	Chatzipetrion	1	174	Kappadhokikon	1
114	Chrisavge	2	175	Kardhitsa	203
115	Chrisomilea	1	176	Kardhitsomagoula	12
116	Psiloma	1	177	Karpochori	4
119	Ag. Paraskevi	2	178	Kastanea	1
120	Ag. Trias	10	179	Katafillion	1
121	Ag. Anaryiroi	2	180	Kedhros	9
122	Aghiopighi	6	181	Kerasea	1
123	Ag. Akakios	2	182	Kordha	2
124	Ag. Georgios	4	183	Koskina	3
125	Ag. Theodhoros	5	184	Kranea	9
126	Agnanteron	1	185	Kria Vrisi	1
127	Aidonochorion	1	186	Krionerion	4
128	Amarandos	5	187	Kriopighi	7
129	Amitelikon	3	188	Kipseli	4
130	Ambelos	5	189	Lamberon	4
131	Amigdhali	1	190	Lazarina	3
132	Anavra	1	191	Leondari	18
133	Anthiron	22	192	Leonditon	3
134	Anthochorion	1	193	Lefki	1
135	Anogeion	1	194	Loxadha	3
136	Ano Ktimeni	1	195	Loutron	1
137	Apidhea	1	196	Loutropighi	1
138	Argithea	2	197	Magoula	11
139	Argirion	2	198	Magoulitsa	9
140	Asimochorion	2	199	Marathea	5
141	Achladhea	14	200	Marathos	5
142	Vathilakon	2	201	Markon	5
143	Vatsounia	2	202	Mascholourion	6
144	Vlasion	2	203	Mataranga	4
145	Vlochos	6	204	Mavrachades	3
146	Vounaina	1	205	Mavrommation	15
147	Vrangiana	17	206	Melissa	2
148	Gelanthi	2	207	Melissochorion	1
149	Gefiria	7	208	Mesinokolas	17
150	Ktimeni	4	209	Metamorphosis	3
151	Georgikon	3	210	Mitropolis	11
152	Gomfoi	5	211	Morfovounion	8
153	Gorgovites	3	212	Moschaton	1
154	Grammatikon	1	213	Mouzakion	28
155	Grimbiana	1	214	Bezoulas	1
156	Dhasochorion	5	216	Mirini	1
157	Dhafnospilia	2	217	Neochorion	2
158	Dhrakotripa	4	218	Xinonerion	7
159	Ellenika	1	219	Oxia	1
160	Ellenokastron	1	220	Orfana	1

APPENDIX D Cont'd

Code No.	Settlement	No. of Questionnaires used	Code No.	Settlement	No. of Questionnaires used
221	Palaiochorion	2	236	Pirgos Kieriou	5
222	Palaiokklision	4	237	Pirgos Ithomis	1
223	Palamas	55	239	Rachoula	6
224	Paliourion	4	240	Rendina	1
225	Paschalitsa	1	241	Rizovounion	3
226	Pedhinon	11	242	Ropoton	1
228	Petrilon	12	243	Servota	1
229	Petrinos	1	244	Sofadhes	50
230	Petroton	3	245	Stavros	4
231	Petrochorion	1	246	Fanarion	3
232	Porti	3	247	Filia	3
233	Proastion	21	248	Frangon	2
234	Prodhromos	5	249	Filakki	1
235	Ptelopoula	1	250	Fillon	2
			251	Charma	4

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G.R.S.R. - Greek Review of Social Research
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K.E.P.E. - Centre for Planning and Economic Research
N.E.D.O. - National Economic Development Office
N.S.S.G. - National Statistical Service of Greece
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