# structural aspects of the network of Greek cities

*A methodological note*

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1.0. This paper is the result of a discussion among researchers at the National Center for Social Research on a working plan for a research project on «The Greek Urban Center.» The working plan identified the need to examine certain structural aspects of Greek urban centers on the basis of various statistical data. The discussion centered around the need for a precise determination of the variables that define Greek urban space, that is, for a specification of the characteristics of that which, in a Greek context, can be defined as an urban center.

1.1. For the research on «The Greek Urban Center» the above target is essential with respect to the selection of the prototype which will serve as an object of the research. With respect to its methodological principles and its general character this research project stands in the tradition established by the study of *Middletown,* in the United States, and by similar research in France and Germany.[1]

1.11. One of the criteria for selecting the representative sample is the number of inhabitants and the population density. In order to set a lower limit for population size and to minimize the unavoidable arbitrariness in setting this limit[2] and, at the same time to determine the number of cities which could constitute an object of the research, it was considered necessary to examine all the data which would contribute to a more precise way of setting the limit.

1.12 The parallel examination of the distribution of active population contributes to a more precise determination of the group of possible representative samples by complementing the criterion of population size, giving a picture of the economic activity of the urban center.[3]

1.2 The same requirement of precision in setting the lower limit of population size for Greek urban centers also holds for another project at the Center, on «voting behavior.» This requirement stems from

1. Robert S. Lynd and Hellen M. Lynd, *Middletown: A Study in Contemporary American Culture,* New York, 1929; Robert S. and Hellen M. Lynd, *Middletown in Transition: A Study in Cultural Conflicts,* New York, 1937. Charles Bettelheim/Suzanne Frère, *Une ville française moyenne: Auxerre en 1950,* Paris 1950; Gemeindestudie des Instituts für sozialwissenschaftliche Forschung, Darmstadt 1952-1954. For the reports which constitute the Darmstadt-Study see: *Soziologische Exkurse,* Frankfurter Beiträge zur Soziologie N. 4, Ed. Th. W. Adorno/Walter Dirks, Frankfurt/Main 1956, p. 140 ff.

2. A limit such as «population larger or equal to 50,000 inhab.» would not be essentially mistaken but theoretically it would be untestably arbitrary.

3. Other criteria for selecting a representative sample cannot be discussed here. Let it be noted however that Athens and Thessaloniki are excluded from the start for obvious reasons.

TABLE 1

| Urban agglomerations - Towns | 1971 Population | Rank | 1961 Population | Rank | 1951 Population | Rank | Pop. 71 / Pop. 51 |
|---|---|---|---|---|---|---|---|
| 1. Greater Athens | 2,540,241 | 1 | 1,852,709 | 1 | 1,378,586 | 1 | 1.84 |
| 2. Greater Salonica | 557,360 | 2 | 380,654 | 2 | 302,124 | 2 | 1.84 |
| 3. Greater Patras | 120,847 | 3 | 103,941 | 3 | 86,267 | 3 | 1.39 |
| 4. Greater Volos | 88,096 | 4 | 80,846 | 4 | 73,817 | 4 | 1.19 |
| 5. Greater Iraklion (Crete). | 84,710 | 5 | 69,983 | 5 | 54,758 | 5 | 1.55 |
| 6. Larissa | 72,336 | 6 | 55,391 | 6 | 41,016 | 7 | 1.76 |
| 7. Greater Canea | 53,026 | 7 | 49,058 | 7 | 37,788 | 9 | 1.40 |
| 8. Kavala | 46,234 | 8 | 44,517 | 8 | 42,102 | 6 | 1.12 |
| 9. Greater Agrinion | 41,794 | 9 | 33,281 | 13 | 26,582 | 19 | 1.57 |
| 10. Serres | 41,091 | 10 | 41,133 | 9 | 37,207 | 10 | 1.10 |
| 11. Greater Kalamata | 40,402 | 11 | 39,256 | 10 | 39,940 | 8 | 1.01 |
| 12. Yanina | 40,130 | 12 | 34,997 | 11 | 32,315 | 11 | 1.24 |
| 13. Trikala | 38,740 | 13 | 31,885 | 15 | 27,914 | 17 | 1.38 |
| 14. Lamia | 38,297 | 14 | 33,170 | 14 | 25,288 | 22 | 1.51 |
| 15. Chalkis | 36,300 | 15 | 24,745 | 24 | 23,786 | 24 | 1.52 |
| 16. Rhodes | 33,100 | 16 | 28,119 | 20 | 24,280 | 23 | 1.36 |
| 17. Komotini | 32,219 | 17 | 31,845 | 16 | 31,893 | 12 | 1.01 |
| 18. Corfu | 31,461 | 18 | 29,896 | 18 | 30,811 | 13 | 1.02 |
| 19. Drama | 30,627 | 19 | 33,536 | 12 | 30,740 | 14 | 0.99 |
| 20. Greater Katerini | 30,512 | 20 | 30,095 | 17 | 26,503 | 21 | 1.15 |
| 21. Verria | 30,425 | 21 | 26,677 | 23 | 22,569 | 25 | 1.34 |
| 22. Greater Chios | 30,021 | 22 | 28,755 | 19 | 29,157 | 16 | 1.03 |
| 23. Xanthi | 27,040 | 23 | 27,802 | 21 | 27,283 | 18 | 0.99 |
| 24. Karditsa | 25,830 | 24 | 23,708 | 25 | 18,543 | 29 | 1.39 |
| 25. Alexandroupolis | 25,136 | 25 | 20,918 | 29 | 18,580 | 27 | 1.35 |
| 26. Mytilini | 24,376 | 26 | 26,846 | 22 | 26,525 | 20 | 0.92 |
| 27. Kozani | 24,020 | 27 | 21,537 | 28 | 17,651 | 32 | 1.36 |
| 28. Greater Aegion | 23,756 | 28 | 22,698 | 27 | 18,562 | 28 | 1.28 |
| 29. Yannitsa | 21,188 | 29 | 23,555 | 26 | 20,187 | 26 | 1.05 |
| 30. Corinth | 20,773 | 30 | 15,892 | 37 | 17,728 | 31 | 1.17 |
| 31. Pyrgos | 20,599 | 31 | 20,558 | 30 | 17,996 | 30 | 1.14 |
| 32. Arta | 20,538 | 32 | 17,654 | 33 | 13,645 | 38 | 1.50 |
| 33. Tripolis | 20,209 | 33 | 18,500 | 32 | 17,585 | 33 | 1.15 |
| 34. Argos | 19,878 | 34 | 17,627 | 34 | 14,026 | 37 | 1.41 |
| 35. Naousa | 17,443 | 35 | 15,752 | 39 | 12,782 | 40 | 1.35 |
| 36. Ptolemais | 16,588 | 36 | 12,747 | 45 | 8,816 | 50 | 1.88 |
| 37. Levadia | 16,271 | 37 | 13,595 | 42 | 12,059 | 44 | 1.36 |
| 38. Ermoupolis | 16,082 | 38 | 20,113 | 31 | 29,812 | 15 | 0.54 |
| 39. Kastoria | 16,043 | 39 | 10,872 | 50 | 10,049 | 49 | 1.59 |
| 40. Thebes | 15,971 | 40 | 15,779 | 38 | 12,582 | 41 | 1.27 |
| 41. Rethymnon | 15,373 | 41 | 15,576 | 40 | 11,790 | 45 | 1.30 |
| 42. Edessa | 14,671 | 42 | 16,145 | 35 | 15,458 | 35 | 0.95 |
| 43. Amalias | 14,615 | 43 | 16,108 | 36 | 15,350 | 36 | 0.95 |
| 44. Sparta | 13,432 | 44 | 15,538 | 41 | 15,538 | 34 | 0.86 |
| 45. Preveza | 12,973 | 45 | 12,865 | 46 | 12,296 | 42 | 1.05 |
| 46. Kilkis | 12,555 | 46 | 13,466 | 43 | 10,937 | 46 | 1.14 |
| 47. Orestias | 12,513 | 47 | 12,908 | 44 | 10,846 | 47 | 1.15 |
| 48. Missolonghi | 12,399 | 48 | 12,618 | 47 | 13,042 | 39 | 0.95 |
| 49. Florina | 11,164 | 49 | 12,004 | 48 | 12,270 | 43 | 0.91 |
| 50. Tirnavos | 10,687 | 50 | 11,074 | 49 | 10,756 | 48 | 0.99 |

the finding of a considerable difference in the voting behavior between urban and rural populations. This difference is related to, among other things, the population size of the urban center and the distribution of active population in the three basic sectors of the economy.

1.3 The contents of this paper attempt to tackle a methodological requirement of the two research projects mentioned above. At the same time they can, perhaps, contribute to the classification of Greek urban centers. This subject, which must be considered in relation to central place theory and to physical and economic planning on national and regional levels,[1] has been studied repeatedly in Greece

1. See mainly: Walter Christaller, *Die zentralen Orte in Süddeutschland,* Jena, 1933; Walter Christaller, «Das Grundgerüst der räumlichen Ordnung in Europa. Die Systeme der europäischen zentralen Orte», in *Frankfurter Geographische*

with great care,[1] without however this research having come to any definitive or binding results.

2.1 The following data were used for the elaboration of the object:

2.11 Statistical data on population, as shown in Table 1.[2] In the case of «Urban agglomerations» (cities 1, 2, 3, 4, 5, 7, 9, 11, 20, 22, 28, 38, 44) the data refer to the whole of the «urban agglomeration.» In the rest of the cases, data refer to the whole of each Township. Table 1 includes all Townships whose most populous settlement exceeded 10,000 inhabitants during the 1971 Census.[3]

2.12 The distribution of the active population of each city, by sector. A graphic representation of this distribution is given in Fig. 6.

This triangular presentation shows:

2.121 The distribution of active population in the three basic sectors of the economy for each city of Table 1, indicated by its ranking.

2.122 The mean distribution for the whole of the urban population.

2.123 The cities for which all three of the components of active population differ less than 5% from the respective mean of the whole of the urban population (interior hexagon, referred to in the text as «5% hexagon»).

2.124 The cities for which the respective differences are less than 15% (exterior hexagon, referred to in the text as «15% hexagon»). The data of paragraphs 2.121 - 2.124 are based on the 1961 census results,[4] as the corresponding data of the 1971 census have not been published yet. The data from 1961 are used with some reservation. In some cases of course the data do not correspond to the actual situation.

2.21 The following settlements of Attica have been excluded from consideration: Menidi, Eleusis, Aspropyrgos, Megara, Ano Liossia, Kalamaki and Salamis. These settlements are considered as autonomous in Greek statistics. The criterion for excluding them is that they fall in the sphere of influence of Athens, even though some of them, like Megara, present some degree of autonomy.

2.22 Data on Athens and Thessaloniki are given for reasons of comparison, because of the particular nature of those cities and because of the place and importance they occupy in the network of Greek cities.

2.23 The settlements with a population of between 7,000 - 10,000 are included. This is done so as to test the usefulness of the limit of 10,000 inhabitants set by the Greek Statistical Service in characterizing a settlement as urban.

2.3 The above data are considered adequate enough for the purpose of this paper, as it does not aim at a complete classification of urban centers.

3.0 According to the so-called Rank-Size Rule,[5] for certain groups of cities, the following relationship holds:

$$P_R \cdot R^n = C \qquad (1)$$

where: R is the ranking of a city within a network or group of cities that it belongs; $P_R$ is the population of the $R^{th}$ city; C and n are constants depending on the particular group of cities. This law is empirically verifiable in many countries, with the frequent exception of the largest city.

*Hefte,* N. 1/1950; August Lösch, *Die räumliche Ordnung der Wirtschaft* (1940), Stuttgart, 1962. See also, among others: G. Olson, «Central Place Systems, Spatial Interactions, and Stochastic Processes», in *Papers of the Regional Science Association,* Vol. XVIII (1967); B. Dietrichs, «Die Theorie der zentralen Orte–Aussage und Anwendung heute», in *Raumforschung und Raumordnung* N. 6/1966; Elizabeth Lauschmann, *Grundlagen einer Theorie der Regionalpolitik,* (sec. ed.) Hannover, 1973.

1. See, e.g.: Δήμητρα Κατοχιανοῦ, «'Εθνικὸν Χωροταξικὸν Σχέδιον–'Εθνικὸν δίκτυον ἀστικῶν κέντρων», Τόμος Α' (Προσχέδιο), ἔκδ. ΚΕΠΕ ('Υπηρεσία Χωροταξικοῦ Προγραμματισμοῦ), 'Αθῆναι 1966. Δήμητρα Κατοχιανοῦ, «Χωροταξικὴ Μελέτη 'Εθνικοῦ δικτύου ἀστικῶν κέντρων», ἔκδ. ΚΕΠΕ, ὅ.π. 'Αθῆναι, 1967. Mary Evangelinides: «Regional Development–Core-periphery Relations: The Greek Case», in *The Greek Review of Social Research,* Athens, No 24 (1975).

2. Most of the data are from the Social Research Center study: *'Εξελίξεις καὶ προοπτικαὶ τοῦ πληθυσμοῦ τῆς 'Ελλάδος 1920-1985,* ΕΚΚΕ, 'Αθῆναι, 1973. The data are adjusted here on the basis of geographic and administrative boundaries of 1971. It must be noted especially that the data for 1951 for Ermoupolis are fictitious, as the census for the township of Ano Syros, that belongs to the urban agglomeration of Ermoupolis, had included a concentration camp for political prisoners (see Bernard Kayser, *Géographie humaine de la Grèce,* Paris 1964, p. 43). The real population of Ermoupolis for 1951 must have been about 20,200 inhabitants, so that: pop. 71/pop. 51 = 0,80

3. Kalymnos, for example is omitted: the township has more than 10,000 inh. but the settlement had, in 1971, less than 10,000 inh.

4. Data are elaborated in M. Παπαδάκης: «Οἰκονομικαὶ καὶ δημογραφικαὶ ἀπόψεις τοῦ οἰκιστικοῦ δικτύου τῆς 'Ελλάδος», mimeo; data presented to the «Seminar for Urban Planning», National Technical University, Athens (n. d.). The relativity of statistical data must also be noted. This relativity is due to various factors, and has as a consequence the presentation of a picture that is different from actuality. Cf., Emile Y. Kolodny, *La Population des îles de la Grèce,* Aix-en-Provence, 1974, Vol. 1, p. 401ff., referring to the case of Ermoupolis.

5. See, e.g.: John Q. Stewart, «Empirical Mathematical Rules Concerning the Distribution and Equilibrium of Population» in J. J. Spengler and Otis D. Duncan (eds.), *Demographic Analysis,* Glencoe, Ill., (The Free Press), 1956, pp. 344-371; Harvey C. Browning and Jack P. Gibbs, «Some Measures of Demographic and Spatial Relationships among Cities», in Jack P. Gibbs (ed.), *Urban Research Methods,* Princeton 1961, pp. 436-459.

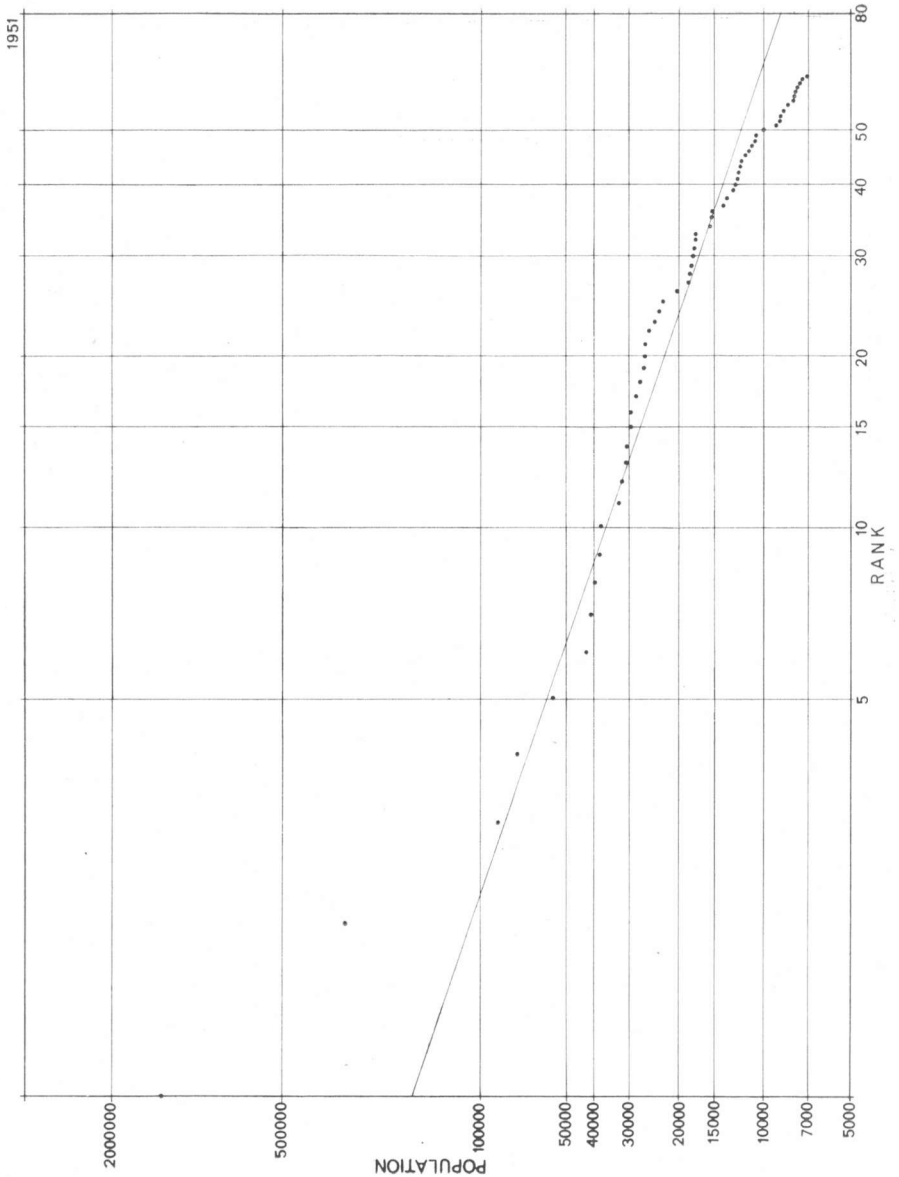
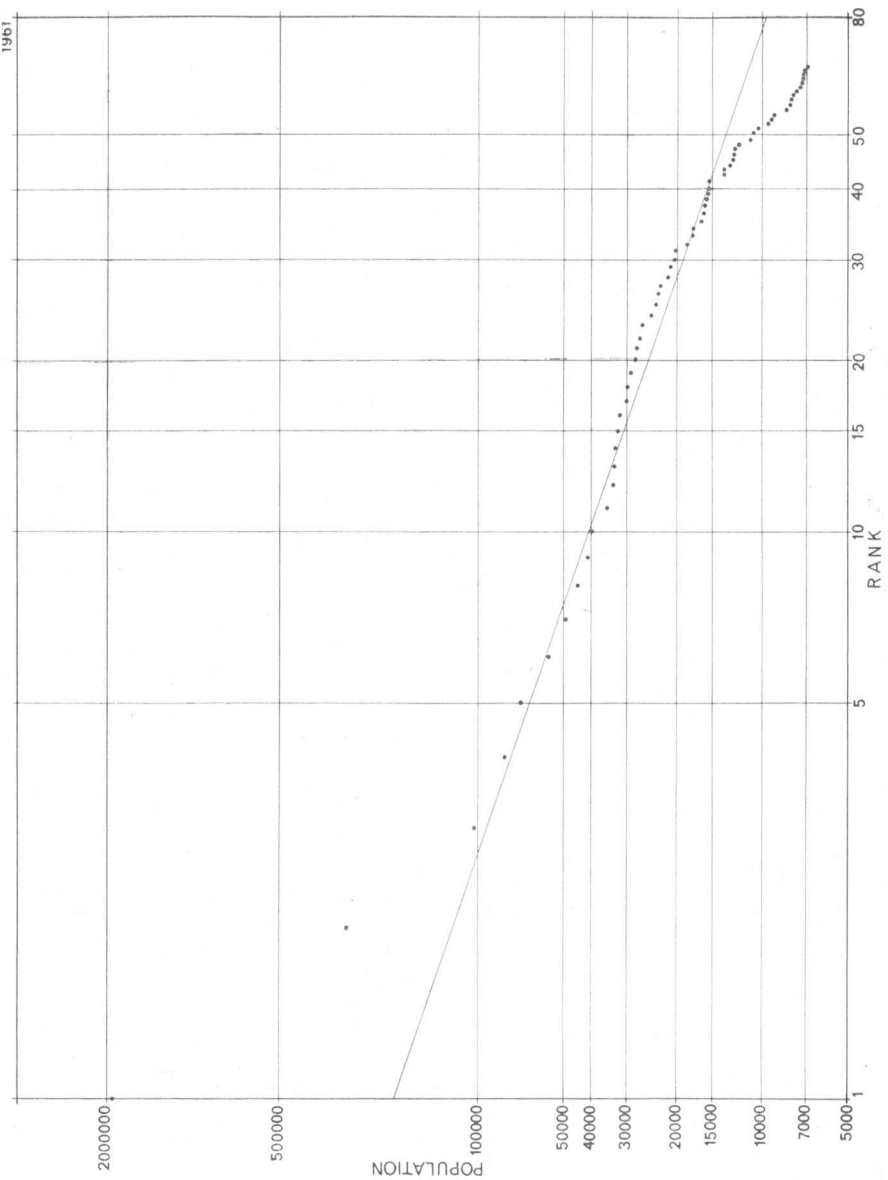

1951
POPULATION
2000000
500000
100000
50000
40000
30000
20000
15000
10000
7000
5000
RANK
5
10
15
20
30
40
50
80

FIGURE 1


1961
POPULATION
2000000
500000
100000
50000
40000
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20000
15000
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7000
5000
RANK
1
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50
80

FIGURE 2

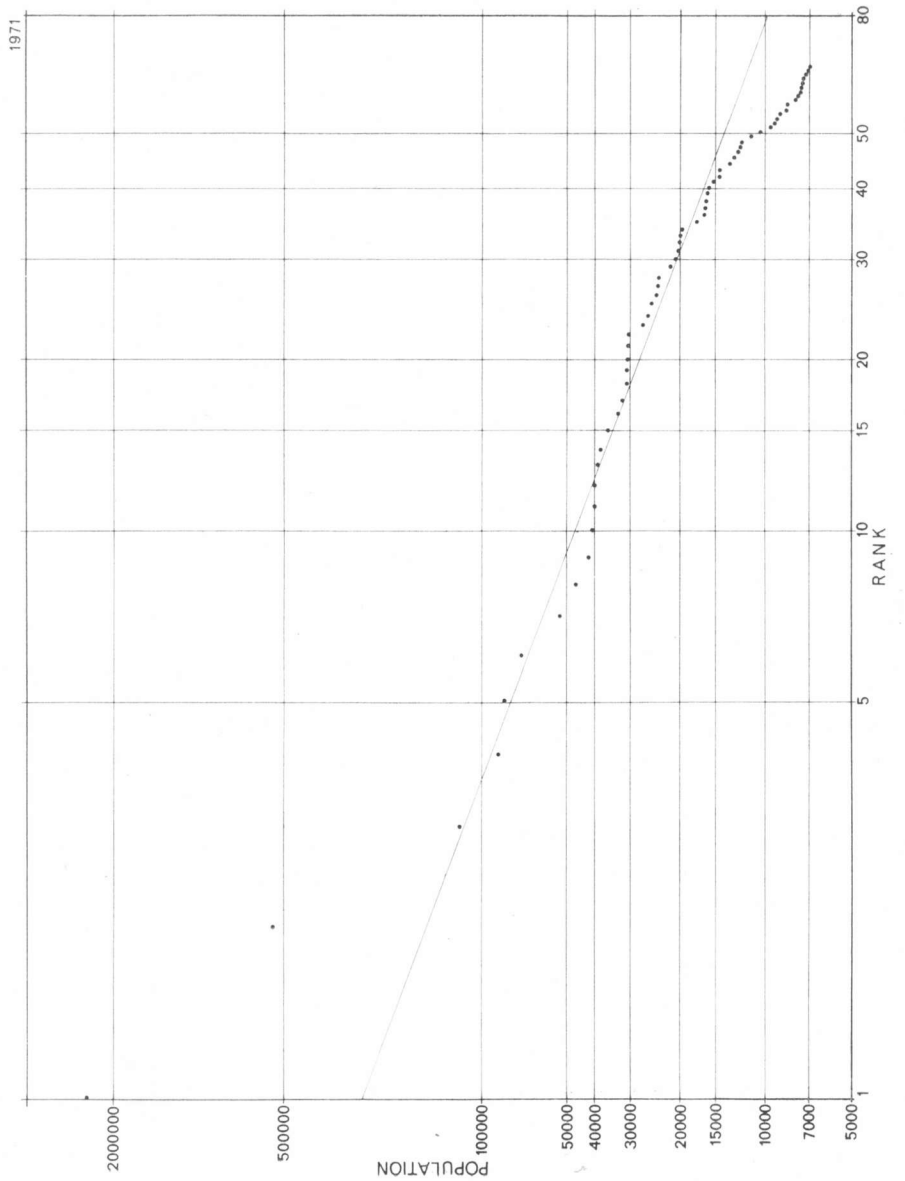

1971
POPULATION
2000000
500000
100000
50000
40000
30000
20000
15000
10000
7000
5000
RANK
1
5
10
15
20
30
40
50
80

FIGURE 3

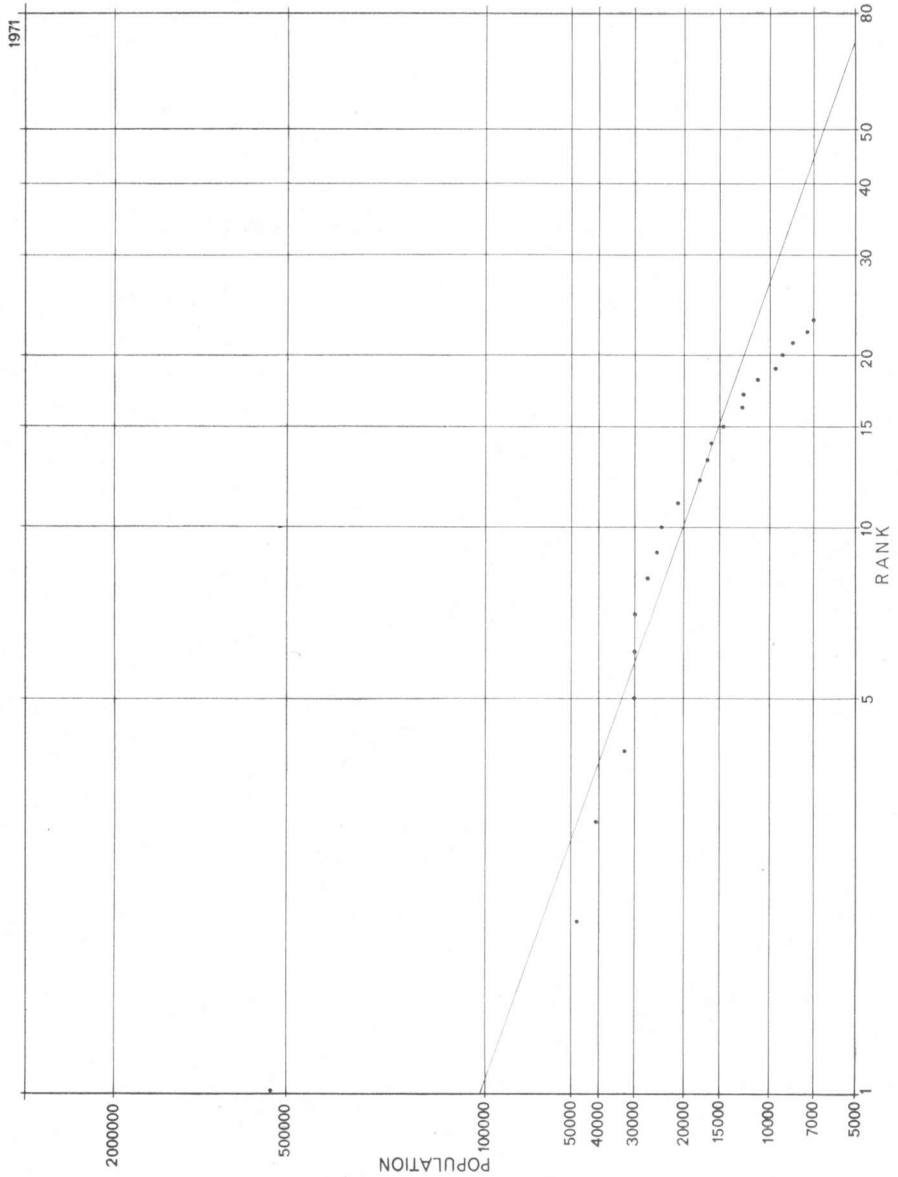

1971
POPULATION
2000000
500000
100000
50000
40000
30000
20000
15000
10000
7000
5000
RANK
1
5
10
15
20
30
40
50
80

FIGURE 4

The logarithmic form of relationship (1) is:

$$\log P_R + n\log R = \log C \qquad (2)$$

and is represented by a straight line on a double logarithmic paper.

3.1 Figures 1, 2, and 3 are an application of the Rank-Size Rule on the basis of data for the Greek Urban network, as given in Table 1.[1] Figure 4 is an application of the same law for cities of Northern Greece (Macedonia and Thrace) on the basis of 1971 data.

3.11 For a better graphic representation of Figs. 1-4, different scales were used for the x, y axes. Thus, the relationship shown by the diagram is:

$$\log P_R + \alpha \log R^2 = \log C$$

$$\text{where } \alpha = \frac{n}{2}$$

3.12 It is noted that the straight lines in the diagrams of Figs 1-4 were plotted by inspection and not, as it would be more correct, by the method of least squares. The possible error is negligible. For the plotting, all cities with a population more than 10,000 were considered, with the exception of Athens and Thessaloniki.

3.2 The following basic remarks can be made for Figs. 1-3:

3.21 The Rank-Size Rule is generally verifiable, with relatively close approximation, for the totality of Greek cities, excepting Athens and Thessaloniki whose actual population is considerably larger than the theoretical one, i.e., the one they should have if the Rank-Size Rule held.

3.22 In all three diagrams, cities with less than 15,000 inhabitants diverge perceptibly downwards from the theoretical line.

3.23 The straight lines of diagrams 1-3 have essentially equal slopes. Indeed, the successive values of n are:

0.70 for 1951
0.71 for 1961
0.75 for 1971

This indicates a stability in the relationship between population and rank size in the whole of the network of Greek urban centers.[2]

3.24 The Rank-Size Rule holds for «complete» regions.[3] As shown in the diagram of Fig. 4 the curve for cities of Northern Greece is approximated sufficiently by a straight line—with the exception of Thessaloniki. This means that Northern Greece (Macedonia and Thrace) can be considered, in the above sense, as a «complete» region in the interior of which primate city distribution holds.

4.0 The comparative analysis of Figs. 1-3, in relation to Fig. 6, leads to the determination of a classification within the network of urban centers. The following six groupings are distinguished:

4.1 Group (0) : Athens and Thessaloniki form a group, distinct from all other groups, both with respect to the very large deviation from the straight line and to the singularity of their urban functions and their administrative importance. Group (0) is also characterized by an internal heterogeneity: the straight line on which are situated the two cities and the straight line which approximates the curve of all the other cities of the Greek urban network are not homothetic. An explanation of this phenomenon is that while Athens is undoubtedly the first city in Greece, Thessaloniki plays the role of the first city in Northern Greece, in addition to its role as a second city on a national level.[4]

4.2 Group (I) : This group is composed of cities with population between 60,000-120,000, on the basis of 1971 data. These are the cities of Patras (3), Volos (4), Iraklion (5), and Larissa (6).[5] The three first form a separate group since 1951 and 1961. Larissa is added in stages : while in 1951 it belonged to the next group of urban centers, in 1961 it could be taken to belong either in Group (I) or (II) while in 1971 it has definitely entered Group (I).

4.3 Group (II) : This group is composed of cities with population between 35,000-60,000, on the basis of 1971 data. The comparison of the curves for years 1951, 1961 and 1971 shows that the 35,000 limit remains diachronically stable as the lower limit for the formation of Group (II), very clearly in 1951 and less so in 1961. With a minor adjustment (= 36,000) this limit will still hold for 1985 with the same clarity as in 1951.[6] Groups (I) and (II) will contain the same cities that they contain today, with the addition of Rhodes (16). By comparing the straight lines it is evidenced that the actual population of cities of Group (II) is always smaller than the theoretical one. Group (II) includes the same cities for years 1951 and 1961. With the 1971 data five more cities are added.

4.4 Groups (0)-(II) that have been discussed above and include all cities with population over 35,000,

1. A first application of the Rank-Size Rule for all Greek cities is the work of A. Ph. Lagopoulos, «Rank-size and primate distributions in Greece,» in *Ekistics* 192, Nov. 1971, pp. 380-386.

2. For comparative data on the value of n, as well as for its change diachronically in other countries, see John Q. Stewart, *loc. cit.*, p. 351.

3. Cf. A. Ph. Lagopoulos, *loc. cit.*, p. 384.

4. Cf. also Fig. 4.

5. The numbers in parentheses refer to the ranking order of Table 1.

6. See the study at EKKE, *op. cit.*, pp. 36-40.

contain ten cities in total for years 1951 and 1961. It is characteristic that eight of them are ports. Of the five cities that have been added to these groups in 1971, four are situated inland and only one, Chalkis, is a port. Its character and function, however, is essentially determined by its proximity to Athens.

4.5 Group (III) : This Group includes all cities with population between 14,000 and 35,000 inhabitants.

4.51 The upper limit (35,000) as well as the lower one (14,000) remain diachronically stable. A quantitative characteristic of this group is that the curve of cities approximates closely the straight line, in all three diagrams.

4.52 A qualitative characteristic of Group (III) is its heterogeneity with respect to the nature of the cities it contains. By way of example, it is noted that this group includes all the island cities (except for those of Crete), it also includes purely agricultural towns (e.g. Yiannitsa (29), Katerini (20), Amalias (43), etc.), towns that could be characterized as agricultural-industrial, etc.

4.53 Since the limit of 18,000 inh. is, with a small change, clearly evidenced in all three diagrams (Figs. 1-3), it could be considered as the lower limit for Group (III) as a whole.

4.6 A closer observation of Group (III) leads to a clear subdivision into four subgroups:

4.61 (IIIa) : Population between 35,000-30,000. It includes seven cities of which three are traditional island cities and three agricultural cities of Northern Greece. All the cities of this subgroup are prefecture capitals.

4.62 (IIIb) : Population between 30,000-22,000. It includes cities of diverse and antithetical structural and functional character and of varied geographic location, so that this subgroup determines the heterogeneic quality of all of group (III). The cities of this subgroup are also prefecture capitals, with the exception of Aegion (28), which could be considered as a satellite of Patras.

4.63 (IIIc): Population between 22,000-18,000. Two thirds of the cities of this subgroup are in the Peloponnese.

4.64 (IIId) : Population between 18,000-14,000 inh. It mainly includes towns of rural industrial character most of which exhibit a normal to rapid population increase. The towns of this subgroup have a relatively diminished administrative importance (4 out of 9 are not prefecture capitals).

4.7 The heterogeneity of Group (III) gives it a negative definition. On the basis of quantitative and qualitative data presented here, it can be argued that the transformation of this group into a homogeneous one—even if that transformation entails the disappearance of the group, and passage of the cities that compose it to other homogeneous groups—will not occur in the near future.[1] At present this group is a kind of a connecting element inside the network of Greek urban centers.

4.8 Group (IV): It includes all towns with population between 14,000 and 10,000 inhabitants (1971 data).

4.81 With the exception of Sparta (44), all towns of this group belonged to the same group in 1951 and 1961. The actual population of the towns of this group is considerably smaller than the theoretical one, and the curve of the towns is characterized by its increasing deviation from the straight line.

4.82 Qualitatively, the group is characterized by:

4.821 Lack of administrative importance of its towns. Two of them are not even prefecture capitals, while five others are influenced by more dynamic, neighboring administrative centers. Therefore, the degree of centrality for cities of group (IV) is low.

4.822 Low level of industrialization (percentage of employment in the secondary sector less than 30%). Conversely all cities belonging to this group in 1951 and presenting, in 1961, a percentage of employment in the secondary sector of more than 30% have moved to the preceding Group (III).

4.823 High percentage of employment in the agricultural sector—with the exception of Florina.

4.9 Group (V): Population between 7,000-10,000 inh. This group consists of settlements that in general cannot be characterized as urban on the basis of qualitative or quantitative criteria.

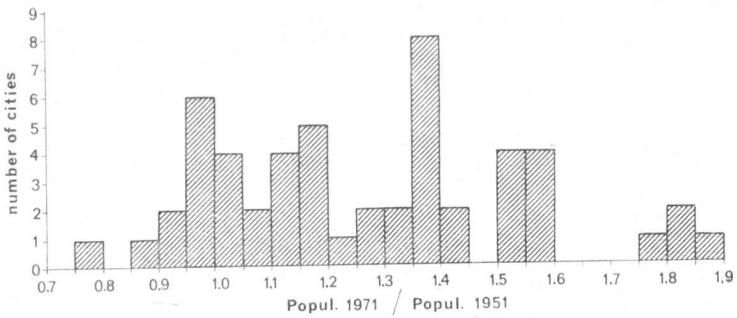
4.91 An exception is all those settlements that are prefecture capitals or those that are found on islands, especially, when these two characteristics are combined (e.g., Zakynthos, Argostoli, Lefkas). The remaining settlements of Group (V) are in their majority agricultural or trade centers.[2]

4.92 The increasing tendency of the curve of cities to deviate from the straight line, is here very pronounced. The comparison of Groups (IV) and (V) shows that the limit of 10,000 inhabitants used by Greek statistics to characterize a settlement as an urban center reflects adequately the reality of Greek urban space. Thus, the statistics for years 1951, 1961 and 1971 include the same cities in their tables of Urban Centers, with three exceptions: Ptolemais that has exhibited a high growth rate, Zakynthos

1. See note 6 of p. 61.

2. See also Kayser, *op. cit.*, p. 22. With respect to the exceptions, it is noted that these demonstrate once again the looseness of statistical limits, depending each time on the concrete objectives of the research. In studying for example the urbanization process in the Ionian Islands it would be a mistake if three of the four prefecture capitals were not considered as urban centers (on this subject see Emile Y. Kolodny, *op. cit.*, Vol. 2, p. 502).

FIGURE 5




The distribution of values of the ratio Pop. 71/Pop. 51, which expresses the population change for this time interval, presents certain noteworthy peaks and gaps. Given the fact that for the same period the total population growth in Greece is 15%, it could be considered that cities with stagnant or declining populations are those for which the ratio Pop. 71/Pop. 51 less than 1.2 (= annual rate of increase less than 1%), and the rest are cities with rising population. It is also noteworthy that the value 1.2 coincides with the distribution median.

whose population declined, due perhaps to the earthquakes, and, finally, Kalymnos.

TABLE 2

| Population [inh.] | Total number of cities | | Continental cities | | Island cities | |
|---|---|---|---|---|---|---|
| | Number of cities | No. of cities incl. in «15% hex.» | Number of cities | No. of cities incl. in «15% hex.» | Number of cities | No. of cities incl. in «15% hex.» |
| 35,000 | 15 | 14 | 13 | 12 | 2 | 2 |
| 35,000 - 18,000 | 19 | 9 | 15 | 5 | 4 | 4 |
| 18,000 - 10,000 | 16 | 3 | 14 | 1 | 2 | 2 |

5.0 The following observations refer to Fig. 6 :
5.1 The «15% hexagon» includes 26 of the 50 cities that are examined here. With the exception of Agrinion (9), they are all prefecture capitals, a fact that obviously contributes to their degree of centrality, and, perhaps, is the determining factor in their qualification as «central places.» Most of the cities included in the «15% hexagon» belong to the following two general categories:[1]

5.11 All cities with population over 35,000, with the exception of Kavala (8). The fact that Athens and Thessaloniki are included in the «15% hexagon» and not in the «5% hexagon» confirms once again their special nature. Furthermore, the «15% hexagon» includes, with the exception of Kavala (8), all the so-called «regional capitals,» irrespective of whether they actually ever functioned as such, and in spite of the ambiguity of the concept of «regional capitals,» and, finally, irrespective of the validity of the original intentions for this subdivision of Greek space into regions.

5.12 All the island cities, irrespective of population size, a fact which confirms their importance as «central places». Also included—but not mentioned —are the settlements of Zakynthos and Argostoli, which, with respect to their population belong to group (V).

5.2 Of all the cities outside the «15% hexagon» only three present a percentage employment in the agricultural sector of less than 24%. The same also present a percentage occupation of active population in the secondary sector, higher than the national average.

Of the remaining:

5.21 Those that present a percentage employment in the secondary sector over 30% also show a growth in their population.

5.22 Those that exhibit less than 25% employment in the secondary sector, have, as a rule, stagnant or declining populations.[2]

1. Cf. also Table 2.

2. Cf. par. 4.822, 4.823.

5.3 In general the following observations hold:

5.31 Cities with a low degree of centrality because of no administrative importance, have populations of up to about 20,000 inhabitants and diverge considerably from the mean distribution of active population by sectors—that is, they are not included in the «15% hexagon.»

5.32 The agricultural population of prefecture capitals does not surpass 30%. Therefore, prefecture capitals that can be characterized as «agricultural» towns (i.e., percent of agricultural population over 30%) are very few.

5.33 The cities that are not capitals of the prefecture in which they are located, exhibit a percentage of agricultural population of about, or more than 30%.

5.34 The above also hold for the towns of Group (V) (7,000-10,000 inhabitants).

6.0 The map (Fig. 7) complements the observations of this paper by presenting the geographic distribution of urban centers. In general, it can be noted that there is evidenced:

6.1 A concentration of developing cities in the geographic center of Greece.[1]

6.2 A presence of pairs of cities of equal size.

7.0 In conclusion, the results of this partial methodological inquiry are:

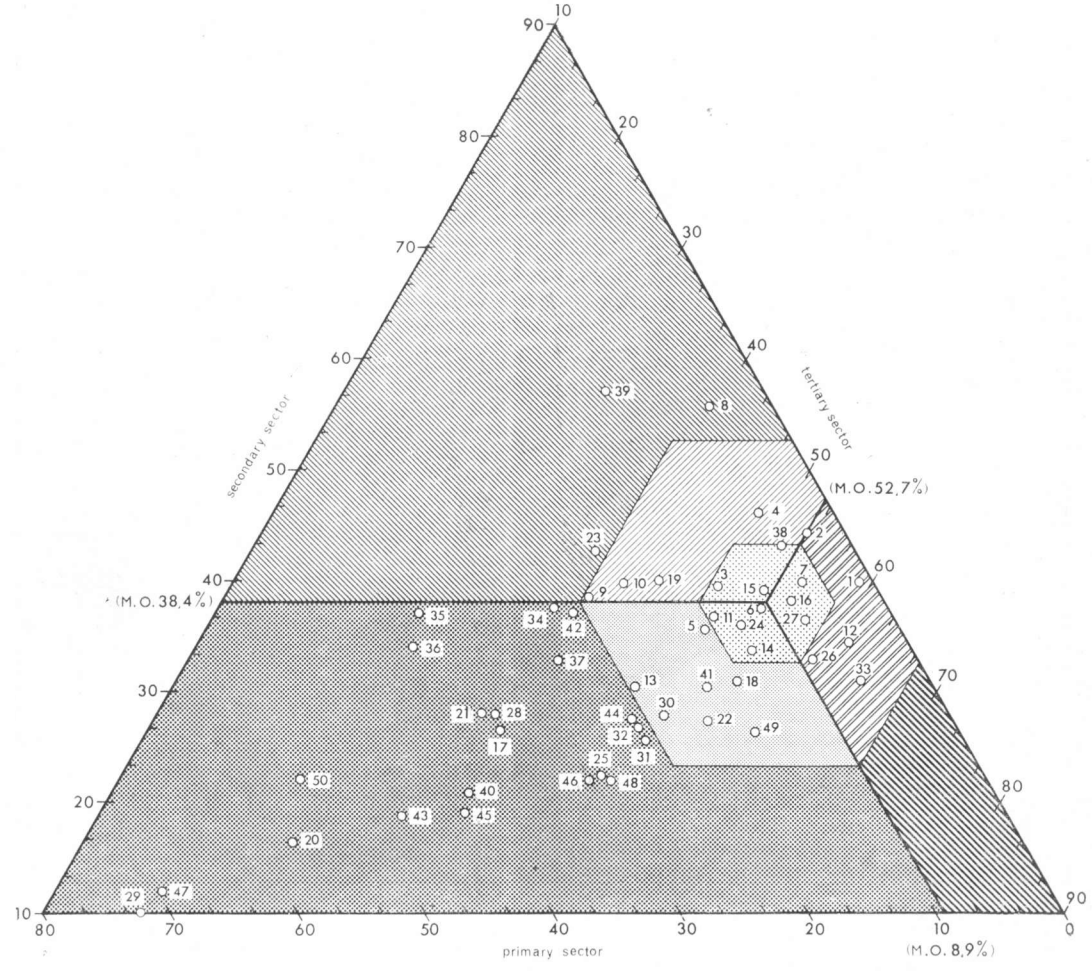
7.1 With respect to the research project on «The Greek Urban Center»: the determination of the group of cities each of which could serve as a representative sample for the research. These are the cities of Groups (I) and (II), or the cities of the first category that are included in the «15% hexagon» of Fig. 6.[2] However, since the population size and the distribution of the active population do not constitute the only criteria for selecting the sample, a method for the final selection has to be designed, through which the group of qualifying cities would be narrowed down to about ten. Even if the population lower limit is brought down to 30,000 inhabitants, so that the cities of subgroup (IIIa)[3] could also qualify as objects for the research, these cities would still have to be excluded on the basis of their special characteristics. It must therefore be assumed that the above approach corresponds to the methodological requirements and to the actuality of the network of Greek urban centers.

7.2 With respect to the research project on voting behavior:

In a preliminary approach to the subject, «urban population» was taken to be those voting in cities of more than 10,000 inhabitants, and also in Nafplio and Zakynthos. In examining the difference in the voting behavior of rural and urban populations of the same province, it was determined that, with few exceptions, it is essentially non-existent with respect to small urban centers, while it is very pronounced for cities in groups (0), (I), and (II). It was also determined that the correlation of employment in the secondary sector to votes for the left, when computed for the whole of Greek cities, is, in contrast to other countries, very low.[4] The above findings make necessary the careful examination of each group of cities, with the intention of determining in the most precise way the factors that influence the formation of an «urban» (as opposed to «rural») voting behavior. This, of course, bearing in mind that various factors from the historical experience of each social space constitute perhaps the best explanatory variables.

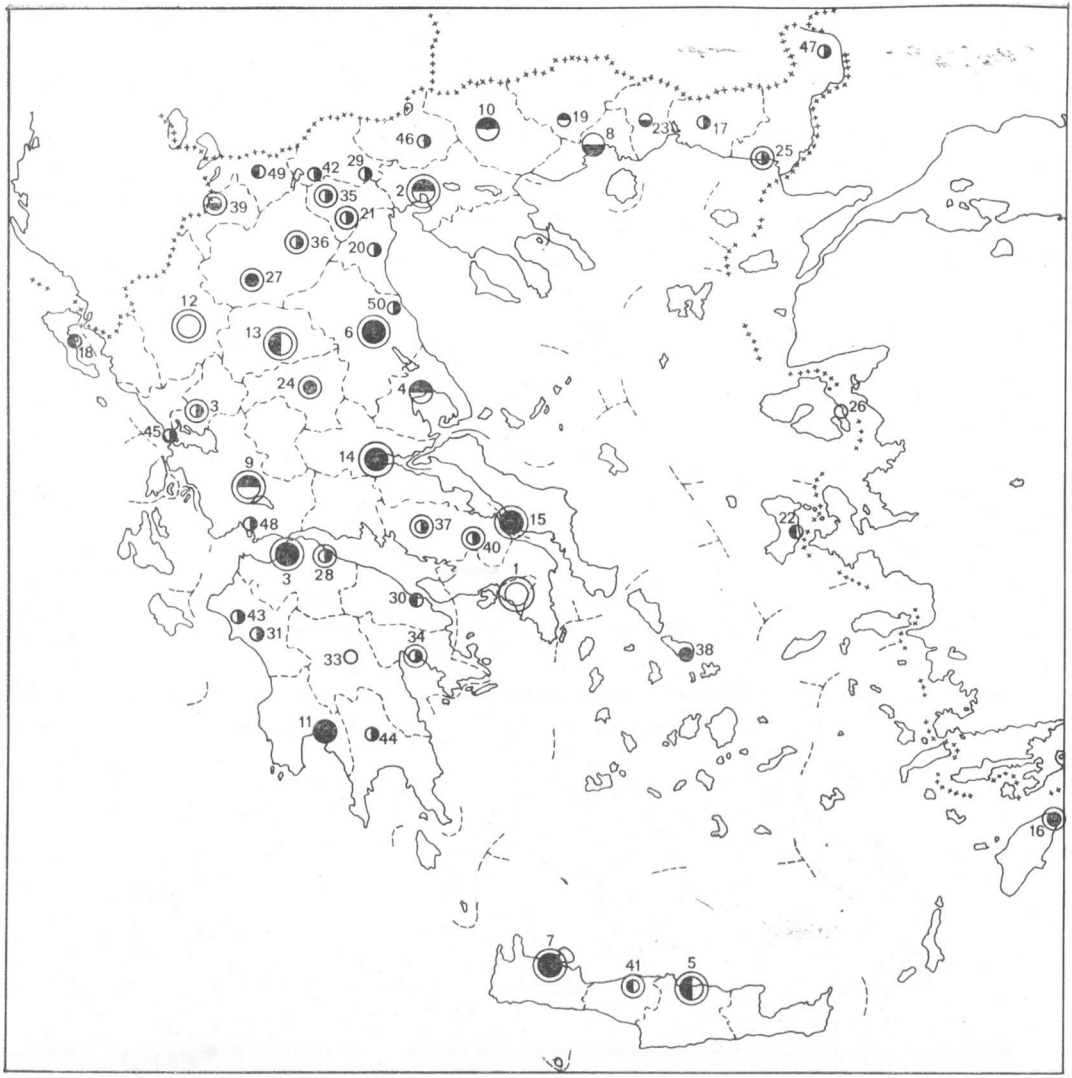
1. Cf. also B. Kayser, *op. cit.*, p. 36 f.
2. Cf. par. 5.11.
3. Cf. par. 4.61.
4. See e.g. Raymond Boudon, «Propriétés individuelles et propriétés collectives; Un problème d'analyse écologique», in *Revue française de sociologie*, 1963, vol. IV, no. 3, pp. 275 - 299.

FIGURE 6




M. O = Mean

FIGURE 7




City Size

○ > 35000 inh

○ < 35000 inh

Population increase 1951-1971 > 20 %

Distribution of active population by sectors

Symbol equivalents

1 4

2 5

3 6

Map / Fig. 6