ASPECTS OF INEQUALITY AND POVERTY IN GREECE: 1974, 1982

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SUMMARY

This study attempts to document the state and nature of inequality and poverty in Greece using the primary consumption expenditure data of two Household Expenditure Surveys conducted in 1974 and 1982.

Chapter 1 provides an outline of recent developments in the Greek economy, a survey of the literature on inequality and poverty in Greece and a comparison of the above data with data from other sources.

In Chapter 2 it is argued that the distribution of consumption expenditure per equivalent adult is a fairly good approximation to the (unobservable) distribution of economic welfare, and three models of equivalence scales for the cost of children are estimated. Based on these results, the distributions of consumption expenditure per equivalent adult are constructed for both survey years.

Chapter 3 provides the results of measurement and decomposition of inequality. One-way decomposition is carried out when the population is grouped according to ten factors, of which five are used to subdivide the population into small homogeneous socioeconomic groups for the purposes of the multivariate decomposition of inequality. The main finding of the one-way decompositions is that disparities "between-groups" play a far less important role in determining aggregate inequality than disparities "within-groups". Even in the multivariate decomposition, variations "between-groups" account for only one third of aggregate inequality in 1974 and for even less in 1982.

The results of measurement and decomposition of poverty, reported in Chapter 4, suggest that poverty is closely associated with certain occupational characteristics of the household head. These characteristics are employment in the agricultural sector or no employment. Households headed by farmers and retired persons account for around two thirds of aggregate poverty in both survey years.

Intertemporal changes in inequality and poverty are examined in Chapter 5. It is demonstrated that inequality and relative poverty declined substantially between 1974 and 1982, while the decline in absolute poverty was spectacular. The impact on inequality of changes in the structure of the population was negligible, but the improvement in the educational level of HH heads had a strong negative effect on poverty. Further, the results of some cross-country inequality and welfare comparisons presented in this chapter show that inequality is higher, and welfare lower, in Greece than in most of the other EEC countries.

Finally, Chapter 6 summarizes the principal findings and discusses briefly their policy implications.

CHAPTER ONE

INTRODUCTION

1. Introduction

In recent years many intense controversies in Greece have centered around questions of economic inequality. However, much of this debate was based on broad generalizations and the quantitative evidence used in arguments and counter-arguments was mainly taken from the National Accounts. Explicit references to the problem of poverty appeared rather rarely in this debate. Nevertheless, they were usually implicit in the arguments about inequality. As in many other countries, until recently, empirical studies on inequality and poverty in Greece based on primary data were almost non-existent. This paucity of empirical work can be attributed to two factors: the first is the scarcity of reliable statistical data and the second is that, at least until the late seventies, there was limited practical interest in the subject. Two reasons can be identified for the limited interest. Firstly, during the first three postwar decades GDP per capita (pc) was growing rapidly and, hence, even if it is assumed that during some of these years inequality was increasing it may also be reasonably assumed that the living standards of the great majority of the population were improving, as well.[1] Hence, there was no serious pressure for redistribution. Secondly, during that period the social classes that could be the main beneficiaries of a potential egalitarian redistribution were not well-organized and were exercising very limited power. This picture changed dramatically in the late seventies and particularly during the eighties. The economy experienced very slow growth rates (effectively, in the 1980s it stagnated) and at the same time there was a rapid increase in the unionization of broad categories of the working population. Acute claims for redistribution were raised and the debate on inequality became a "burning issue".

The aim of the present study is to provide a systematic analysis of measurement and decomposition of inequality and poverty in Greece using the primary data of two Household Expenditure Surveys (HESs) conducted by the National Statistical Service of Greece (NSSG) in 1974 and in 1981/82.[2] This analysis can be viewed as an attempt to document the state and nature of inequality and poverty in Greece. In particular, the

1. See Athanasiou (1984, pp 22-26).
2. The second of these HESs was conducted mainly in 1982. For this reason, we refer to it as "the 1982 HES".

computation of several indices of inequality and poverty allows a comparison of the levels of inequality and poverty of several socioeconomic groups, while the decomposition analysis enables the identification of the sources of inequality and poverty.

The study consists of six chapters. The remaining part of the first chapter provides a brief description of the Greek economy in the postwar period, a survey of the existing literature on inequality and poverty in Greece and a comparison of the data used in this study with data from other sources (National Accounts and Population Censuses). Chapter 2 deals with the construction of equivalence scales for the cost of children. It is argued that what we are really interested in measuring is the level of inequality in the distribution of economic welfare and that a relatively good approximation to this is the distribution of consumption expenditure per equivalent adult (pea). Three models of equivalence scales for the cost of children are estimated (Engel, Rothbarth and Barten). Using this empirical evidence, the distribution of consumption expenditure pea is constructed and used in the rest of the study. Chapter 3 reports the results of measurement and decomposition of inequality in Greece. It starts with a discussion of theoretical issues related to the measurement and decomposition of inequality. Five indices are selected and used for the measurement of inequality, whereas the decomposition analysis is performed using three of them. For the purposes of one-way decomposition of inequality, the population is grouped into homogeneous groups using ten criteria. These criteria are regional (region and size of municipality or commune), occupational (sector of employment, type of profession and occupational status of household [HH] head and number of economically active HH members), demographic (age and sex of HH head and HH size) and educational (educational level of HH head). In the last part of this chapter a multi-variate decomposition of inequality is carried out by dividing the population into many small homogeneous socioeconomic groups using five of the criteria mentioned above and the average and marginal effects on consumption expenditure pea of participating in particular socioeconomic groups are calculated. Chapter 4 contains the results of measurement and decomposition of poverty in Greece. The structure of this chapter is similar to that of chapter 3. It starts with a detailed discussion of problems related to the measurement and decomposition of poverty. A new decomposable poverty index is constructed and used in this chapter's analysis. The results of measurement and decomposition of poverty are reported when the population is grouped using the ten criteria mentioned above. The last part of the chapter focuses on the characteristics of the two groups which account for more than 60%

of aggregate poverty (that is, members of HHs headed by farmers and retired persons). An appendix to the chapter contains a profile of the high expenditure groups. Chapter 5 is devoted to the examination of changes in inequality and poverty in Greece between 1974 and 1982. The impact of changes in population shares on inequality and poverty is also evaluated. In addition, this chapter contains a comparison of estimates of inequality in the distribution of consumption expenditure by HH in Greece with similar estimates for other countries and an attempt to compare the welfare levels of these countries. Finally, chapter 6 summarizes the principal findings of the study and discusses briefly their possible policy implications.

2. A short description of the Greek economy in the postwar period[3]

During World War II, Greece was occupied by the Axis forces and her economy was almost completely devastated. This war was followed by a civil war in which the Left was defeated. As a result, the Communist party was outlawed and, although the regime was parliamentary democracy, there was a relative restriction of civil liberties. This period lasted until the early sixties and was dominated by conservative governments. After a short period of liberal governments, there was a military dictatorship between 1967 and 1974. This period of complete lack of political freedom was followed by the restoration of democracy and centre-right governments until 1981, when a socialist government came to power.

Throughout this period several important changes took place in the Greek economy. Between 1950 and 1986 the volume of GDP increased by a factor of 6.5 and GDP pc grew at an average annual rate of 4.6%; in 1986 GDP pc was 4022 current US dollars.[4] In addition, between 1950 and 1980 the share of manufacturing (including mining, construction and electricity) in national income rose from 21.3% to 31.3% whereas that of agriculture declined from 31.1% to 17.4%. Between 1960 and 1980 the share of urban population in total population rose from 42.9% to 61.9%, and the percentage of the labour force in agriculture fell from 55.8% to 36.6%.[5] Further, the share of investment in national income increased from an average of

3. For a survey of developments in the Greek economy after 1922 see Freris (1986).

4. IMF (1987, pp 360-61). In fact, excluding the period 1980-1986 when the GDP pc growth rate was only 0.7% per annum, in the period 1950-1980 Greece was one of the fastest growing economies in the world with GDP pc growing at an annual rate of 5.3%.

5. World Bank (1984b, p. 35). It seems likely that, in reality, this figure is substantially lower. The high percentage reported above may be attributed to the fact that the definition of "labour force participation" used by the Greek authorities classifies many rural HH members as labour force participants, even though they only help the HH head occasionally, when additional labour force is required (for example, in harvesting). Note also that the relevant percentage in the 1981 Population Census was only 28.8% [NSSG (1984, p.53)].

17.8% during the period 1950-1960 to 23.9% during the sixties and 27.9% in the seventies.[6] Many social indicators suggest that a direct consequence of the increase in GDP pc was a general improvement in the standard of living. For example, between 1960 and 1980 life expectancy at birth rose from 68.8 to 73.4 years, infant mortality dropped from 40.1 to 17.9 per thousand, the secondary school enrollment ratio rose from 37% to 81% and energy consumption pc increased from 516 to 2605 kilograms of coal equivalent.[7]

In spite of the fact that most of the postwar governments were conservative, the state did play an important role in economic life. Nevertheless, no kind of planning - general or indicative - was ever applied. The state intervention in the economy was implemented mainly through regulation and, particularly, through tight control of the financial system. All the major commercial banks in Greece are under state control.[8] Further, throughout most of this period, the Central Bank was dictating not only the level of deposits of commercial banks in the Central Bank, but the level and the structure of the interest rates too and, in addition, it was setting quotas for the sectoral allocation of loans. Three other areas where the state played an important role were in the fixing of the exchange rate, in investment in infrastructure and in price support schemes for agricultural products. During this period the share of the public sector in GDP was rising steadily. The share of general government expenditure in the GDP rose from 16.0% in 1955 to 34.9% in 1985.[9] In line with this, there was an almost steady rise in the public sector deficit. During the 1980s the public sector deficit has never been below 10% of GDP. For most of the postwar period, between two thirds and three quarters of government spending was devoted to consumption purposes. In fact, the share of investment in government spending was not only small but decreasing. For example, although the share of investment in general government spending was around 25% until the early seventies, it dropped below 15% in the early eighties.[10]

Reliable unemployment data, which would be comparable with those of other Western European countries, were not collected in Greece until very recently. However, again until very recently, unemployment did not seem to be a very serious problem. Apart from the high GDP growth rates and the relatively low population growth rates (0.8% per annum in the period 1950-1986) this can be attributed to the high level of

6. World Bank (1984a, p. 67).
7. World Bank (1984b, p. 35).
8. The role of the Stock Exchange in financing investment in Greece is very limited.
9. IMF (1987, pp 360-361).
10. Freris (1986, p. 193).

international migration. Net migration (permanent emigrations - repatriations) from Greece during the postwar period has been more than one million persons, most of them of working age.[11] Taking into account that the total population of Greece in 1986 was less than 10 million, one can appreciate the scale of international migration. With respect to the other major disease of contemporary economies - inflation - the picture has been rather different. During World War II Greece experienced one of the worst hyperinflations ever recorded in history. Between 1940 and 1944 the cost of living in the Greater Athens region (the only region where such data were collected) increased 164 million times.[12] This hyperinflation left deep and bitter memories in the minds of the public and created a distrust towards the national currency (the drachma). For this reason the monetary authorities were very cautious, following tight monetary policies, particularly in the fifties. As a result, the rate of inflation until 1972 was modest, the average annual rate between 1950 and 1972 being 3.9%.[13] However, after 1972, the combination of the two oil shocks and domestic economic policies resulted in double digit inflation rate figures - in some years around 25%.

In chronological order, the main developments in the Greek economy during the postwar period were the following. In the immediate afterwar period, during the years of the civil war and until the early fifties, the productive capacity of the economy was very low. There were huge balance of payments and budget deficits and the economy depended heavily on international aid, particularly from the USA. Through the Marshall Plan, Greece received more than one billion current dollars.[14] In the peak year (1950) US aid was as high as 15% of GNP. These funds were vital for the reconstruction efforts of governments in that period, but caused obvious political and economic dependency problems. Apart from reconstruction, the other main objective of the authorities in the 1950s was to restore confidence in the drachma. This objective was gradually achieved through tight monetary policies and falling inflation rates. Another major event of the fifties was the devaluation of the drachma from 1 US dollar=15 drachmas to 1 US dollar=30 drachmas, in 1953. This exchange rate was maintained fixed until 1973. The devaluation of the drachma was accompanied by an opening of the economy to international trade.

In the late fifties and throughout the sixties there was an extensive government effort for investment

11. NSSG "Statistical Yearbook of Greece", several years.
12. Freris (1986, p. 116).
13. World Bank (1984a, pp 66-67).
14. Freris (1986, p. 134). The total amount of US aid to Greece between 1944 and 1962 was 3.7 billion dollars.

in infrastructure. However, the main characteristics of the 1960s were the high rates of international migration and the increase in the level of direct foreign investment. During the period 1960-1972 alone, about one million people left Greece permanently. Most of them emigrated to West European countries (in particular to West Germany). As a result of the post-oil-shock economic crises in the host countries, after 1974 permanent emigration was negligible and almost cancels out with repatriations. Most of the migrants were from rural areas of Greece. At the same time there was substantial internal migration from the rural areas to urban centres, such as Athens and Salonica. In respect of direct foreign investment, although the legal framework for its protection existed since 1953, the bulk of this type of investment occurred in the sixties. Most foreign capital was (and still is) concentrated in mining and in the following branches of manufacturing: petroleum products, chemicals, basic metal industries, and transport equipment. It has been calculated that foreign control in manufacturing as a whole is around 30%.[15] The role of direct foreign investment is still a subject of heated controversy in Greece. The legislation which covers direct foreign investment also covers ships under the Greek flag. This, together with other historical reasons, might explain why the Greek merchant fleet is one of the largest in the world. The volume of direct foreign investment rose during the years of the military dictatorship.

Although the military regime reopened the wounds of the civil war, its economic policies were not dramatically different from those pursued before. The first oil shock, which occurred towards the end of the dictatorship, was accompanied by accommodative monetary policies. At about the same time (1974) Turkey invaded and occupied the northern part of Cyprus in response to a coup staged by the Greek military regime on the island. These events brought Greece and Turkey to the brink of a war and resulted in the collapse of the dictatorship. As a consequence of the above factors there were rapid increases in the price level while, at the same time, total output fell for the first time in the postwar period. Apart from the high rates of inflation and the virtual elimination of net international migration which have already been mentioned, another characteristic of the post-1974 period was the unionization of broad categories of the working population who demanded increases in their real incomes, while total output was rising at a slower pace than before. Towards the late seventies and particularly in the early eighties highly expansionary fiscal and monetary policies were pursued. These policies resulted in high inflation rates and increases in the budget and balance of payments

15. See Freris (1986, p. 172) and the references cited there.

deficits, while output did not rise substantially. A complete reversal of these policies has been attempted since 1985. However, the major event of the eighties was the accession of Greece to the EEC as a full member (1981). The experience of Greece's first years in the EEC seems to suggest that the main beneficiaries among the Greek population are the farmers, who have enjoyed higher prices for their products through the Common Agricultural Policy. It also seems likely that the losers can be found in the industrial sector which no longer enjoys protection from EEC competition. Nevertheless, it is still too early for any full appraisal of economic costs and benefits of the participation of Greece in the EEC to be made.

We turn now to the description of sectoral developments. Probably the most notable development in the postwar period was the decline in the relative importance of the agricultural sector. Traditionally, the contribution of this sector to total output and employment was very high. Even in the 1980s, more than one quarter of the economically active population is employed in agriculture. Although, as noted earlier, the share of agriculture in GDP declined from 31.1% in 1950 to 17.4% in 1980, in absolute terms the volume of agricultural output rose 3.3 times (4.6% per annum).[16] Taking into account that during this period there was a substantial fall in the number of persons employed in agriculture, it can be deduced that agricultural productivity was growing rapidly. This was achieved through mechanization,[17] more widespread use of fertilizers, pesticides and new varieties of seeds, and withdrawal of marginally productive farms. The composition of agricultural output did not change substantially during this period. The main products of Greek agriculture are wheat, tobacco, currants, cotton, edible oil, citrus fruits and sugar. Among them, only sugar was introduced after World War II. Meat and dairy produce account for about 30% of total agricultural output. The main problem facing Greek agriculture is the small average size of land holdings. In 1973 the average farm size in Greece was 8.4 acres, whilst the relevant figure for the EEC countries was 27.2 acres.[18]

The output of the industrial sector (manufacturing, mining, construction and electricity/gas/water) rose by a factor of 8.6 (7.4% per annum) between 1950 and 1980.[19] In fact, the growth rates of the non-manufacturing industrial branches were considerably higher than those of manufacturing. Using the standard 20-branch classification of manufacturing, the most important branches in terms of output, employment and

16. World Bank (1984a, pp 66-67).
17. Between 1962 and 1981 the number of tractors rose from 24,533 to 238,131 [Freris (1986, p.181)].
18. Freris (1986, p. 181).
19. World Bank (1984a, pp 66-67).

horsepower are food, textiles, clothing and footwear, chemicals, non-metallic mineral products, basic metal industries, metal products and transport equipment. Although the overall performance of Greek industry in the postwar period has been rather good, the capital goods sector is still relatively small. As a consequence, almost all the machinery used in Greek industry is imported. Moreover, the average size of the manufacturing establishments is also small; 5.2 persons per establishment in 1978. In 1978 there were only 751 manufacturing establishments (0.6% of the total) employing more than 100 employees, while about 85% of the establishments were employing less than five persons.[20] The bulk of industrial employment (over 60% in 1978) is concentrated around Greater Athens and Greater Salonica. This fact, combined with the massive population exodus from rural areas, has caused serious regional imbalances in the Greek economy.

Throughout all the postwar years the most important contribution to GDP was made by the tertiary sector whose share in GDP rose from 47.6% in 1950 to 51.3% in 1980. In absolute terms, the product of services rose 7.8 times (7.1% per annum).[21] In 1981, 40.4% of the economically active population was engaged in this sector.[22] Although the most important branch of services in terms of output and employment during this period was the wholesale and retail trade, the most dynamic branches were those directly related to tourism (hotels, restaurants, etc), transport and communications, and finance. Most of the establishments in the tertiary sector are very small and self-employment is widespread. For example, in 1978 the average establishment in the wholesale and retail trade was employing 2.1 persons and 68.2% of all the persons employed in this branch were classified as employers, self-employed or unpaid family workers.[23]

During the period under examination, Greece experienced an almost continuous opening of her economy to international trade. Exports and imports together accounted for 23.8% of GDP in 1950; by 1986 this percentage had risen to 42.7%. Between 1955 and 1986 the volumes of exports and imports rose 13.5 and 9.0 times, respectively.[24] The change in the structure of production is clearly reflected in the structure of exports. In 1962 only 10.9% of exported goods consisted of manufactures. By 1980, this had risen to 47.5%.[25] However, the value added of most manufactured exports remained relatively low. Over 80% of

20. NSSG (1984, pp 189-190).
21. World Bank (1984a, pp 66-67).
22. NSSG (1984, p. 53)
23. NSSG (1984, p. 312-313).
24. IMF (1987, pp 360-361).
25. World Bank (1984a, pp 522-523).

imports consist of fuel and manufactured goods (particularly machinery and equipment). Greece's main trading partners throughout most of this period, and particularly after 1981, have been the rest of the EEC countries. In all the years of the period under consideration, Greece was running a trade account deficit. In most years about two thirds of this deficit was covered by the surplus on the invisibles account - particularly tourism, shipping, emigrants' remittances, aid (at the beginning of the period) and EEC transfers (in recent years). Until the mid-seventies the remainder was covered by autonomous private capital inflows. However, in recent years these inflows have not been sufficient to cover the current account deficit and Greece had to rely on international loans. By 1985 Greece's Debt/GDP ratio was as high as 56.3%.[26]

After the collapse of the military dictatorship there have been four general elections in Greece. The first two (1974 and 1977) were won by the conservative New Democracy party led by K. Karamanlis, and the last two (1981 and 1985) by the Panhellenic Socialist Movement (Pasok) led by A. Papandreou. After each election, the prime minister outlines the basic objectives of his government for his period in office, in his opening address to parliament. References to inequality and poverty in these addresses can be presented as evidence of the public interest on questions concerning these two issues. Further evidence may be sought from the relevant sections of two five-year Economic Development Plans drafted in 1979 and 1985. Although these plans were never implemented and the opening addresses to parliament are usually very vague, nonetheless, they encapsulate both the perception of the Greek authorities about the level, causes and changes in inequality and poverty as well as their attitudes towards policy action in these areas.

In the first of these opening addresses, K. Karamanlis argued that the high inflation of 1973-1974 had eroded the real incomes of the most deprived social classes, which he identified as the wage and salary earners and the farmers.[27] Further, he explicitly stated that an objective of his government was to reduce inequality through progressive taxation (direct and indirect) and the implementation of appropriate social policies.[28] In his 1977 opening address, K. Karamanlis used National Accounts data to show that during the period 1974-1977 the real incomes of farmers and wage and salary earners (particularly in manufacturing) had increased

26. World Bank (1988, p. 149). Nevertheless, since for the calculation of this percentage Greece's debt is expressed in U.S.A. dollars and in 1985 the dollar was exceptionally strong, the above figure may overstate her "true" Debt/GDP ratio.

27. Karamanlis (1974, p. 13).

28. Karamanlis (1974, p. 14).

substantially and, as a result, there was a considerable reduction in aggregate inequality. However, he also claimed that there was still room for further reductions in the level of inequality, mainly through the tax system.[29] In addition - using a Keynesian argument - he argued that a redistribution policy would increase effective demand for domestic products, which in turn would stimulate higher growth rates.[30]

In his first opening address to the parliament as prime minister, A. Papandreou asserted that, as a result of the economic policies pursued before 1981, there were substantial increases in the levels of inequality in the distribution of income and wealth, and that one of the main priorities of his government would be the reduction of these inequalities.[31] Apart from the wage and salary earners and the farmers, he also identified as poor the pensioners, particularly those of the agricultural sector.[32] In addition, he noted that inequalities between regions and between urban and rural areas of the country were unacceptably high.[33] He stated that his government would try to reduce inequality mainly by increasing low pensions and extending them to cover old persons not otherwise covered by a pension scheme, and through changes in the tax system (particularly by switching from indirect to direct taxation).[34] The second opening address of A. Papandreou contained the claim that the economic policies implemented between 1981 and 1985 had reduced inequality substantially but at the same time there were no important productivity increases.[35] He also restated the commitment of his government to continue with attempts to reduce inequality further, through changes in the tax system and implementation of regional development policies.[36]

In several parts of the 1978-1982 Economic and Social Development Plan it is claimed that between 1974 and 1978 economic and social inequalities declined quite substantially. This was due to the combined effect of low levels of unemployment and under-employment, increases in the real levels of the minimum wages and tax allowances and improvements in the standard of the social services.[37] According to the authors of this plan, the remaining inequalities were mainly due to serious regional imbalances and imbalances

29. Karamanlis (1977, p. 14).
30. Karamanlis (1977, p. 15).
31. Papandreou (1981, p. 20).
32. Papandreou (1981, p. 21).
33. Papandreou (1981, p. 20). However, he also noted that the level of inequality within rural areas was very high; Papandreou (1981, p. 23).
34. Papandreou (1981, p. 21).
35. Papandreou (1985, pp 27-28).
36. Papandreou (1985, pp 28-29 and 22).
37. Ministry of Coordination (1979, pp 24, 27, 28).

between urban and rural areas.[38] Among the objectives of the plan were included the gradual decline in economic and social inequalities and the immediate satisfaction of the "basic needs" of all the population members (health, education, housing, social insurance, welfare).[39] The later, probably, implies the existence of poverty. Regarding the policies to achieve the above objectives, it recommended the implementation of regional development policies and policies designed to improve the provision of social services.[40]

The 1983-1987 Economic and Social Development Plan noted that inequality in Greece was very high and included explicitly among its objectives inequality reduction and poverty alleviation.[41] As causes of the high level of aggregate inequality, it identified the existing disparities between social classes, geographical regions, urban and rural areas and, also, within the group of retired persons.[42] It was also noted that the high inflation rates of the post-1974 period had an adverse effect on the purchasing power of the low-income groups and that although in recent years there was a decline in the level of inequality between regions, inequalities within regions were rising.[43] In addition, it was suggested that welfare inequalities between regions were probably even greater than observed income inequalities, because of the existence of serious inter-regional non-economic disparities (in cultural and social life, health, education and so on).[44] As policy measures for the reduction of inequality and poverty, this plan recommended increases in the real incomes of low-income earners (pensioners, farmers, low-income workers), increases in transfer payments (mainly in kind) and extension of the social security system.[45] These policies would be financed by progressive direct taxation, higher GDP growth rates and redistribution within the group of pensioners.[46]

3. A survey of the literature on inequality and poverty in Greece

Most of the existing studies on inequality and poverty in Greece use data either from HESs or from tax returns and can be divided accordingly into two groups. However, since some of them use data from both sources, it is, probably, preferable to present them in a roughly chronological order. Studies on inequality are

38. Ministry of Coordination (1979, p. 31).
39. Ministry of Coordination (1979, pp 16, 24).
40. Ministry of Coordination (1979, pp 16 and 91-99).
41. Ministry of National Economy (1985a, pp 16, 183).
42. Ministry of National Economy (1985a, pp 16-17, 19, 160-61, 193).
43. Ministry of National Economy (1985a, pp 22 and 161).
44. Ministry of National Economy (1985a, p. 161).
45. Ministry of National Economy (1985a, pp 42, 194, 388).
46. Ministry of National Economy (1985a, p. 194).

surveyed first and the main results of studies on poverty follow. Many references to these studies are made in subsequent chapters, where their findings are compared with the findings of the present study.

The first study on inequality in Greece is that of Crockett (1967). The principal aim of the author is to estimate consumption and demand functions, income elasticities and elasticities with respect to HH characteristics for groups of commodities. The part of her work related to inequality is a by-product of her study. She uses the published income and consumption expenditure data of a number of HESs carried out by the NSSG in the urban areas of Greece in 1957/58 and 1960-62.[47] In these surveys the HHs interviewed were asked questions on both consumption expenditure and income. Income was defined as weekly cash income of all HH members. There is sufficient evidence that the response rate to the income questionnaires was lower for the high income classes. HHs responding to both questionnaires had lower weekly cash purchases, smaller houses and contained a smaller proportion of HHs headed by professional and administrative workers (by far the two highest paid occupations) than HHs responding to expenditure questionnaires only. Crockett is obviously aware of these deficiencies of the data, so she does not attempt to calculate any summary measure of inequality and simply reports some descriptive findings. These findings are that the mean income in the Greater Athens area was substantially higher than in the rest of the urban areas, that inequality in the distribution of income by pc HH was lower than inequality in the distribution of income by HH and that there was a strong association between the type of profession of the HH head and total HH income. HHs headed by managers and professional and administrative workers were found to be associated with high incomes, whereas low income HHs were in most cases headed by persons out of the labour force.

The published income data of the 1957/58 HES are used by Ahluwalia (1974) who classifies Greece as a middle income country with low inequality. From these data, he calculates that the relative income shares of the poorest 40%, middle 40% and richest 20% of the urban population were 21.0%, 29.5% and 49.5%, respectively. However, his method of calculation is not clear. Jain (1975) fits a Lorenz curve to the published income data of the 1957/58 HES and estimates a Gini index of 0.381. However, her estimates of the relative income shares are very different from those of Ahluwalia (1974); 17.4%, 37.9% and 44.7% for the bottom 40%, middle 40% and top 20%, respectively.

47. The 1957/58 HES was based on a relatively large sample (2568 HHs) whilst the 1960-62 HESs were small sample surveys.

The first attempt to calculate a summary measure of inequality for the entire population is that of Karayiorgas (1973). The main purpose of this study is to examine the distribution of tax-burden by income groups in Greece. Although it uses the published results of a 1964 HES covering the semi-urban and rural areas only,[48] the author claims that it covers the entire population. In order to generate a distribution of income, he estimates a logarithmic consumption function using National Accounts data and then calculates the incomes corresponding to the consumption expenditures figures reported in the published results of the HES. Apart from the controversy over whether cross-section relationships can be captured by time-series data, this method has the disadvantage that the estimated total HH income is not necessarily equal to the total HH income, as given in the National Accounts. The estimated Gini indices are 0.588 for the distribution of income before taxes and transfer payments, 0.606 for the distribution of income after taxes but before transfer payments and 0.544 for the distribution of income after taxes and transfer payments.[49] Although Karayiorgas does not report the formula of the Gini index used in order to derive these estimates, it can be shown that he calculates the lower bound of the Gini index from six income classes only. Hence, if his methodology is accepted, one should conclude that these indices probably understate the actual level of inequality in Greece and that income inequality in Greece was very high in comparison to most other countries.[50]

The first HES covering both the urban and the rural areas of Greece was carried out by the NSSG in 1974. Karayiorgas (1977) repeats the methodology of Karayiorgas (1973) on the new survey. Although he does not calculate summary measures of inequality, comparable estimates of the Gini index can be calculated for 1964 and 1974. The corresponding 1974 indices are 0.455, 0.457 and 0.435. Since the 1974 indices have been calculated using eight instead of six income classes, the understatement of the actual level of inequality is lower for 1974 than for 1964. Hence, Karayiorgas (1977) could conclude that income inequality declined substantially between 1964 and 1974, although its 1974 level was still high in comparison with many other countries. Similar methodology is also followed in Karayiorgas and Pakos (1985) for the construction of the distribution of income after taxes and transfer payments from the published data of the 1982 HES. Although

48. In the rest of this study, the term "rural areas" denotes "semi-urban and rural areas", unless the term "semi-urban areas" is explicitly mentioned.

49. Both direct and indirect taxes are included. The income recipient unit is the HH.

50. See Jain (1975). Some of this paper's deficiencies should be attributed to the fact that at that time Karayiorgas was a political prisoner of the military regime and no research facilities were available to him.

the authors conclude that inequality declined between 1974 and 1982, they base this conclusion on the comparison of the relevant quintile income shares, without attempting the calculation of any summary measure of inequality. Using their data (eight income classes) the lower bound of the Gini index of the distribution of income after taxes and transfer payments in 1982 is calculated to be 0.396, suggesting a further decline in inequality from the comparable levels in 1964 and 1974.

During the 1970s a number of studies on inequality in Greece used data from tax returns. Although such data are used extensively in studies related to inequality in many industrialized countries, the Greek data are unreliable and inappropriate for studies of this kind for a number of reasons. Firstly, unlike other countries, the Greek tax legislation does not require every HH or working person to fill in a tax return. Large parts of the population (agricultural HHs, HHs with annual income below a certain limit and so on) are effectively exempt from the payment of income taxes and, hence, do not fill tax returns. As a result, only a small proportion of the working population fills tax returns and the taxed income is a small fraction of the personal income reported in the National Accounts.[51] Secondly, income in kind, consumption of own production, capital gains and some transfer payments are not included in the definition of income used by the tax authorities. Hence, this definition does not seem to be appropriate for welfare comparisons across HHs. Thirdly, it is widely accepted among Greek economists, politicians and the general public that tax evasion in Greece is high. Therefore, even the existing data may be of low quality.

Geronymakis (1970) undertook the first study using tax returns data and although he does not calculate any index of inequality he claims (without substantiation) that a large part of the existing inequality was the result of regional inequalities. However, the first study that used these data sets systematically is that of Lianos and Prodromidis (1974).[52] This is the first study focusing exclusively on aspects of inequality in Greece. They report that during the period 1959-1971 aggregate inequality was increasing. For example, the Gini indices for the distribution of income before taxes were 0.411, 0.441 and 0.453 for 1960, 1965 and 1970, respectively. However, they also admit that at least part of this increase might have been "artificial" and could be attributed to the reduction in tax evasion, which was more widespread in the high income brackets, and to

51. In 1961 and 1971 only 8.3% and 20.7% of the working population filled income tax returns [Lianos and Prodromidis (1974, p. 22)] and in 1975 the taxed personal income was 29.9% of the personal income reported in the National Accounts [Athanasiou (1984, p.108)]. The corresponding 1981 figures were 40.1% and 27.6%; see chapter 6.

52. See also Prodromidis (1975).

the increase in the number of HHs with incomes just above the tax allowance levels.[53] They also report that during that period the relative income share of the very high income groups remained largely unchanged whilst the middle income groups benefited at the expense of the low income groups. In addition, they attempt some international comparisons, although they admit that the income distributions used by them were not strictly comparable. Their conclusions is that Greece was probably a "medium inequality" country and that the relative income share of the poor was higher in Greece than in most other countries in their sample, whereas the income share of the middle income groups was relatively lower.[54] Approximately the same data sets as those used by Lianos and Prodromidis (1974) are used by Tsoris (1975) in his attempt to measure income inequality in Greece using the first Theil index. His reference period is from 1957 to 1970. During this period the estimates of the first Theil index varied between 0.379 and 0.278. However, unlike the results of Lianos and Prodromidis, Tsoris' results suggest that during this period income inequality was declining.[55]

The last part of the study of Germidis and Negreponti-Delivanis (1975) is devoted to the measurement of inequality in Greece using tax returns data. For 1961, 1966 and 1971 they calculate the following Gini indices for the distribution of total HH income: before direct and indirect taxes 0.378, 0.371 and 0.363; after direct but before indirect taxes 0.343, 0.343 and 0.340; after direct and indirect taxes 0.413, 0.398 and 0.393. The first of these series of estimates is comparable with the relevant estimates of Karayiorgas (1973, 1977) and Lianos and Prodromidis (1974), while the third is comparable with the corresponding estimates of Karayiorgas (1973, 1977). The above estimates are lower than those of the other studies and give support to the findings of Karayiorgas regarding the regressiveness of the tax structure in Greece. Further, the authors suggest that the main source of inequality was the existence of high mean income differentials between sectors of economic activity, particularly between the primary sector and the rest of the economy. However, they do not support their argument with any kind of decomposition analysis. Apart from indicating a relatively low level of inequality in comparison with the other studies mentioned above, their results also suggest that inequality was declining over time. Both of these findings can be attributed partly to deficiencies of their data and methodology. Firstly, they calculate the lower bound of the Gini indices from five income classes only.

53. The reduction in tax evasion was the consequence of the introduction of severe penalties for tax evasion during that period, whereas the virtual elimination of unemployment and the consequent increases in wages and salaries moved the incomes of many HHs slightly above the personal income tax allowance levels.

54. Sawyer (1976) surveys the works of Karayiorgas (1973) and Lianos and Prodromidis (1974). However, he points out that the estimates of inequality of those studies are not comparable with his estimates for other OECD countries.

55. Nevertheless, if 1957 is dropped from the reference period, no clear trend can be discerned.

Hence, it is likely that they understate seriously the actual level of inequality. Secondly, the reported decline in inequality can be attributed to the fact that the income brackets used by them for the grouping of the population into income classes were the same for all the years under examination. Since during that period the economy was growing rapidly, an increasing proportion of the population was included in the top (open) income bracket, causing an "artificial" decline in the reported level of inequality.

The study of Mourgos (1980) refers to the period 1955-1976. Although his basic data set is that provided by the tax authorities, his study covers the entire population. It does so by generating an income distribution for the rest of the population. For the agricultural population he uses National Accounts income data and assumes that incomes in this sector were distributed according to a two-parameter lognormal distribution. Taking into account evidence of other countries, he assumes that the value of the variance of logarithms of those incomes lay between 0.2 and 0.5 and generates several distributions. As most plausible he considers the value of 0.3. For the remaining part of the population he assumes that their income distribution is similar to the combined distribution of the "agricultural" and the "tax return" population. Although some of Mourgos' assumptions seem plausible, some others might not necessarily be so. For example, the crucial assumption for his analysis, that income inequality among the agricultural population remained unchanged throughout the above period, despite the dramatic changes that took place in the agricultural sector, can be considered unrealistic.[56]

Using those distributions, Mourgos (1980) examines the trends in the relative income shares of population deciles and in aggregate inequality. Under the assumption that the variance of the logarithms of agricultural incomes was equal to 0.3, he estimates the following Gini indices for the distribution of income by HH 1955: 0.434, 1960: 0.465, 1965: 0.453, 1970: 0.457, 1975: 0.403. It is not clear whether these distributions refer to income before or after taxes and what is the treatment of transfer payments. Income in kind, and consumption of own production are excluded from the analysis. According to his results, between 1955 and 1976 the relative income share of the "middle" income groups (second and third richest quintiles) rose at the expense of the poorest 40%, whereas the share of the richest quintile remained largely unchanged (apart from the last years of that period, when it declined). Comparing the level of inequality in Greece with

56. The lognormality assumption may also be challenged using evidence from some countries [Oshima (1962)].

that of other countries, Mourgos concludes that Greece was in the middle of the spectrum in comparison with LDCs, whilst inequality was higher in Greece than in most developed countries. According to Mourgos, the recorded changes in inequality were due to a combination of structural changes and specific government policies. During that period the main aim of most government policies was to promote industrial development, whereas the agricultural sector which included the great majority of the poor was somewhat neglected. As a result, there was a decline in the income share of the poor. At the same time, high international migration coupled with low population growth rates shifted the labour supply curve to the left, whilst rapid economic growth shifted the labour demand curve to the right. The middle income groups benefited mostly from the resulting higher wage rates. In addition, the demand for skilled labour was increasing rapidly, benefiting mainly the upper-middle income groups. Further, he suggests that since a large number of Greek high income earners were dependent on international transactions, the decline in the income share of the rich in the last years of that period should be attributed to the international recession.

The work of Bakarezos (1981)[57] which covers the period 1962-1975, is not strictly comparable with the rest of the works surveyed here, because Bakarezos excludes income generated from wealth from his analysis.[58] In addition, the index of inequality he uses (which he calls "combined" inequality index because, as he asserts, it combines the measurement of inequality in both personal and functional distribution of income) is not comparable with any other summary measure of inequality. For the purposes of his study, he groups the income recipient population into three broad groups: wage and salary earners, entrepreneurs and pensioners.[59] The income concept used by Bakarezos is money income after taxes and transfer payments. For the total income of each of the three groups he uses data from the National Accounts. In order to allocate the total income of each group to its members he uses information from the tax returns along with a series of other (rather strong) assumptions. In this way he generates income distribution data for the entire population and for each of the three groups separately. The mean income of the wage and salary earners was found to be very close to the mean national income, whereas the mean income of the pensioners was lower and that of entrepreneurs higher than the national average. Within-group inequality was lowest among wage and salary earners and highest among entrepreneurs. Inequality was found to be increasing over time in the group of

57. See also Bakarezos (1984).

58. Oddly enough, although Bakarezos (1981) claims that income generated from wealth is excluded from his analysis, he also claims that profits and pensions are included!

59. Self-employed are grouped with wage and salary earners.

wage and salary earners, decreasing in the group of pensioners and fairly constant in the group of entrepreneurs. In addition, the author claims that a trend towards greater aggregate inequality could be detected during the period 1962-1975.

A number of studies on aspects of inequality in Greece appeared in recent years using the results of the 1974 HES. The first of those studies is that of Karayiorgas (1977) mentioned before. The second is that of Pashardes (1980a),[60] who uses the grouped consumption expenditure data of that survey. The main purpose of Pashardes is to examine the impact of redistribution policies on the process of economic development. The measurement of inequality is a by-product of his work. His definition of consumption expenditure includes, apart from purchases, consumption of income in kind, consumption of own production and imputed rent for owner occupied accommodation. The author points out that since there are differences in needs between HHs with different composition, some sort of equivalence scales are needed in order to approximate better the actual level of welfare inequality. Since he did not have access to the primary data of the 1974 HES, he was not able to estimate equivalence scales for Greece, so he adopted those of the British Supplementary Benefits Commission. The value of the Gini index for the distribution of consumption expenditure per equivalent HH was then estimated to be 0.403 for the urban areas, 0.451 for the rural areas and 0.430 for the entire population.

The most interesting part of Pashardes (1980a) analyzes the effects of a hypothetical redistribution of consumption expenditure. Some of the studies surveyed here make general recommendations for redistribution[61] and most of the policies suggested in them are in line with the policies suggested in Chenery et al (1974). Where the study of Pashardes differs from them is in its attempt to estimate the quantitative effects of the proposed redistribution. For the purposes of his study he uses input-output analysis and postulates various hypotheses about the form of redistribution (redistribution of the existing consumption expenditure, redistribution of incremental consumption expenditure, redistribution from the urban rich to the rural poor, or from the rural rich to the urban poor and so on). In all the cases the results are similar. Through changes in the demand patterns, an egalitarian redistribution would increase employment, improve the balance of payments, and lower the needs for capital equipment. In addition, an egalitarian redistribution of incremental consumption expenditure would increase the total amount of savings (in the long-run but not in the short-run)

60. See also Pashardes (1980b).

61. See, for example, Lianos and Prodromidis (1974), Mourgos (1980), and Bakarezos (1981).

and it would, probably, increase the growth rate of the economy.[62] Although the work of Pashardes (1980a) is technically sound, his policy suggestions may be considered as unrealistic and in some cases undesirable. According to his analysis, after an egalitarian redistribution there would be increased demand for domestically produced agricultural products, slightly decreased demand for domestically produced manufactured products and, hence, increased employment opportunities in the agricultural sector and decreased opportunities in the non-agricultural sector of the economy. Taking into account that the Greek economy in the early seventies was in a state of almost full-employment, implementation of the policy suggestions implied by his analysis would require an urban to rural migration which would be rather difficult to implement and, perhaps, a de-industrialization process which could undermine the long-run growth prospects of the economy.

A number of aspects of inequality are examined using several data sets in Carantinos (1981). Using the Gini index, the Kuznets index and the first Theil index on tax returns data for the period 1966-1976, he reports that no trend in aggregate inequality could be detected.[63] The estimated Gini indices vary between 0.386 and 0.416. Carantinos suggests that part of the recorded variation should be attributed to changes in the tax legislation. His Gini indices are not strictly comparable to those of Lianos and Prodromidis (1974) and Germidis and Negreponti-Delivanis (1975) because Carantinos' Ginis are the weighted averages of the upper and the lower bound of the Gini indices of the relevant years, whilst those of the other studies are simply the lower bounds.[64] After interpolating the grouped tax returns data (using a Pareto logarithmic interpolation) to obtain the relative income shares of population deciles, he concludes that between 1966 and 1976 there was a slight decrease in the share of the "poor" and the "very rich" and an increase in the shares of the "middle" and "upper middle" groups. In the next part of his study Carantinos uses the grouped data of the 1974 HES and estimates the following Gini indices: 0.322 for the urban areas, 0.344 for the rural areas and 0.344 for the whole country. Since Carantinos does not use of equivalence scales, these results are not comparable to those of Pashardes (1980a). However, his results confirm that inequality was higher in rural than in urban areas. A decomposition analysis using the first Theil index, attributes 25.9% of aggregate inequality to inequality

62. However, Pashardes (1980a) performs his analysis within a fixed-price model, that is there are no changes in prices when there are changes in demand. In addition, he does not take into account factor availability and mobility constraints and treats labour supply and exports as completely exogenous. The latter implies that there is no switching from production of export goods to import substitution when there is increased domestic demand.

63. Surprisingly, the estimates of the Theil index of Carantinos for the period 1966-1970 are different than the relevant estimates of Tsoris (1975), although they use exactly the same data.

64. Carantinos also reports the estimates of the lower bounds of his Gini indices. They are always lower than those of Lianos and Prodromidis (1974), but higher than those of Germidis and Negreponti-Delivanis (1975).

between urban and rural areas, 40.7% to inequality within urban areas and 33.4% to inequality within rural areas. The last part of his study is devoted to the measurement of inequality in the distribution of wealth. Carantinos himself conducted a survey in the Greater Athens region[65] and estimates the Gini index to be 0.646. Taking into account that most of the country's wealth is, probably, concentrated in the Greater Athens region, the above figure may imply that inequality in the distribution of wealth in the whole country was considerably higher.

Athanasiou (1984) uses the primary instead of the published grouped data of the 1974 HES, so his results are not strictly comparable to the results of other authors who use the same data set. For the distribution of consumption expenditure by HH he calculates the following Gini indices: 0.341 for the urban areas, 0.364 for the rural areas and 0.361 for the entire population. However, he points out that differences in HH composition and economies of scale in consumption make these estimates poor approximations of the level of welfare inequality. So he uses equivalence scales in order to take these factors into account. The estimated Gini indices for the distribution of consumption expenditure pea - 0.270, 0.287 and 0.301 for the urban areas, the rural areas and the entire population, respectively - turn out to be substantially lower than those referring to the distribution of consumption expenditure by HH. Although the pattern of inequality found by other authors using the 1974 HES (that is higher inequality in rural than in urban areas) is also confirmed by Athanasiou (1984), his estimates are substantially different than those reported by them. The difference between the estimates of Athanasiou and Pashardes (1980a) can be attributed to the facts that, firstly, they use different equivalence scales and, secondly, the consuming unit of Pashardes is the "equivalent HH", whereas that of Athanasiou is the "equivalent adult". The Gini indices of Carantinos (1981) for the distribution of consumption expenditure by HH are, naturally, lower than the corresponding indices of Athanasiou, because Carantinos calculates his indices from grouped data and, therefore, he does not take into account inequality within income groups.

The next part of Athanasiou (1984) is devoted to the measurement of inequality in the distribution of income. In order to construct this distribution, Athanasiou uses three alternative methods. Firstly he uses the

65. The method by which estate duty data are collected in Greece (particularly with respect to revenues from inheritances) does not allow the measurement of inequality in the distribution of wealth. This is the main reason for the paucity of studies on the distribution of wealth in Greece. The only other similar attempt is a small part of the work of Athanasiou (1984) which is surveyed below.

consumption expenditure data of the 1974 HES and allocates the amount of total personal savings to population deciles using various "reasonable" but arbitrary assumptions. The values of the resulting Gini indices for the distribution of income by HH are between 0.375 and 0.390. Secondly, following the methodology of Karayiorgas (1973, 1977), he estimates a consumption function in order to generate income data. The estimated Gini index for the distribution of income by HH are 0.356 when the income data are generated from a linear consumption function and 0.364 when they are generated from a logarithmic consumption function. Thirdly, using a number of data sets, he attempts to construct income distributions for the various occupational subgroups of the working population and from these distributions to construct a distribution for the entire population.[66] The estimated Gini index for the distribution of personal income before taxes by member of the working population is, then, found to be 0.372 or 0.379 (depending on the treatment of interest payments on public sector debt). Athanasiou asserts that a substantial part of the observed inequality should be attributed to the existence of an oligopolistic market structure and oligopolistic profits (particularly in commerce) and to the existence of a segmented labour market (particularly for public sector employees). However, he does not attempt to substantiate this assertion quantitatively.

Comparing his estimates of income inequality with those of Sawyer (1976) for other OECD countries, Athanasiou (1984) argues that inequality in Greece was slightly higher than in most of these countries. In addition, he argues that the income share of the "very rich" (top decile) was higher in Greece than in most OECD countries, not to the expense of the poorest deciles (whose income share was relatively higher in Greece) but to the expense of the middle income groups. Further, using the results of the 1957/58, 1964 and 1974 HESs, Athanasiou suggests that inequality in the distribution of consumption expenditure was increasing over time in the urban areas and was more or less stable in the rural areas. Although the above data sets do not allow any judgment about the trend in aggregate inequality, Athanasiou speculates that between 1957 and 1974 inequality did not decline and it might even have risen. In addition, he suggests that if consumption expenditure increases at a diminishing rate as income rises, then income inequality had probably increased even more than inequality in the distribution of consumption expenditure during that period. Finally, in a small part of his work, Athanasiou estimates the Gini indices for the distribution of wealth in the Greater Athens region (0.570) and for the distribution of agricultural property (between 0.467 and 0.483). He

66. This method has the disadvantage that it cannot capture the total income of persons with more than one job.

considers these estimates as low in comparison with relevant estimates for other countries.

Kanellopoulos (1986) uses the primary consumption expenditure data as well as the corresponding income data of the 1974 HES. In all the HESs, members of the HHs in the sample were asked questions about their incomes. Nevertheless, the income part of the HESs information is considered by NSSG as unreliable. For this reason, NSSG did not publish the income results of any HES apart from those used by Crockett (1967). The total personal income of the 1974 HES is only 74.2% of the relevant National Accounts figure. Further, the degree of understatement of the reported income varies substantially across occupational groups. For example, although the total amount of wages, salaries and pensions of the 1974 HES was 82.9% of the corresponding National Accounts figure, the relevant percentage for agricultural incomes was only 52.0%. Although Kanellopoulos was aware of these deficiencies, he decided to use these data because "this degree of understatement is not particularly high in comparison with other HESs of developing or developed countries".[67] The definition of income used by him includes imputed rent for owner occupied accommodation and monetary transfer payments, but not income in kind and consumption of own production. The estimated Gini index for the distribution of personal disposable income by HH was 0.372 and the Gini indices for the distribution of consumption expenditure by HH were 0.326 for the urban areas, 0.342 for the semi-urban areas, 0.357 for the rural areas and 0.373 for the entire population.[68]

Prodromidis (1975) and Voloudakis and Panourgias (1980) deal exclusively with aspects of income inequality between regions. Prodromidis uses the National Accounts data without any further disaggregation (seven regions) and argues that the Gini index of inequality in the distribution of gross regional product pc declined from 0.239 in 1961 to 0.218 in 1971. Taking into account that these figures are calculated from only seven observations of the relevant Lorenz curves, one could reach the conclusion that the regional disparities in Greece were very high, at least in comparison with other European countries.[69] In a similar attempt, Athanasiou (1984) calculates the Gini index between eleven regions in 1974 to be only 0.099. Although Prodromidis' study refers to different years to that of Athanasiou, no obvious explanation can be offered for the striking difference in their estimates (especially taking into account that Athanasiou calculated his index

67. Kanellopoulos (1986, p. 33).

68. Although the consumption expenditure data of Kanellopoulos are adjusted for the effects of inflation whereas those of Athanasiou (1984) are not, the difference in the corresponding Gini indices can be considered as large.

69. For estimates of regional inequalities in EEC countries, see EEC (1975, Table 2).

from more observations of the Lorenz curve). Voloudakis and Panourgias (1980) study inequality in the distribution of personal disposable income by county (51 counties). Although they do not report their actual estimates, they state that the value of the relevant Gini index almost doubled between 1961 and 1971 and claim that the level of inequality in the distribution of personal disposable income between counties was lower than the level of inequality in the distribution of gross domestic product between counties. They attribute this difference to the redistributive impact of the fiscal system and to the impact of payments from abroad.[70]

We turn now to the presentation of the main results of studies on poverty in Greece. The first such study is that of Babanasis (1981). Basically, this is a historical study of the conditions of the urban working population in the twentieth century. The author adopts a multi-dimensional approach to poverty (by defining it in terms of income, health, education, housing and so on) and derives his statistical material from several sources. The basic variable in his analysis is the minimum wage rate. He argues that during the twentieth century absolute poverty declined but relative poverty rose and that around 20% of the population were living in conditions of poverty in the late 1970s. The main groups in poverty were the unemployed, the homeless, the unskilled workers and the illiterate. It can be noted that the National Accounts indicate that the mean rural income in Greece has always been considerably lower than the mean urban income. Therefore, the fact that Babanasis restricts his analysis to the urban population only, might imply that the bulk of the country's poor are excluded from it.

Carantinos (1981) uses the published consumption expenditure data of the 1974 HES in an attempt to measure the extent of poverty in Greece. He adopts an absolutist approach for the construction of a poverty line and reports that, using this line, 30.85% of all HHs or 24.68% of the total population were living in conditions of poverty. The value of the relevant Sen index was 0.166. High incidence of poverty is found among HHs living in rural areas, among HHs headed by farmers or persons out of work, and among HHs headed by very young or, particularly, very old persons. He also calculates that a transfer of 6.6% of the consumption expenditure of the non-poor to the poor would be sufficient to eliminate poverty.

For the purposes of his poverty analysis, Kanellopoulos (1986) uses the primary income data of the

70. A large part of immigrants' remittances was directed to the poorest counties of the country.

1974 HES. He adopts a relativist approach for the selection of a poverty line and uses equivalence scales in order to "standardize" the incomes of HHs with different composition. His results suggest that 26.4% of all the HHs (26.6% of the total population) had incomes below the poverty line. He also calculates the value of the Sen index to be 0.183 and that a redistribution of 10.67% of total personal income would bring the incomes of all the poor to the level of his poverty line.[71] According to Kanellopoulos, the population groups with the highest incidence of poverty were those living in rural areas, or in poor regions (Epirus, Thessaly, East Macedonia and Thrace), or headed by farmers or persons out of work. It can be noted that since, firstly, in the 1974 HES the agricultural incomes were seriously under-reported and, secondly, the definition of income used by Kanellopoulos does not include consumption of own production which is widespread in agricultural HHs,[72] his results probably overstate the true extent of rural poverty.[73]

What becomes evident from this survey is that there is no agreement in the above studies about either the level or the trend of inequality in Greece. The lack of reliable income distribution data makes the measurement of income inequality in Greece a very difficult task. Part of the differences in the results of the inequality studies surveyed above should be attributed to the different data sets used. With respect to poverty, there seems to exist some agreement that around one quarter of the total population should be classified as poor and that poverty is a predominantly rural phenomenon. Nevertheless, since none of the above studies makes extensive use of inequality and poverty decomposition techniques, it can be argued that both the search for factors associated with inequality and poverty and detailed policy recommendations for their alleviation cannot be based on their results.

4. Description of the Household Expenditure Surveys and comparison with other sources of data

The empirical part of this study uses the primary consumption expenditure data of the 1974 and 1982

71. Since the value of a poverty index depends heavily on the poverty line selected, this estimate is not comparable with the relevant estimate of Carantinos (1981).

72. Consumption of own production and income in kind (excluding imputed rent) represented 12.6% of the total consumption expenditure of rural HHs, but only 2.7% of the total consumption expenditure of urban HHs in 1974. In addition, there was a very strong inverse relation between total consumption expenditure and percentage of total consumption expenditure from income in kind etc. For example, the published results of the 1974 HES show that for the poorest group of rural HHs, the relevant percentage was as high as 44.8%.

73. A non-quantitative study of poverty in Greece is that of Kavouriaris (1983), who identifies as high poverty groups the members of the population living in the most deprived regions of the country (East Macedonia and Thrace, Epirus and Aegean Islands), the retired, the unemployed and the handicapped.

HESs. The first of these surveys was carried out between January and December 1974, and the second between November 1981 and October 1982. Their main purpose was to compile data on the level and composition of consumers' expenditures which would provide information for the revision of the weights used in the Retail Price Index. The results of the 1974 HES were published in NSSG (1977, 1978b). The final report of the 1982 HES has not yet been published.

The sampling frame of the 1974 (1982) HES was the 1971 (1981) Population Census. The surveys covered all the private (non-institutional) HHs in Greece, excluding those housing either more than three boarders or members of foreign diplomatic missions. The general sampling fraction of the 1974 (1982) HES was 3/1000 (2/1000).[74] All the municipalities and communes of the country were allocated into one of eight major strata, according to their size. For the purposes of the 1974 HES, Greater Athens and Greater Salonica formed two of these strata and they were subdivided into 20 and 10 strata of almost equal population size, respectively. The six remaining strata were subdivided into 42 smaller strata according to the administrative division of Greece.[75] The total number of strata in the 1982 HES was 84.[76] In Greater Athens and Greater Salonica a two-stage sampling procedure was used. The blocks or groups of adjacent blocks were the primary sampling units (area units) and the dwellings were the secondary sampling units. In the six other strata, three-stage sampling was applied. The municipalities and communes were the primary units, the blocks or groups of adjacent blocks were the secondary units and the dwellings were the tertiary units. Municipalities or communes and area units were selected randomly with probabilities proportional to their size. For the whole year, four independent selections were made (by replacement), each one corresponding to a quarter of the year. The selection of the HHs was made by the interviewers in the course of the survey. The interviewers enumerated all the dwellings of the area and selected some of them on the basis of the unit's sampling interval. This sampling interval was estimated on the basis of the number of HHs contained in the unit at the time of the 1971 (1981) Population Census, in such a way as to ensure that the selection probability for each HH would be equal to the general sampling fraction. If more than one HH was residing in a selected dwelling, all the HHs were surveyed. If a dwelling was found to be either vacant or a "second house" of a family, it was excluded

74. These sampling fractions can be considered as large in comparison with the sampling fractions of many HESs of other countries. See Wahab (1980) and Kemsley et al (1980).

75. NSSG (1977, p. XXI).

76. Personal correspondence with the NSSG.

from the survey.[77]

For the purposes of the surveys, a HH was defined either as two or more persons sharing the same dwelling and having common arrangements for the provision of meals (irrespective of whether they were related), or as a single person living on his/her own in a dwelling or living with other persons but having no common arrangements for the provision of housing needs nor sharing meals with them. Persons being absent from the HH during the time of the survey or being temporarily present in it, were considered as HH members according to the duration of their presence or absence and the cause of the latter. The person who was identified by all other HH members to be responsible for major HH decisions was defined as HH head. In the case of married couples, with very few exceptions, the husband was considered to be the HH head. Such definitions are in line with those of the United Nations.[78]

In the 1974 (1981) HES 8604 (7183) dwellings were selected initially. Among them, 1160 (1105) were excluded because they were either vacant or "second houses". From the HHs residing in the remaining 7444 (6078) dwellings, 755 (468) were temporarily absent at the time of the survey and 240 (295) either refused to cooperate or no contact could be made between them and the interviewer, so they were replaced by other HHs of the same primary or secondary unit. 35 (10) dwellings contained two HHs each and 9 dwellings three HHs each. Further, 73 (53) HHs either ceased cooperating during the period of the survey or their records were rejected during the processing of the data. Hence, the final sample contained 7424 (6035) HHs.[79]

Information was collected by specialized female employees-interviewers of the NSSG, who visited the selected HHs for seven consecutive days. The method of interviews was used exclusively, through all the stages of information collection.[80] Two types of questionnaires were used. The first contained questions on the demographic and employment characteristics of HH members and on the general expenditures of the HH. The second contained questions on personal expenditures of each HH member. The first questionnaire was answered by either the HH head or the housewife. The answers to the second questionnaire were given by

77. No attempt was made by the NSSG to bring the frames of the 1974 and 1981 Censuses up-to-date by excluding vacant and demolished dwellings and including dwellings built after the relevant Census.

78. See United Nations (1977, pp 26-27).

79. NSSG (1977, pp XIII-XIV) and personal communication with the NSSG.

80. For a good discussion of the advantages and disadvantages of the two main methods used for information collection in HESs (interview and record-keeping) see Kemsley (1979).

individual HH members aged 14 and over.[81] In case of goods and services where expenditures are frequently incurred (foodstuffs, beverages, tobacco and so on) the interviewers recorded the expenses incurred on each day of the survey. In case of less frequently purchased goods and services (durables, holidays, clothing, and so on) they entered the expenditures realized during previous time periods. These periods were dependent on the frequency of purchase of the items and varied between one month and one year from the beginning of the survey. For the purposes of the final reports, expenditures with reference period other than one month were reduced to expenditures of a monthly duration. Apart from purchases of goods and services, consumption of goods and services received free from other HHs or from the HH's enterprise and imputed rent for owner occupied accommodation were also recorded, evaluated at market prices.

Regarding the reliability of the HESs estimates it can be noted that, in general, there are two types of errors in a HES: sampling errors and non-sampling errors. Sampling errors give the variation of the estimates that can be attributed to the sample design. Although the samples of the HESs were multi-stage stratified random samples, the published sampling errors were derived using the formula of the sampling error of a single-stage random sample.[82] Hence, they should be considered only as approximations of the true sampling errors. However, as Kemsley (1966) has shown using UK Family Expenditure Survey data, although the estimates of the sampling errors derived using the single-stage random sample formula usually underestimate the true sampling errors, this underestimation is negligible. The sampling errors and the corresponding monthly mean expenditures for groups of commodities and for the total consumption expenditure in both surveys are reported in Table 1.1.[83]

The sampling errors are lower for those categories of consumption expenditure captured using the current enumeration method (for example, food), and higher for the categories where the post enumeration method was used.[84] Further, the sampling errors were, in general, slightly higher in the 1982 HES. This is hardly surprising, since the sampling fraction of the 1982 HES was lower than that of the 1974 HES. The

81. Apart from questions on consumption expenditures, the interviewers were asking questions about incomes too. In order to avoid affecting the reliability of the rest of the answers, the latter questions were asked to each HH member separately and only during the last visit to the HH. As noted earlier, the income information collected in this way was considered unreliable and, hence, it was not published.

82. This is a common practice in many HESs of other countries. See Kemsley (1966) and Wahab (1980).

83. NSSG (1977, pp 173-174) and personal communication with the NSSG. The sampling errors of imputed rent and consumption of own production and income in kind were not reported.

84. This is in line with the findings of HESs of other countries. See Wahab (1980).

TABLE 1.1 Sampling errors of the 1974 and 1982 HESs

Commodity Group	1974 Average Monthly Purchases (1)	1974 Sampling Error (2)	[(2)/(1)]*100 (3)	1982 Average Monthly Purchases (4)	1982 Sampling Error (5)	[(5)/(4)]*100 (6)
Food	3426	10.3	0.3	16109	168	1.0
Alcohol and Tobacco	448	7.2	1.6	1381	22	1.6
Clothing and Footwear	1206	28.9	2.4	6253	137	2.2
Housing, Light and Fuel	1234	21.0	1.7	5513	89	1.6
Durable goods	857	17.1	2.0	4625	124	2.7
Personal and Medical Care	457	11.9	2.6	3045	65	2.1
Education and Recreation	651	15.6	2.4	2745	79	2.9
Transport and Communications	1033	20.7	2.0	5422	152	2.8
Other goods and services	296	9.5	3.2	2486	79	3.2
Total Purchases	9608	57.6	0.6	47579	566	1.2

[The figures in columns (1), (2), (4), and (5) are in current drachmas]

sampling errors of Table 1.1 are rather low in comparison with those of HESs of other countries surveyed in Wahab (1980). Non-sampling errors are those related to the inaccuracy of information provided by the HHs. They can be attributed either to the respondent or to the interviewer. Respondent errors can be attributed to memory lapses due to long recalling periods, to respondent bias in deliberately providing inaccurate information and to ignorance. Part of the non-sampling errors should be attributed to the failure of the interviewers either to convince the respondent to disclose the relevant information or to explain to them accurately the content of their questions. There is no study on the non-sampling errors of the HESs used here.[85] Nevertheless, it is believed that the experience of the interviewers and the special training they

85. There are very few studies on the non-sampling errors of HESs of other countries, apart from the part of sampling error attributable to non-response. Most of them point out that the non-sampling errors are not very high and they do not affect the HESs estimates seriously. See, for example, Grootaert et al (1982).

received for the HESs kept these errors to a minimum. The part of the non-sampling error which was found to cause a number of problems to the estimates of some HESs is the error attributable to non-response. The overall non-response rate of the 1974 (1982) HES was 13.4% (12.6%). These rates are relatively low in comparison with the relevant rates of HESs of other countries.[86] The fact that these rates were low can be attributed partly to the information collection method used in the Greek HESs. In general, the non-response rates of HESs using the interview method are substantially lower than the corresponding rates of HESs using the record keeping method.[87] There is no information at all about any characteristics of the non-respondent HHs and, in addition, these HHs were replaced by other HHs of the same primary or secondary unit. Hence, there is no direct way to test whether non-response introduces significant biases to the estimates of the surveys.

An attempt to test the representativeness of the 1974 and 1982 HESs samples for consistency with the 1971 and 1981 Population Censuses, in respect of some characteristics of the HHs, is made in Table 1.2. Exact tests of statistical significance are difficult to develop in this situation (multi-stage stratified random sampling) but a χ^2-test can be used as an approximation.[88] The fact that the all the χ^2 values are substantially lower than the relevant critical values at any conventional level of significance can be considered as an indication that the samples of these surveys represent the total population fairly satisfactorily. However, there are two population groups which appear to be under-represented in the samples of these surveys: the farmers and the one-member HHs. In addition, it seems that employers are over-represented in the 1982 HES sample. The difference in the case of farmers can be attributed to the slightly different definitions used in the Censuses and the HESs. The under-representation of one-member HHs is a usual phenomenon in HESs of other countries, but, nevertheless, employers are usually found under-represented in these surveys. An attempt to reweigh the samples according to these variables (HH size, type of profession and occupational status) was abandoned, because it caused even more serious biases in the representativeness of the sample with respect to other variables (particularly, sector of employment).[89] The above evidence suggests that the Greek surveys fare well in comparison with the HESs

86. See Kemsley (1975) and Wahab (1980).

87. For example, in the UK Family Expenditure Surveys, which use the record keeping method, the non-response rates are usually around 30% [Kemsley (1975, p. 16)]. Kemsley (1979) speculates that if the interview method was the only method of information collection used in the above surveys, the non-response rates would be between 10% and 20%.

88. See Kemsley (1975). It is assumed that the "real" percentage distribution of these HH characteristics in 1974 was a weighted average of the percentage distributions of the relevant characteristics in the 1971 and 1981 Population Censuses. The Census data used in Table 1.2 are from NSSG (1976) and NSSG (1984).

89. Harris (1977) reweighed the sample of the 1971 UK Family Expenditure Survey by a number of social and demographic variables for which there were significant differential response rates between the survey's sample and the Census, but found the effect of the reweighing on inequality to be negligible.

TABLE 1.2. Differential response between HESs and Population Censuses as measured by χ^2

Variable (Characteristic of the HH or the HH members)	χ^2 Value (Degrees of freedom) 1974	1982
Region of residence	0.41 (8)	0.47 (10)
Size of municipality or commune	0.36 (4)	0.11 (4)
Sector of employment (Economically active HH members aged over 13)	2.70 (8)	2.07 (8)
Type of profession (Economically active HH members aged over 13)	2.43 (7)	1.62 (7)
Occupational status (Economically active HH members aged over 13)	0.44 (3)	3.99 (3)
Educational level (HH members aged over 13)	0.79 (4)	0.93 (3)
Number of HH members	1.87 (9)	2.00 (9)
Number of HH members classified by size of municipality or commune	2.26 (29)	2.52 (29)

of other countries presented in Scott et all (1980), Wahab (1980) and van Ginneken and Park (1985) in terms of sample design, method of information collection, sampling fractions and non-response rates.

We turn now to the comparison of the consumption expenditure data of the HESs with the relevant data of the National Accounts. Before doing so, an adjustment has to be made for the effects of inflation on the HESs data. The survey period of both HESs was one year. During that period, prices were not constant. In 1974 the Retail Price Index rose by 26.9% and between November 1981 and October 1982 it increased by 20.0%.[90] The HES data provided by the NSSG do not take into account these changes in the price level. As a result, in some cases, HHs with the same level of real consumption expenditure are reported to belong to different consumption expenditure classes because their levels of nominal consumption expenditure differ. In order to take into account the effect of inflation, the data used in this study were adjusted in the following way.

90. NSSG (1976, p. 433) and NSSG (1983, p. 428).

Initially, all the consumption expenditures of each HH were aggregated into nine broad categories ("Food", "Alcohol and Tobacco", "Clothing and Footwear", "Housing, Light and Fuel", "Durable goods", "Personal and Medical care", "Education and Recreation", "Transport and Communications" and "Other goods and services"). Then, these aggregates were inflated (or deflated) using monthly price indices,[91] so as to derive HH consumption expenditures for each aggregate category in average 1974 (1982) prices. Finally, the nine categories of consumption expenditure were aggregated for each HH in order to derive the total consumption expenditure per HH. Taking into account the fact that in both HESs HHs from all the strata were interviewed throughout the whole survey period, these adjustments are not expected to affect seriously the aggregate level of inequality in the distribution of consumption expenditure. However, it is possible that these adjustments may affect the ranking of the HHs according to their total expenditure, which could influence the results of poverty analysis. It should be noted that it is possible that prices are not the same for all the regions of a country. Therefore, the purchasing power of a given amount of consumption expenditure might differ across regions. However, regional price indices are not available in the case of Greece and, therefore, no such adjustment is possible. Nevertheless, Greece is a relatively small country and, hence, the regional price differentials are not expected to be substantial.

The grossed-up data of the HESs can be compared with the "Private Final Consumption Expenditure Table" of the National Accounts. For a number of reasons, one can expect the National Accounts aggregates to differ from the HESs aggregates. Firstly, the classifications of the consumption expenditure categories in the National Accounts are not identical to those of the HESs. There are also some differences in their definitions which make the comparison even more difficult. For the purposes of the comparisons reported below, the National Accounts' consumption expenditure categories were regrouped in order to correspond as closely as possible to the relevant HESs categories. In spite of this regrouping, the two classifications do not match perfectly. Secondly, the HESs samples do not include tourists and members of institutional HHs, the consumption expenditures of whom are included in the above mentioned Table of the National Accounts. It seems likely that these population groups have different consumption expenditure patterns to the HHs included in the HESs samples.[92] Thirdly, if rich (poor) HHs have higher non-response rates, the HESs estimates should

91. The price indices used can be found in NSSG (1976, p. 433) and NSSG (1983, p. 428).

92. Note, also, that in the summer of 1974 there was a general call-up to the army which increased the part of population living in institutional HHs (military camps). In addition, since at that time Greece and Turkey were in the brink of a war, one could expect a temporary change in the expenditure patterns of some HHs.

be lower (higher) than the relevant estimates of the National Accounts. There are, also, a number of factors which operate systematically in the direction of overstating or understating the HESs estimates in comparison with the estimates of the National Accounts. On the one hand, it has been observed that there is a tendency of the HHs in the HESs to inflate expenditures ("demonstration effect").[93] It has also been observed that during the first two or three days of the survey the number of cash outgoings per HH per day was higher than for the rest of the survey period.[94] Further, it has been observed in HESs of other countries that when information is collected retrospectively, some expenditures which incurred just outside the reference period are reported as just within it.[95] These factors are expected to cause an overstatement of the HESs estimates in comparison with the relevant National Accounts figures. On the other hand, there are numerous factors operating in the opposite direction. Memory errors, where an informant forgets to report a certain expenditure belong to this category. Deliberate omission or understatement of expenditures associated with "socially stigmatized" goods and services (alcohol, tobacco, betting and so on) is another factor leading to understatement of HESs aggregates. Further, changes in the consumption behaviour of some HHs either prior to the survey in order to avoid purchasing some of the "stigmatized" goods during that period, or during the survey period because the HH members become conscious of the extent of their spending and decide to reduce it, can cause understatement of the HES aggregates in comparison to the National Accounts. Whether the aggregate HES figure for a particular category of consumption expenditure is higher or lower than the relevant figure of the National Accounts depends on the strength of each of the above factors.

The comparison of the grossed-up HESs consumption expenditure estimates with the corresponding estimates of the National Accounts is reported in Table 1.3.[96] For 1974, the HES estimate of total consumption expenditure is 10% lower than the relevant estimate of the National Accounts. The most important discrepancies come from the categories "Alcohol and Tobacco", "Durable goods", "Education and Recreation" (understatement) and "Housing, Light and Fuel" and "Other goods and services" (overstatement). It seems likely that the discrepancies in "Education and Recreation" and "Other goods and services" can be

TABLE 1.3 Comparison of consumption expenditure estimates:

93. See NSSG (1977, p. XVII).

94. See NSSG (1977, pp XVII-XVIII).

95. See Kemsley (1979).

96. The 1974 and 1982 National Accounts data are from Ministry of Coordination (1981, p. 68) and Ministry of National Economy (1985b, p.35), respectively. The 1982 National Accounts figures are the weighted averages of the relevant 1981 and 1982 figures, the weights being 1/6 and 5/6, respectively.

HESs and National Accounts

Commodity Group	1974 Grossed-up HES estimate (1)	1974 National Accounts estimate (2)	(1)/(2) (3)	1982 Grossed-up HES estimate (4)	1982 National Accounts estimate (5)	(4)/(5) (6)
Food	121,688	142,878	0.85	654,759	655,237	1.00
Alcohol and Tobacco	14,872	20,105	0.74	53,306	86,922	0.61
Clothing and Footwear	38,334	45,991	0.83	236,874	155,876	1.52
Housing, Light and Fuel	67,931	49,911	1.36	371,736	221,277	1.70
Durable goods	27,305	38,159	0.72	170,844	135,944	1.26
Personal and Medical Care	18,136	17,476	1.04	112,339	86,539	1.30
Education and Recreation	22,486	33,445	0.67	101,131	72,888	1.39
Transport and Communications	32,650	38,270	0.85	197,526	231,105	0.85
Other goods and services	9,366	3,710	2.52	115,110	122,997	0.94
Total	352,768	389,936	0.90	2,013,625	1,768,785	1.14

[The figures in columns (1), (2), (4), and (5) are in millions of current drachmas]

attributed to differences in classifications and definitions. Experience of other countries shows that, to a large extent, the understatement in "Alcohol and Tobacco" can be attributed to deliberate under-reporting combined with differences in classifications[97] and the understatement in "Durable goods" to memory lapses. Further, the overstatement in "Housing, Light and Fuel" is mainly due to an overstatement of imputed rent in the HESs. The whole picture was rather different in 1982. Instead of understating, the HES aggregates overstate the National Accounts figures by 14%. In addition, the discrepancies for most commodity groups were larger in 1982 than in 1974. No obvious explanation can be offered for this increase in discrepancies apart, perhaps,

97. It is also likely that the understatement in "Alcohol and Tobacco" may be due to the refusal of many heavy drinkers to cooperate with HES interviewers. See Atkinson et al (1984).

from the reduction in the sampling fraction.[98] Nevertheless, even in 1982 the total discrepancy cannot be considered as extraordinarily high. Taking into account, firstly, that the overall discrepancies are not substantially different from the relevant discrepancies of other countries' HESs[99] and, secondly, that a potential adjustment of the HESs data would be theoretically controversial and practically arbitrary and difficult to implement, it was decided to make no further attempts to reconcile them with the National Accounts estimates.

98. In personal communication, the Chief Statistician of the NSSG suggested that the "demonstration effect" was very strong in the 1982 HES.

99. See, for example, Kemsley et al (1980)

CHAPTER TWO

THE ESTIMATION OF EQUIVALENCE SCALES FOR THE COST OF CHILDREN[1]

1. Introduction

Like most studies on inequality, the present one is ultimately concerned with inequality in the distribution of welfare. However, since welfare is not directly observable, we have to select a variable which can serve as a reasonably good approximation to it. Using standard arguments from microeconomic theory, it can be argued that, ceteris paribus, in the long-run the welfare level of an individual (or a HH) is determined by his/her level of "life-cycle" or "permanent" income. Within this framework we can justify current consumption as a measure of current welfare (short-run welfare). Following the tradition of Modigliani and Brumberg (1954) or Friedman (1957), current consumption can be considered as a better approximation to life-cycle income than current income.[2] This, of course, does not mean that an individual's (HH's) consumption does not fluctuate over time. It does so, and sometimes quite substantially, since needs are not evenly distributed over the life-cycle and capital markets may be far from perfect, particularly for the poor HHs. In the latter case, poor HHs are unable to borrow and their current consumption is determined by their current instead of their life-cycle income. Nevertheless, even in this case, current consumption is as good an approximation to life-cycle income as current income.

Before proceeding to the measurement and decomposition of inequality and poverty, we have to decide on the unit of measurement. One could reasonably argue that the HH should be the unit of measurement because the HH is the unit where the decisions about total consumption expenditure and its allocation among HH members are taken. However, HHs differ in size and, hence, pc HH expenditure may be regarded as a better indicator of welfare. Two problems arise in this case. Firstly, pc HH expenditure does not take into account differences in needs by sex or by age, as well as possible economies of scale in consumption.

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1. Some of this chapter's results were presented in the Development Economics Research Workshop at the University of Warwick and in the ESRC Development Economics Study Group at the LSE.

2. See, also, Sen (1975b) and Deaton (1980).

Secondly, numerous studies have shown[3] that in most countries HH expenditure (or income) is positively but less than proportionately related to HH size. Consequently, the use of total HH expenditure automatically associates poverty with small HHs, whereas the use of pc HH expenditure causes an over-representation of large HHs among the poor.

The usual way to overcome these problems is the construction of equivalence scales intended to measure the relative amounts of consumption expenditure required to enable HHs facing different circumstances to enjoy the same standard of living. More formally, an equivalence scale can be defined as "an index number [which] ... indicates at reference prices the cost differential for a HH, due to different HH size and composition, to reach the indifference curve of the reference HH".[4] There are three main approaches to the construction of equivalence scales. The first uses nutritional needs of different sex-age groups to determine the equivalence scales. However, "needs" are usually regarded as a social rather than a physiological concept. Further, even if we accept the physiological approach, the estimated scales are likely to vary considerably over time and across regions, since nutritional needs depend on climate, environment, health, work habits and so on.[5] The second approach relies on the use of survey questionnaires directly asking HHs questions about preferences or hypothetical choices. Clearly, this approach introduces a very strong subjective element in the construction of equivalence scales.[6] The third approach advocates the estimation of equivalence scales from observed expenditure patterns of HHs. This approach is described in the present chapter and equivalence scales based on it are used in this study. This is not only because the data required for the construction of equivalence scales according to the other methods do not exist in the case of Greece, but also because the third method - despite some disadvantages - is theoretically the most sound of the three.

2. The theory of equivalence scales estimated from observed behaviour

The definition of equivalence scales given in the last section suggests that they can help in measuring changes in welfare as a result of changes in demographic characteristics. Welfare is derived from the

3. See, for example, Kuznets (1976, 1982), Datta and Meerman (1980) and Visaria (1980).

4. Grootaert (1983, p.5).

5. For equivalence scales based on calorific requirements see Visaria (1980). A good example of a heated controversy on what the "correct" nutritional needs are, can be found in Sukhatme (1982) and Dandekar (1982).

6. For equivalence scales constructed from responses to such questionnaires see Kapteyn and van Praag (1976) and Goedhart et al (1977).

consumption of goods and services, consumption being translated into welfare as a function of several characteristics of the consuming unit (in this case the HH) such as sex and age, as well as environmental factors. However, in this study it is assumed that the consumption of a particular bundle of commodities gives the same amount of welfare to any HH, irrespective of psychological factors which can lead to differences in the utility that different HHs derive from its consumption. Hence, welfare and utility will be used interchangeably. In other words, we assume that all the differences in preferences between HHs can be attributed to observable characteristics. As a result, if two demographically identical HHs behave identically they should have identical welfare levels. Two further clarifications are required. The first concerns the consuming unit in whose welfare we are interested. Assuming that the change of the demographic characteristics takes the form of the arrival of a child, then, the welfare we are interested in keeping constant is certainly the parental welfare, since only the parents are present both before and after the arrival of the child. The second clarification concerns the time horizon of this analysis. As noted in the previous section, the notion of welfare used here is short-run welfare, which assumes intertemporal separability of preferences over the life-cycle. Children have some needs, the satisfaction of these needs requires their parents to reduce their own consumption and, hence, their own welfare. On the other hand the existence of children might generate the expectation of future benefits for their parents. In this case the parents may increase their consumption in the short-run, thereby increasing their welfare. What is not assumed here is that the parental welfare increases at each and every level of consumption expenditure because of the existence of the children.

It should be noted that even if demographically identical HHs consume identical bundles of commodities they may not enjoy the same level of welfare, since their labour supplies may differ. For this reason some authors advocate the use of "full income", instead of consumption, as a proxy for welfare.[7] The full income method evaluates imputed income for leisure, freely provided public goods and unpaid HH work for each HH. However, it requires time-use data which are not available in the case of Greece, so it cannot be applied in this study. Hence, it is further assumed that labour supply is exogenous and that demographically identical HHs consuming the same bundle of goods and services enjoy the same level of welfare.

Formally, we assume that the direct utility function of the parents is given by

7. See, for example, Kusnic and Davanzo (1986) and Manser (1979).

$$u = u(\mathbf{q}, \mathbf{z}) \tag{1}$$

where: u is utility

$\mathbf{q}$ is the vector of commodities consumed by the HH

and $\mathbf{z}$ is the vector of HH demographic characteristics

Associated with this utility function is a cost function giving the minimum level of expenditure, X, required to reach utility level u at prices $\mathbf{p}$ when the vector of demographic characteristics, $\mathbf{z}$, is given

$$c(u, \mathbf{p}, \mathbf{z}) = X \tag{2}$$

Then, we can select a reference price vector $\mathbf{p}^0$ and a reference utility level u^0 and divide the cost function of any HH h by the cost function of the reference HH 0, in order to derive the equivalence scale

$$\mu^h = c(u^0, \mathbf{p}^0, \mathbf{z}^h)/c(u^0, \mathbf{p}^0, \mathbf{z}^0) \tag{3}$$

(1), (2) and (3) involve direct utility which is unobservable, but associated with them is a system of demand equations linking commodity expenditures to total expenditure, prices and demographic characteristics. Using Shepherd's lemma we can derive the Hicksian (uncompensated) demand functions

$$p_i q_i = \partial c(u, \mathbf{p}, \mathbf{z})/\partial \ln p_i \tag{4}$$

Then, substituting indirect $v(X,\mathbf{p},\mathbf{z})$ for direct utility $u(\mathbf{q},\mathbf{z})$ we can derive the Marshallian demand functions[8]

$$p_i q_i = \partial c(v(X, \mathbf{p}, \mathbf{z}), \mathbf{p}, \mathbf{z})/\partial \ln p_i = f(X, \mathbf{p}, \mathbf{z}) \tag{5}$$

whose components are observable. However, even full knowledge of the system of demand equations is insufficient to recover complete information about the cost function[9] and we need some identifying assumptions to do so. Different assumptions regarding the form the demographic variables enter the cost function lead to different models of equivalence scales.

The above procedure has been strongly criticized by Pollak and Wales (1979, 1981). They argue that,

8. The indirect utility function $v(X,\mathbf{p},\mathbf{z})$ can be derived by inverting the cost function (2).

9. See Pollak and Wales (1979).

although this methodology is useful for demand analysis, it cannot be used for welfare comparisons because the presence of children leads parents not only to change their consumption patterns but to relabel their utility indifference curves, as well. As a result, changes in the utility caused by the presence of children will not have any observable effect on behaviour and, hence, equivalence scales cannot be estimated. They call the preferences of the parents "conditional" when the vector of demographic variables is given and "unconditional" when it is not. Corresponding to conditional and unconditional preferences are conditional and unconditional equivalence scales. The equivalence scales derived using the above procedure are conditional because the vector of demographic characteristics is given. Pollak and Wales argue that unconditional equivalence scales are required for welfare comparisons. Unconditional equivalence scales can be considered as "equivalence scales in the long-run", where HHs have to take decisions about their labour supply, intertemporal allocation of consumption, inter-generational transfers and composition of the HH.[10] Despite their theoretical elegance, the models of unconditional equivalence scales have the essential disadvantage of treating children like durable goods. However, as Tobin (1973, pp S276-S277) points out "[children] ... cannot be bought or sold in the used-child market or scrapped at will; the rental market is highly imperfect; delivery time is more than normally uncertain; their qualities are very uncertain ex ante, and ex post control of quality is very limited". Apart from this, the estimation of unconditional equivalence scales has very significant data requirements and, to date, there is no known attempt to estimate such scales.[11] Therefore, the equivalence scales estimated here are "conditional". Before proceeding to their estimation, three models of equivalence scales are presented and compared.

3. The Engel model of equivalence scales

The first model of equivalence scales goes back to the last century, when Engel pointed out that, firstly, richer HHs devote a lower proportion of their total expenditure to food than poorer HHs and, secondly, the average propensity of smaller HHs to consume food is lower than that of larger HHs when they are at the same level of total expenditure. As a result, the share of food expenditure in total expenditure can be considered as an (inverse) indicator of welfare and, hence, two HHs with the same foodshare must be at the

10. See, also, Fisher (1987) for arguments against the construction of equivalence scales from observed behaviour.

11. For a critique of Pollak and Wales see Deaton (1980) and Deaton and Muellbauer (1980a, ch.8 and 1986). A paper examining the implications of endogenous fertility for the welfare of the parents is Nerlove et al (1986), although the authors do not try to interpret their results in terms of unconditional equivalence scales.

same level of welfare irrespective of differences in size, composition and total expenditure. Then, comparing their total expenditures at the same foodshare we can derive an index of the cost of maintaining the first HH relative to the cost of maintaining the second (reference) HH. This index is the equivalence scale. Formally, the Engel model can be described as follows.[12] Assume, for convenience, that the reference HH consists of one adult only. Then, the equivalence scale can be thought of as the number of adult equivalents of the HH under examination. According to the Engel model, the cost function of any HH h with demographic characteristics $\mathbf{z}^h$ is the product of two terms

$$c(u, \mathbf{p}, \mathbf{z}^h) = \mu(\mathbf{z}^h, u)c(u, \mathbf{p}) \tag{6}$$

where $c(u,\mathbf{p})$ is the cost function of the reference (one adult) HH and $\mu(\mathbf{z}^h,u)$ is the number of equivalent adults of HH h.[13] For the reference HH $\mu(\mathbf{z}^0,u)=1$. Then, the direct utility function of HH h becomes

$$u^h = u(\mathbf{q}^h, \mathbf{z}^h) = u(\mathbf{q}^h/\mu(u^h, \mathbf{z}^h)) \tag{7}$$

and the - per equivalent adult - demand functions become

$$q^h_i/\mu(u^h, \mathbf{z}^h) = \phi_i(X^h/\mu(u^h, \mathbf{z}^h), \mathbf{p}) \tag{8}$$

or, in budget share form

$$w^h_i = p_i q^h_i/X^h = p_i\phi_i(X^h/\mu(u^h, \mathbf{z}^h), \mathbf{p})/(X^h/\mu(u^h, \mathbf{z}^h)) \tag{9}$$

which is a function of $X^h/\mu(u^h,\mathbf{z}^h)$ and not of X^h or $\mu(u^h,\mathbf{z}^h)$ separately. As a result, if the price vector is the same for all the HHs and both HH h and the reference HH have the same foodshare, w_f, they should be at the same welfare level. Therefore, (9) implies that

$$X^h/\mu(u^0, \mathbf{z}^h) = X^0/\mu(u^0, \mathbf{z}^0) \quad => \quad \mu(u^0, \mathbf{z}^h) = X^h/X^0 \tag{10}$$

In this model the foodshare is an indicator of welfare. This follows from (6), since the foodshare is given by differentiating $\ln c(u,\mathbf{p},\mathbf{z})$ with respect to $\ln p_f$[14] (p_f is the price of food).

12. See Deaton and Muellbauer (1980a, pp 193-195).

13. If it is assumed that the cost of an extra member to the HH is the same at any level of welfare (or total expenditure) then μ should be a function of z only (not of both z and u).

14. See Deaton and Muellbauer (1980a, pp 40-43).

$$w^h_f = \partial \ln c(u^h, \mathbf{p}^h, \mathbf{z}^h)/\partial \ln p_f$$

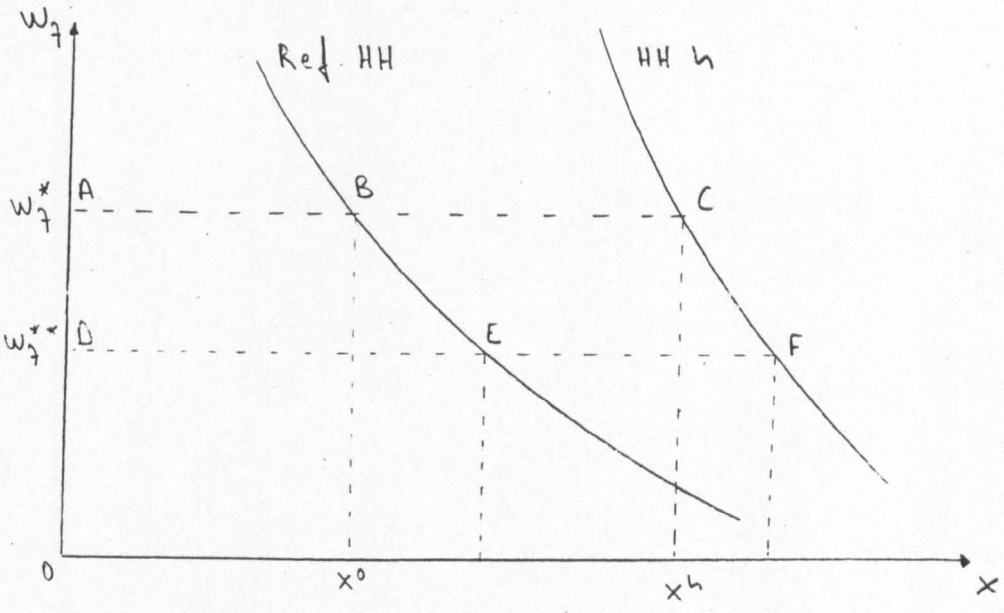
$$= \partial[\ln \mu(u^h, \mathbf{z}^h) + \ln c(u^h, \mathbf{p}^h)]/\partial \ln p_f$$

$$= \partial \ln c(u^h, \mathbf{p}^h)/\partial \ln p_f \qquad (11)$$

So, assuming that prices are constant, w^h_f varies directly with u^h and, hence, it is an indicator of welfare.[15]

The Engel method is illustrated in Diagram 1.

DIAGRAM 1



We first select a welfare level u^* which corresponds to a foodshare w_f^*. The foodshare of the reference HH is w_f^* when its total expenditure is X^0, whereas the foodshare of HH h is w_f^* when its total expenditure is X^h. Hence, the equivalence scale X^h/X^0 is equal to AC/AB. Note that, in general, the selection of a different reference foodshare affects the equivalence scale (DF/DE ≠ AC/AB).

Various forms of the Engel model have been estimated by Seneca and Taussing (1971), Muellbauer (1977), Deaton (1981a) and Ray (1986).[16] There are two practical advantages in estimating equivalence scales according to the Engel method. Firstly, it is computationally straightforward and, secondly, the food information of HESs is usually considered to be of very high quality. Against these advantages, the

15. The same analysis is correct for any budget share, not only the foodshare.

16. Friedman's (1952) method can also be considered as a special case of the Engel method.

disadvantage of this method is that it is based on a very strong identifying assumption ("foodshare always indicates welfare correctly"). Moreover, even with this assumption there are grounds for believing that Engel's methodology is not very powerful for estimating the "cost of children". Following Nicholson (1976), let us assume that a HH obtains another child and is compensated (in money) in order to retain its previous level of welfare. However, since children are mainly food-consuming, a very large part of the compensation will be spent on food. Hence, the marginal HH consumption on food will be higher than the average and the foodshare will increase. In this case, Engel's method will indicate that HH welfare has declined. Consequently, it overstates the cost of children and the estimated equivalence scales are biased upwards.[17]

4. The Rothbarth model of equivalence scales

An alternative model for the construction of equivalence scales was suggested by Rothbarth (1943). According to Rothbarth, the goods and services consumed by a HH can be divided into two groups: those consumed exclusively by adults ("adult goods") and those which are usually consumed jointly by adults and children ("other goods"). The level of adults' welfare is determined by their consumption of adult goods. If two HHs with the same number of adults spend the same amount of money on adult goods, they are considered to be equally well-off irrespective of their size and total expenditure.[18] Formally, instead of the multiplicative form of the Engel cost function, the Rothbarth model assumes an additive cost function

$$c(u, \mathbf{p}_A, \mathbf{p}_B, \mathbf{z}_c) = \alpha(u, \mathbf{p}_A, \mathbf{p}_B, \mathbf{z}_c) + \beta(u, \mathbf{p}_A, \mathbf{p}_B) \qquad (12)$$

where $\mathbf{p}_A$ prices of adult goods

$\mathbf{p}_B$ prices of other goods

and $\mathbf{z}_c$ the vector of demographic characteristics of children only

The second component of the cost function, (β), can be thought of as the base or fixed costs and the first part (α) as the cost of children as a function of prices and welfare. $\alpha(u,\mathbf{p}_A,\mathbf{p}_B,\mathbf{z}_c)$ is homogeneous of degree zero in $\mathbf{p}_A$ and homogeneous of degree one in $\mathbf{p}_B$, while $\beta(u,\mathbf{p}_A,\mathbf{p}_B)$ is homogeneous of degree one in $\mathbf{p}_A$ and $\mathbf{p}_B$ jointly. Total expenditure, X, consists of expenditure on adult goods (X_A) and on other goods (X_B).

17. Only if the group of commodities selected is equally important for adults and children Engel's method indicates the cost of children correctly.

18. Unlike Engel's model, the Rothbarth model can be applied only to HHs with the same number of adults.

$$X = X_A + X_B = \mathbf{p}_A\mathbf{q}_A + \mathbf{p}_B\mathbf{q}_B \qquad (13)$$

and - given (12) - expenditure on adult goods is

$$X_A = \Sigma_{i\epsilon A} p_i \partial\beta(u, \mathbf{p}_A, \mathbf{p}_B)/\partial p_i = \theta(u, \mathbf{p}_A, \mathbf{p}_B) \qquad (14)$$

Assuming that the prices are the same for all HHs, X_A and u are monotonically related and, hence, X_A is an indicator of welfare.

Subtracting (14) from (12) we can derive the expenditure on other goods

$$X_B = \alpha(u, \mathbf{p}_A, \mathbf{p}_B, \mathbf{z}_c) + \beta(u, \mathbf{p}_A, \mathbf{p}_B) - \theta(u, \mathbf{p}_A, \mathbf{p}_B) \qquad (15)$$

and comparing two HHS with different numbers of children, for given $\mathbf{p}_A$, $\mathbf{p}_B$ and u, we can find the cost of extra children by calculating the differences in X_B.

$$X_B^h - X_B^0 = \alpha(u^0, \mathbf{p}_A^0, \mathbf{p}_B^0, \mathbf{z}_c^h) - \alpha(u^0, \mathbf{p}_A^0, \mathbf{p}_B^0, \mathbf{z}_c^0) \qquad (16)$$

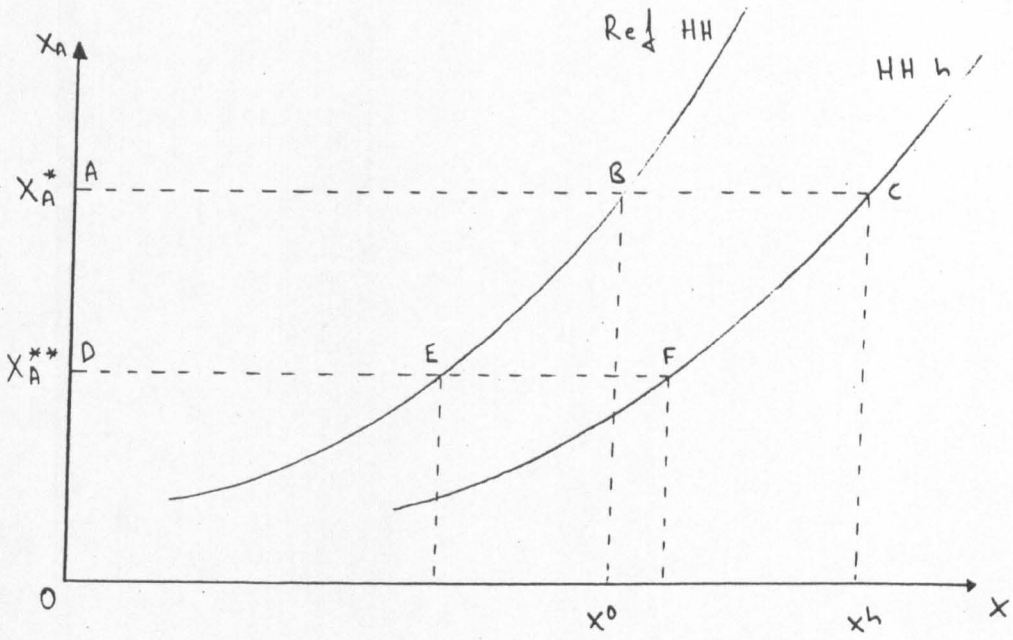
If the reference HH is a childless couple $\alpha(u^0,\mathbf{p}_A^0,\mathbf{p}_B^0,\mathbf{z}_c^0)=0$ and the equivalence scale is given by

$$\begin{aligned}\mu^h &= c(u^0, \mathbf{p}_A^0, \mathbf{p}_B^0, \mathbf{z}_c^h)/c(u^0, \mathbf{p}_A^0, \mathbf{p}_B^0, \mathbf{z}_c^0) \\ &= [\alpha(u^0, \mathbf{p}_A^0, \mathbf{p}_B^0, \mathbf{z}_c^h) + \beta(u^0, \mathbf{p}_A^0, \mathbf{p}_B^0)]/\beta(u^0, \mathbf{p}_A^0, \mathbf{p}_B^0) \qquad (17)\end{aligned}$$

The Rothbarth method is illustrated in Diagram 2. Again, we first select a welfare level u^* which corresponds to an expenditure on adult goods X_A^*. This, in turn, corresponds to total expenditure levels X^0 for the reference HH and X^h for HH h. Therefore, the equivalence scale X^h/X^0 is equal to AC/AB. In general, the selection of a different reference welfare level (for instance, X_A^{**}) might affect the equivalence scale (DF/DE ≠ AC/AB).

Several forms of the Rothbarth model have been estimated by Nicholson (1949), Henderson (1949-50a, 1949-50b, 1950-51), Espenhade (1973), Garganas (1977), Deaton (1981a) and Deaton et al (1985). Like the Engel model, it is a single equation model and, therefore, easy to estimate. Apart from this, the identifying assumption of the Rothbarth model (adults' welfare is determined by their consumption of adult goods) may

DIAGRAM 2



be considered as more plausible than the identifying assumption of the Engel model. On the other hand, the Rothbarth model assumes that adults do not derive any welfare from the consumption of goods which are also consumed by children, and that the presence of children does not change the preferences of the adult HH members. These are contestable assumptions. In addition, the selection of adult goods is more or less arbitrary. Rothbarth (1943) used a very broad definition of adult goods, including savings and all the expenditures other than those on food, clothing and fuel. However, subsequent authors have used a rather narrow definition; mainly alcoholic drinks and tobacco. These goods are known to be notoriously under-reported in most HESs[19] and, therefore, their measurement error may be very large. Furthermore, as Cramer (1969) indicates, these goods are not very responsive to changes in income and, hence, they may not constitute the best commodity group for capturing income effects.

5. The Barten model of equivalence scales

Both the Engel and the Rothbarth model implicitly assume that the needs of children relative to those of adults and economies of scale in consumption are the same for every commodity. However, a child is probably equivalent to more adults in the consumption of some goods (for example, milk) than in the

19. See, for example, Kemsley et al (1980) and chapter 1.

consumption of others (for example, tobacco). Hence, it may be desirable to construct "commodity-specific" equivalence scales, $\mu_i(\mathbf{z})$, as well as a general equivalence scale, $\mu_i(u,\mathbf{z})$. This idea was first developed by Prais and Houthakker (1955) but, as Forsyth (1960), Cramer (1969) and Muellbauer (1975) have shown, their model of equivalence scales has a severe identification problem and the estimated scales are determined by the restrictions exogenously imposed on it. Therefore, it was decided to exclude the Prais - Houthakker model from the present discussion.[20] The only model of equivalence scales that is consistent with traditional utility theory is that of Barten (1964). According to Barten the direct utility function should be written as[21]

$$u = u(q_1/\mu_1(\mathbf{z}),\ q_2/\mu_2(\mathbf{z}),\ \ldots,\ q_n/\mu_n(\mathbf{z})) \tag{18}$$

u should be interpreted as a measure of parents' welfare and $q_i/\mu_i(\mathbf{z})$ as the quantity of commodity i consumed by the parents, when the HH consumption of this commodity is q_i. Consequently, $\mu_i(\mathbf{z})$ is equal to one when children do not consume commodity i and all the μ_is are set to one for the reference HH (childless couple).

We, then, define $q_i^* = q_i/\mu_i(\mathbf{z})$ and $p_i^* = p_i\mu_i(\mathbf{z})$. p_i^* can be regarded as the "effective price", that is the price to the parents of one unit of consumption of commodity i. The cost function associated with (18) is

$$c(u,\ p_1^*,\ p_2^*,\ \ldots\ p_n^*) = X \tag{19}$$

and the HH demand functions are given by

$$q_i = \mu_i g_i(u,\ p_1^*,\ p_2^*,\ \ldots\ p_n^*) \tag{20}$$

where: g_i is the compensated demand function of the reference HH.

Now, we can reformulate the HH's problem as: maximize $u(\mathbf{q}^*)$ subject to $\Sigma_i p_i^* q_i^* = X$, and derive the general equivalence scale[22]

$$\mu^h = c(u^0,\ \mathbf{p}^*)/c(u^0,\ \mathbf{p}^0) \tag{21}$$

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20. For a presentation of the Prais-Houthakker model of equivalence scales and comparison with the Barten model see Deaton and Muellbauer (1980a pp 196-205). For estimates of equivalence scales based on the Prais-Houthakker model and controversies about them see McClements (1977, 1979), and Muellbauer (1975, 1979, 1980). See, also, Pollak and Wales (1981) and Lewbel (1986) who show that, under relatively strong assumptions, a modified version of the Prais-Houthakker model can be consistent with utility maximization theory.

21. See, also, Deaton and Muellbauer (1986).

22. Muellbauer (1977) points out that the Engel model can be considered as a special case of the Barten model if $\mu_1(\mathbf{z}) = \mu_2(\mathbf{z}) = \ldots = \mu_n(\mathbf{z})$.

Gorman (1976) argues that, in the framework of the Barten model, we should recognize explicitly that there exist some fixed costs, $\Sigma_i p_i n_i(\mathbf{z})$, associated with the presence of children in the HH. Therefore, the cost function (19) should take the form

$$c(u, p_1^*, p_2^*, \ldots p_n^*) + \Sigma_i p_i n_i(\mathbf{z}) = X \qquad (22)$$

and the related demand equations (20) should be modified to

$$q_i = \mu_i g_i(u, p_1^*, p_2^*, \ldots p_n^*) + n_i(\mathbf{z}) \qquad (23)$$

A noticeable characteristic of demand equations (20) and (23) is that they allow both a scaling up of the reference demands by μ_i (which corresponds to the needs of children) and substitution due to changes in relative prices. In general, these two effects operate in opposite directions. On the one hand, the presence of children makes the goods consumed by them relatively more expensive for the parents and, therefore, there is a substitution away from these goods. On the other hand, children need to consume these goods and, hence, there is an increase in the HH demand for them.[23]

Versions of the Barten model of equivalence scales have been estimated by Blokland (1976), Kakwani (1977), Muellbauer (1977), Buce and Salathe (1978), van der Gaag and Smolensky (1982), and Ray (1983, 1985, 1986).[24] As mentioned earlier, Barten's model has the advantage of being the only model of equivalence scales consistent with utility theory. Its main disadvantage lies in the difficulties associated with its empirical estimation. In order to estimate Barten equivalence scales we need to estimate a complete system of demand equations. In addition, as Muellbauer (1974) has shown, more than one HES is required for its estimation because in the case of a single HES without price variation the commodity-specific equivalence scales can be identified only relative to each other and not in absolute terms.[25] A minor disadvantage of the Barten model is that it assumes that all types of HHs consume all types of commodities. This would imply, for example, that childless couples buy toys or baby foods, which is an implausible assumption. Nevertheless, this

23. See Gorman (1976) and the comments of Brown and Prais in the original Barten (1964) paper.

24. Parks and Barten (1973) and Pollak and Wales (1978) estimate complete systems of demand equations incorporating demographic characteristics according to the Barten model, but they do not interpret their results in terms of equivalence scales.

25. See also Cramer (1969).

is not a serious problem if the model is estimated using broad commodity groups.

6. Comparison of the three models[26]

Under the assumption that there are only two goods, one necessity consumed by both adults and children ("food") and one consumed exclusively by adults ("non-food"), it can be shown that the Rothbarth scale is always lower than or equal to the Engel scale. If we change the assumptions slightly, allowing children to consume both goods but relatively more food, it can be shown that the Barten scale lies somewhere between the Engel and Rothbarth scales.[27]

6i. Comparison of Engel and Rothbarth scales

Assuming that expenditure on food is given by the function $g_f(X, \mathbf{p}, \mathbf{z})$, the Rothbarth compensated expenditure, X^{hR}, is given by

$$X^{hR} - g_f(X^{hR}, \mathbf{p}, \mathbf{z}^h) = X^0 - g_f(X^0, \mathbf{p}, \mathbf{z}^0) \tag{24}$$

Since $X^{hR} \geq X^0$, if we divide the left hand side of (24) by X^{hR} and the right hand side by X^0, we obtain

$$[X^{hR} - g_f(X^{hR}, \mathbf{p}, \mathbf{z}^h)]/X^{hR} \leq [X^0 - g_f(X^0, \mathbf{p}, \mathbf{z}^0)]/X^0 \Rightarrow$$

$$g_f(X^{hR}, \mathbf{p}, \mathbf{z}^h)/X^{hR} \geq g_f(X^0, \mathbf{p}, \mathbf{z}^0)/X^0 \tag{25}$$

Engel's compensated expenditure, X^{hE}, is given by

$$g_f(X^{hE}, \mathbf{p}, \mathbf{z}^h)/X^{hE} = g_f(X^0, \mathbf{p}, \mathbf{z}^0)/X^0 \tag{26}$$

Combining (25) and (26) yields

$$g_f(X^{hR}, \mathbf{p}, \mathbf{z}^h)/X^{hR} \geq g_f(X^{hE}, \mathbf{p}, \mathbf{z}^h)/X^{hE} \tag{27}$$

But food is a necessity, so g_f/X is a declining function of X and, consequently, $X^{hR} \leq X^{hE}$ that is, the Engel compensation is always at least as generous as the Rothbarth compensation and the Engel scale at least as large as the Rothbarth scale.

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26. This section draws on Deaton and Muellbauer(1986).

27. These results are in line with the empirical findings of most of the papers mentioned in the last three sections.

6ii. Comparison of Engel and Barten scales

Changing the notation slightly, we can write the cost function of the Barten model as

$$c(u, \mathbf{p}, \mathbf{z}) = f[u, p_1\mu_1(\mathbf{z}), p_2\mu_2(\mathbf{z})] \qquad (28)$$

where good 1 is food and good 2 is non-food.

Two more assumptions are required: (a) $\mu_1 \geq 1$, $\mu_2 \geq 1$, $\mu_1/\mu_2 > 1$ that is, children consume both goods but their needs are relatively greater for food than for non-food, and (b) The compensated demand function for food is price-inelastic. For most countries, neither of these assumptions appear to be very strong.

The budget share for food is given by $\partial \ln f/\partial \ln(p_1\mu_1)$. If the HH under examination is compensated according to Engel's method, then

$$\partial \ln f(u^h, p_1\mu_1, p_2\mu_2)/\partial \ln(p_1\mu_1) = \partial \ln f(u^0, p_1, p_2)/\partial \ln(p_1\mu_1) \qquad (29)$$

If $u^h=u^0$ and the Barten model is the "true" model, then the Engel method gives the correct answer (that is, the Engel scale is equal to the Barten scale). If, however, $u^h>u^0$ ($u^h<u^0$) the Engel scale understates (overstates) the Barten scale.

Both expressions in (29) are homogeneous of degree zero in effective prices. Therefore

$$\begin{aligned} \partial \ln f(u^h, p_1\mu_1, p_2\mu_2)/\partial \ln(p_1\mu_1) &= \partial \ln f(u^h, p_1\mu_1/\mu_2, p_2)/\partial \ln(p_1\mu_1) \\ &\geq \partial \ln f(u^h, p_1, p_2)/\partial \ln(p_1\mu_1) \end{aligned} \qquad (30)$$

The inequality follows from the assumptions (a) and (b) that $\mu_1/\mu_2 > 1$ and that food is price inelastic. Combining (29) and (30), we obtain

$$\partial \ln f(u^0, p_1, p_2)/\partial \ln(p_1\mu_1) \geq \partial \ln f(u^h, p_1, p_2)/\partial \ln(p_1\mu_1) \qquad (31)$$

Since food is a necessity, its budget share decreases as total expenditure increases and, hence, (31) implies that $u^0 \leq u^h$ which means that the Barten scale is no greater than the Engel scale.

6iii. Comparison of Barten and Rothbarth scales

Retaining the assumptions of the previous subsection and compensating the HH according to Rothbarth's method we have

$$\partial c(u^h, p_1\mu_1, p_2\mu_2)/\partial \ln(p_2\mu_2) = \partial c(u^0, p_1, p_2)/\partial \ln(p_2\mu_2) \qquad (32)$$

Expressing demand for non-food as a function of utility and relative prices, $\gamma_2(u, p_1/p_2)$, we can write (32) as

$$\mu_2\gamma_2(u^h, p_1\mu_1/p_2\mu_2) = \gamma_2(u^0, p_1/p_2) \qquad (33)$$

Since it is assumed that there are only two goods, they must be substitutes. By assumption (a), $p_1\mu_1/p_2\mu_2 > p_1/p_2$, so

$$\gamma_2(u^h, p_1\mu_1/p_2\mu_2) \geq \gamma_2(u^h, p_1/p_2) \qquad (34)$$

Multiplying both sides of (34) by μ_2 and combining (33) and (34) yields

$$\gamma_2(u^0, p_1/p_2) \geq \mu_2\gamma_2(u^h, p_1/p_2) \qquad (35)$$

But by assumption (a), $\mu_2 \geq 1$. Therefore

$$\gamma_2(u^0, p_1/p_2) \geq \gamma_2(u^h, p_1/p_2) \qquad (36)$$

Taking into account that non-food is not a necessity,[28] (36) implies that the HH under examination has been under-compensated and that the Barten scale is at least as large as the Rothbarth scale.

7. The estimation of the Engel model of equivalence scales

The present and the next two sections are devoted to the estimation of the models described in sections 3, 4, and 5. The sample used for their estimation consists of the two-adult couples, with and without children, of the 1974 and 1982 HESs.[29] The reference HH is always the childless couple. A child is defined as a person aged up to sixteen. Children in the age bracket 0-5 are called "little children" (LCH) and children

28. The fact that there are only two goods and food is a necessity ensures that non-food is a normal good.

29. Both the Engel and the Barten model can be generalized to give estimates of the cost of an extra adult to the HH. However, preliminary analysis in this direction turned out to be unsuccessful, so the following analysis is restricted to the estimation of the cost of children only.

in the age bracket 6-16 are called "big children" (BCH). Before proceeding to the estimation of these models some methodological issues are discussed.

As noted earlier, it is assumed that welfare depends on the consumption of goods and services. However, HESs record expenditures not consumption and, taking into account the short period of the survey, one would expect a high incidence of zero expenditures even at high levels of expenditure aggregation. This cannot be attributed entirely to variation in preferences across the sample. For example, it is difficult to believe that 35% (23%) of the sample in 1974 (1982) purchased no clothing and footwear. Therefore, the recorded expenditures should be interpreted as approximations to unobservable consumptions, measured with error. Kay et al (1984) suggest a method for estimating unobservable consumptions from observable expenditures. However, their method is not applied in this study because, apart from being computationally rather complex, it is based on the doubtful assumption that the probability of purchasing a particular commodity is independent of the total expenditure of the HH under examination.

Nevertheless, some "cleaning" of the data is required before proceeding further. We have chosen to exclude two of the most "lumpy" expenditures from our analysis. These expenditures are purchases of means of transportation (cars and motorcycles), and home repairs and improvements. For neither of these is the annual recall period of the HESs (normalization period) sufficient to remove the chance element and to make their purchases reasonable approximations of consumption. Hence, the expenditures on these items have been subtracted both from the relevant consumption expenditure categories for the estimation of the Barten model and from the concept of total expenditure used in the rest of this study. Similar arguments could be used to exclude durable goods from our analysis. However, expenditures on durables have been included for three reasons. Firstly, the proportion of HHs reporting purchases of durables is considerably higher than the proportion of HHs reporting purchases of means of transportation and home repairs and improvements.[30] Secondly, expenditures on durables are not as lumpy as expenditures on means of transportation and home repairs and improvements.[31] Thirdly, at least for some durables, and even more so for durables as a group, a

30. In the 1974 HES (1982) 49.8% (57.8%) of the HHs reported purchases of durables, whereas the relevant percentages for purchases of means of transportation and home repairs and improvements were 2.9% (4.3%) and 9.7% (17.4%), respectively.

31. In 1974 (1982) the mean expenditure on durables as a group, among HHs reporting purchases of durables was 1210 (5528) drachmas, compared with mean expenditures of 6580 (24235) for means of transportation and 2656 (5419) for home repairs and improvements.

normalization period of one year does not seem to be unrealistic.

In addition, it was decided to remove 20 (15) HHs from the 1974 (1982) HES sample. Some of these HHs did not report any expenditures other than expenditures on housing, while others reported expenditures on particular commodity groups far in excess of the relevant expenditures of the rest of the sample. Hence, the reported expenditures of these HHs could be considered as very inappropriate approximations to their consumption. Of course, any exclusion of either specific HHs or specific expenditures is more or less arbitrary and - in the context of the present study - can affect the measurement of inequality and/or poverty. It is for this reason that we have adopted a rather conservative approach, excluding only the strikingly dubious HHs and only those expenditures with a normalization period unquestionably longer than one year.[32]

In order to proceed to the estimation of the Engel model, we must select a functional form for the Engel curve for the foodshare.[33] Among the several simple functional forms which were tried, the Working - Leser form

$$w_f = \alpha_0 + \alpha_1 \ln X \qquad (37)$$

was found to give the best results in terms of goodness of fit.[34] Deaton and Muellbauer (1980b) show that this functional form is compatible with the requirements of a complete system of demand equations. However, the Engel model requires the estimation of a single equation only and, further, w_f is a limited dependent variable, whose estimated value should always be between 0 and 1. For this reason it was decided to replace w_f by its logistic transformation, $\ln[w_f/(1-w_f)]$, as the dependent variable in (37).[35] After the logistic transformation, Engel curves are estimated, using Ordinary Least Squares, pooling all the observations and for each of seven family types separately.[36] In order to eliminate the impact of inflation, expenditure is given in constant

32. Nevertheless, it should be noted that after these changes the Gini index for the distribution of consumption expenditure by HH decreases from 0.376 to 0.360 in 1974 and from 0.340 to 0.331 in 1982. Implementation of the method suggested by Kay et al (1984) would, probably, reduce the measured inequality even more.

33. The mean foodshare in the 1974 (1982) HES is 0.409 (0.376) with a standard deviation of 0.148 (0.152).

34. For a comparison of different functional forms for the foodshare see De Witte and Cramer (1986). Some authors recommend the use of the logarithm of pc HH expenditure instead of the logarithm of total HH expenditure as the dependent variable; see, for example, Deaton (1981a), Deaton et al (1985). However, in our samples, total HH expenditure was found to give slightly better results than pc HH expenditure.

35. See Maddala (1983, ch. 4).

36. Childless couples, couples with one little child only, or with one big child only, or two little children,or two big children, or one little child and one big child, all other two adult couples.

TABLE 2.1 Engel curves for the foodshare of different family types (1974)

Dependent Variable: $\ln[w_f/(1-w_f)]$

Equat No	Family Type	Intercept (α_0)	ln(X) (α_1)	F	R^2	N	H_0: $\alpha_1 = -0.540$ t-statistic
1.1	Childless couple	4.322 (19.13)	-0.540 (19.07)	434.91	0.267	1190	
1.2	Couple with one LCH only	3.906 (7.64)	-0.489 (7.89)	77.36	0.177	355	0.81 (Not rejected)
1.3	Couple with one BCH only	4.282 (9.82)	-0.526 (9.39)	119.22	0.259	339	0.25 (Not rejected)
1.4	Couple with two LCH only	5.412 (8.44)	-0.640 (8.10)	85.57	0.282	217	1.27 (Not rejected)
1.5	Couple with two BCH only	4.556 (11.38)	-0.541 (10.07)	153.46	0.205	591	0.01 (Not rejected)
1.6	Couple with one LCH and one BCH only	5.197 (9.63)	-0.609 (9.31)	106.80	0.253	313	1.05 (Not rejected)
1.7	All other two adult couples	5.053 (9.49)	-0.578 (9.96)	99.11	0.248	299	0.66 (Not rejected)
1.8	All two adult couples	4.068 (25.39)	-0.498 (27.97)	969.59	0.227	3304	

(t-ratios in parentheses)

January 1974 prices both for the 1974 and for the 1982 sample. The results are given in Tables 2.1 and 2.2.[37]

It should be noted that all the estimated equations of this chapter have been tested for the presence of heteroskedasticity, using a Breusch-Pagan (1979) χ^2-test. Almost all of them failed to pass it at the 5% level of significance. As a result, although the estimates are both unbiased and consistent, they are not efficient and the standard errors and t-ratios are probably biased. This may be due to the fact that the HESs samples are not simple random samples, but multistage stratified random samples and, therefore, the error terms across HHs may not be independent.[38] The t-ratios reported here have been estimated using the method suggested by

37. The Engel model (and the Rothbarth model which is estimated in the next section) assumes that relative prices are constant. So, it is not legitimate to pool observations from different years (1974 and 1982). Naturally, relative prices exhibit some variation within a certain year, but this variation is not substantial.

38. See Scott and Holt (1982).

TABLE 2.2 Engel curves for the foodshare of different family types (1982)

Dependent Variable: $\ln[w_f/(1-w_f)]$

Equat No	Family Type	Intercept (α_0)	ln(X) (α_1)	F	R^2	N	H_0: $\alpha_1 = -0.566$ t-statistic
2.1	Childless couple	4.733 (14.89)	-0.566 (16.24)	263.67	0.191	1113	
2.2	Couple with one LCH only	3.816 (5.25)	-0.489 (6.47)	41.84	0.123	293	1.02 (Not rejected)
2.3	Couple with one BCH only	5.501 (9.47)	-0.645 (10.33)	111.52	0.280	285	1.27 (Not rejected)
2.4	Couple with two LCH only	4.554 (5.67)	-0.549 (6.59)	43.47	0.179	196	0.20 (Not rejected)
2.5	Couple with two BCH only	3.752 (9.14)	-0.455 (7.78)	83.61	0.149	473	2.22 (Rejected)
2.6	Couple with one LCH and one BCH only	4.803 (6.32)	-0.565 (7.18)	51.57	0.193	213	0.01 (Not rejected)
2.7	All other two adult couples	5.230 (8.17)	-0.589 (8.89)	78.98	0.196	320	0.35 (Not rejected)
2.8	All two adult couples	4.469 (22.54)	-0.543 (25.44)	738.45	0.203	2893	

(t-ratios in parentheses)

White (1980) and, hence, they are heteroskedasticity-consistent.[39]

Equivalence scales could be constructed from Tables 2.1 and 2.2 by comparing the foodshare of each family type with the foodshare of the reference HH (childless couple) at some predetermined expenditure level. However, this would make the analysis cumbersome. Alternatively, we can assume that each additional child has some needs, the satisfaction of which reduces parents' welfare (that is, increases the HH foodshare) by a constant amount. This has the testable implication that the slope coefficients of the Engel curves of the HHs with children are not significantly different from the slope coefficient of the Engel curve of the childless couples. If this is the case it would be legitimate to pool all the family types together and introduce

39. Nevertheless, the t-ratios were not dramatically different before and after the White-corrections, especially the t-ratios of the demographic variables.

TABLE 2.3 Engel curve for the foodshare (All two-adult couples, 1974)

Dependent Variable $\ln[w_f/(1-w_f)]$ (N=3304)

Equat. No	3.1	3.2	3.3	3.4	3.5
Intercept	4.428	-5.750	-7.100	-7.100	3.692
	(27.09)	(4.12)	(5.12)	(5.12)	(20.76)
$\ln(X)$	-0.554	1.736	1.940	1.940	-0.485
	(29.80)	(5.56)	(6.26)	(6.26)	(24.54)
$[\ln(X)]^2$		-0.128	-0.135	-0.135	
		(7.34)	(7.83)	(7.83)	
LCH	0.107	0.097	0.102		0.112
	(6.75)	(6.20)	(6.70)		(7.27)
BCH	0.126	0.116	0.107		0.117
	(11.16)	(10.27)	(9.61)		(10.53)
CH				0.106	
				(10.45)	
R_2			0.109	0.109	0.111
			(3.50)	(3.51)	(3.55)
R_3			0.276	0.277	0.265
			(10.95)	(10.97)	(10.41)
S_2			-0.041	-0.041	-0.039
			(1.39)	(1.39)	(1.29)
S_3			0.102	0.102	0.110
			(3.43)	(3.43)	(3.63)
S_4			0.059	0.059	0.063
			(2.09)	(2.09)	(2.21)
F	385.05	309.58	162.23	183.00	170.23
R^2	0.259	0.272	0.306	0.306	0.291

(t-ratios in parentheses)

demographic variables in the estimated equation. An appropriate test is a t-test of the form

$$t = (\alpha_1 - \alpha_1^*)/\sqrt{\sigma^2(\alpha_1)} \qquad (38)$$

with 3402 (2891) degrees of freedom in 1974 (1982). α_1^* takes the values of -0.540 in 1974 and -0.566 in 1982. The results of the test are reported in the last columns of Tables 2.1 and 2.2. In the 1974 HES the hypothesis of equal slope coefficients cannot be rejected for any family type. For the relevant subsamples of the 1982 HES it is rejected only in one case out of six. Taking into account these results, it would seem

TABLE 2.4 Engel curve for the foodshare (All two-adult couples, 1982)

Dependent Variable $ln[w_f/(1-w_f)]$
(N=2893)

Equat. No	4.1	4.2	4.3	4.4	4.5
Intercept	4.816	-3.785	-5.915	-5.731	3.669
	(22.99)	(1.57)	(2.61)	(2.52)	(16.49)
ln(X)	-0.580	1.266	1.574	1.535	-0.480
	(25.41)	(2.47)	(3.26)	(3.18)	(20.19)
$[ln(X)]^2$		-0.098	-0.110	-0.108	
		(3.63)	(4.28)	(4.20)	
LCH	0.024	0.017	0.026		0.034
	(1.30)	(0.92)	(1.48)		(1.91)
BCH	0.093	0.089	0.079		0.083
	(7.15)	(6.83)	(6.33)		(6.68)
CH				0.063	
				(5.49)	
R_2			0.261	0.261	0.263
			(7.02)	(7.03)	(7.07)
R_3			0.411	0.417	0.405
			(13.71)	(13.90)	(13.43)
S_2			0.092	0.093	0.094
			(2.80)	(2.82)	(2.85)
S_3			0.161	0.162	0.166
			(5.04)	(5.07)	(5.20)
S_4			0.063	0.065	0.063
			(2.00)	(2.06)	(1.99)
F	267.61	206.50	128.43	143.20	140.26
R^2	0.217	0.221	0.286	0.282	0.280

(t-ratios in parentheses)

legitimate to pool all the observations in both years. The results are given in equations 1.8 and 2.8. In both equations the coefficient of lnX is highly significant and has the expected sign. The proportion of the dependent variable's variation explained by this simple model is higher in the 1974 than in the 1982 sample.

As noted above, the next step is to introduce demographic variables into the analysis. These variables are the numbers of little children (LCH) and big children (BCH) in each HH,[40] so that the estimated model

40. In fact, we started by disaggregating children by sex and age. However, using an F-test, it was found that the coefficients were not significantly different between children of different sex belonging to the same age group.

becomes

$$\ln[w_f/(1-w_f)] = \alpha_0 + \alpha_1 \ln X + \alpha_3 LCH + \alpha_4 BCH \qquad (39)$$

The results are given in equations 3.1 and 4.1 of Tables 2.3 and 2.4 for 1974 and 1982. Comparing equations 1.8 and 2.8 with equations 3.1 and 4.1 it can be noticed that in the latter there is a substantial increase in the explained variation of the dependent variable. The coefficients of the demographic variables are positive indicating, as expected, that the presence of children increases the proportion of the family budget devoted to food. In addition, in both equations the coefficient of BCH is greater than the coefficient of LCH, indicating that big children have heavier food requirements than little children, as one would expect. From a statistical point of view, the coefficient of BCH is in both cases highly significant, but this is not the case for the coefficient of LCH. The latter, although significant in 1974 turns out to be not significant in 1982.

Several studies point out that, at least in the case of foodshare, a three-parameter Engel curve performs significantly better than the relevant two-parameter Engel curve.[41] Accordingly, it was decided to introduce a quadratic term in (39) and estimate the equation

$$\ln[w_f/(1-w_f)] = \alpha_0 + \alpha_1 \ln X + \alpha_2 (\ln X)^2 + \alpha_3 LCH + \alpha_4 BCH \qquad (40)$$

Apart from removing some of the remaining curvature in the relationship between the foodshare and lnX, the introduction of the quadratic term has both an advantage and a disadvantage. The advantage is that the estimated equivalence scales can vary with the expenditure level of the reference HH. This is particularly desirable if it is assumed that there are some fixed costs associated with the presence of children. The disadvantage is that there exists a high degree of correlation between lnX and $(\ln X)^2$ which might violate a basic assumption of Ordinary Least Squares estimation. Hence, this correlation might affect the values of the estimated parameters and their standard errors. Nevertheless, functional form (40) is a popular one for the estimation of Engel curves in the present context.[42] The results are given in equations 3.2 for 1974 and 4.2 for 1982. As expected, in both cases the t-ratios for lnX and $(\ln X)^2$ are relatively "low" (in comparison with the t-ratios of lnX in equations 3.1 and 3.2) indicating, perhaps, the presence of some degree of multicollinearity. However, in both cases the quadratic term is not rejected by the data and it has the expected (negative) sign.

41. See, for example, De Witte and Cramer (1986).

42. See, for example, Deaton (1981a), Deaton et al (1985).

In addition to the quadratic term, it is possible that the goodness of fit of the estimated equations can be improved by introducing some regional and seasonal dummies. Of course, the selection of these dummies is arbitrary, since other dummies such as educational, occupational and so on could also be included.[43] However, it was found that the latter exhibited a relatively high degree of correlation both between each other and with the variables already included (particularly with lnX) and, in addition, their interpretation is not always obvious. It was, therefore, decided not to include them in our analysis. Thus the new estimated equation becomes

$$\ln[w_f/(1-w_f)] = \alpha_0 + \alpha_1 \ln X + \alpha_2(\ln X)^2 + \alpha_3 LCH + \alpha_4 BCH + \Sigma^3_{i=2}\beta_i R_i + \Sigma^4_{i=2}\gamma_i S_i \quad (41)$$

The results of the estimation of (41) are presented in equations 3.3 and 4.3. R_2 and R_3 are, the dummy variables for semi-urban and rural areas, whilst S_2, S_3 and S_4 are dummies for spring, summer and autumn, respectively. With respect to the seasonal dummies, equations 3.3 and 4.3 indicate that, ceteris paribus, a higher proportion of the family budget is devoted to purchases of foodstuffs during summer and autumn vis-a-vis winter. For the spring the evidence of the two surveys differs. According to the same equations, the regional variation in the foodshare appears to be highly significant. In both cases the foodshare appears to be remarkably higher in the rural than in the urban areas at similar levels of total expenditure. The same is true for the semi-urban areas vis-a-vis the urban areas, although to a lesser extent. These findings may indicate that there are marked differences in the expenditure patterns between urban and rural areas of Greece.[44] Apart from differences in tastes, these differences may be due to the relatively fewer spending alternatives available to the rural HHs. Nevertheless, it should also be noted that there exists some (though not a very high) correlation between the regional dummies and lnX, so it can be argued that, to some extent, the former have picked up some of the variation explained by the latter.[45]

Two other attempts to improve the performance of the estimated equations are not reported here. The first was the introduction of multiplicative interaction terms between lnX and the demographic variables. This is potentially important since it can allow the cost of children (and, therefore, the equivalence scales) to vary

43. See, for example, Deaton et al (1985).

44. See, also, Sapounas (1981, 1985).

45. However, note that after the introduction of the seasonal and regional dummies the t-ratios of almost all the existing variables increase, indicating that without the dummies the model may suffer from misspecification.

even more systematically with the level of expenditure. The second was the introduction of the demographic variables in quadratic form and the introduction of a multiplicative interaction term between the demographic variables. These variables have the potential of capturing economies of scale in consumption. Both attempts turned out to be unsuccessful, probably because all the new explanatory variables were highly correlated with the existing variables.

Before moving to the estimation of equivalence scales, we test whether it is legitimate to merge the two demographic categories. Equations 3.4 and 4.4 are identical to equations 3.3 and 4.3 but instead of having children disaggregated by age, there is only one demographic variable, the number of children in the HH (CH). The appropriate test in this case is an F-test of the form

$$F = \{[\Sigma(\varepsilon_R)^2 - \Sigma(\varepsilon_U)^2]/d\}/[\Sigma(\varepsilon_U)^2/(n-k)] \qquad (42)$$

where: $\Sigma(\varepsilon_R)^2$ is the sum of squared residuals of the restricted equation

$\Sigma(\varepsilon_U)^2$ is the sum of squared residuals of the unrestricted equation

d is the number of restrictions

$n-k$ are the degrees of freedom of the unrestricted equation

The F-ratios are 0.06 and 7.65 for 1974 and 1982, respectively. Under the null hypothesis of equal coefficients for LCH and BCH, these are distributed as $F_{1,3295}$ and $F_{1,2884}$. The relevant critical value of the F-distribution at the 1% and 5% levels of significance are 6.63 and 3.84, respectively. Clearly, the null hypothesis cannot be rejected in the case of the 1974 sample, but it is firmly rejected by the data in the case of the 1982 sample. For reasons of symmetry and because it does not sound unreasonable that the cost of a little child is different from the cost of a big child it was decided to retain the two demographic categories and estimate Engel equivalence scales based on equations 3.3 and 4.3.

In order to estimate the Engel equivalence scales, we should equate the foodshare of the reference HH (0) with the foodshare of the HH under examination (h). Assuming that both HHs live in the same region and were interviewed in the same month (that is, ignoring the regional and seasonal dummies) we can go back to (41) and express the above equality as

TABLE 2.5 Engel equivalence scales for the cost of children

Reference Household: Two-adult childless couple = 1.00

Expenditure of the reference household in constant January 1974 prices	*Year and age of the child*			
	1974		*1982*	
	0-5	*6-16*	*0-5*	*6-16*
3000	*0.445*	*0.466*	*0.144*	*0.433*
5000	*0.291*	*0.305*	*0.091*	*0.281*
7000	*0.234*	*0.246*	*0.073*	*0.226*
10000	*0.194*	*0.203*	*0.060*	*0.186*
15000	*0.161*	*0.169*	*0.050*	*0.155*
20000	*0.144*	*0.151*	*0.045*	*0.138*
5876 (median 1974 reference expend.)	*0.261*	*0.273*		
7714 (mean 1974 reference expend.)	*0.222*	*0.232*		
8857 (median 1982 reference expend.)			*0.064*	*0.198*
10832 (mean 1982 reference expend.)			*0.058*	*0.179*

$$\alpha_0 + \alpha_1 \ln X^0 + \alpha_2 (\ln X^0)^2 = \alpha_0 + \alpha_1 \ln X^h + \alpha_2 (\ln X^h)^2 + \alpha_3 LCH + \alpha_4 BCH \Rightarrow$$

$$\alpha_2 (\ln X^h)^2 + \alpha_1 \ln X^h + \alpha_3 LCH + \alpha_4 BCH - [\alpha_1 \ln X^0 + \alpha_2 (\ln X^0)^2] = 0 \qquad (43)$$

For each set of values for X^0, LCH,and BCH (43) has two roots for $\ln X^h$, the larger of which is the one we are interested in.[46] Then, the equivalence scale is simply $\mu^h = X^h/X^0$. The estimated scales are presented in Table 2.5. The reference HH is the two-adult childless couple, so if the figures of Table 2.5 are to be interpreted in terms of "adult equivalents" they should be multiplied by two. Several comments can be made regarding these results. In median expenditure levels, a big child appears to cost 27.3% of the total expenditure of a childless couple in 1974. The relevant figure for 1982 is 19.8%. Although these figures may not seem very close to each other, neither can they be considered to be dramatically different. Note, however, the similarity of the estimated scales for a big child at any given expenditure level for both years. Taking into

46. This is because the ascending part of the Engel curve is an artificial one.

account that the mean expenditure of the reference HHs rose by 40.4% between the two surveys, this similarity could suggest a "nutritionist" approach to the measurement of the cost of children; that is, at any time children have the same needs and the satisfaction of these needs requires a diminishing proportion of their parents' expenditure (or income) as GDP pc increases. A number of authors argue convincingly against this concept of "needs".[47] Against these results, the estimated scales for little children appear to be dramatically different between the two years.[48] If we are prepared to accept Engel's method, a little child's costs were 26.1% of the cost of a childless couple in 1974, but the corresponding figure for 1982 was only 6.4%.

Another interesting feature of the estimated scales is that they drop sharply with the level of reference expenditure. For example, in 1974 the relative costs of a little child in comparison to those of an adult appear to be 80.7% higher for a poor HH (5000 drachmas) than for a rich HH (15000 drachmas). Nevertheless, if we are not prepared to accept that the scales vary with the reference expenditure level, we can drop the quadratic term from (41) and re-estimate equations 3.3 and 4.3, as in equations 3.5 and 4.5. Hence, (43) should be modified to yield

$$\alpha_0 + \alpha_1 \ln X^0 = \alpha_0 + \alpha_1 \ln X^h + \alpha_3 LCH + \alpha_4 BCH \quad \Rightarrow$$

$$X^h/X^0 = \exp\{-(\alpha_3 LCH + \alpha_4 BCH)/\alpha_1\} \qquad (44)$$

Using the estimates of α_1, α_3, and α_4 from 3.5 and 4.5, the cost of a little child is estimated to be 26.0% (7.2%) of the cost of a childless couple in 1974 (1982), whereas the relevant figure for a big child is 27.3% (18.9%). The similarity of these figures with the estimates of the cost of children in median expenditure levels is really striking, particularly for 1974. Further, there appear to be some weak diseconomies of scale in consumption of food which are reflected in the size of the equivalence scales. For example, using the estimates of equation 3.3 (4.3) we can calculate the cost of two little children, two big children and one big plus one little child to be, respectively, 54.7% (12.9%), 57.4% (41.5%) and 56.1% (26.8%) of a childless couple's costs in 1974 (1982) median reference expenditure levels. The small size of these diseconomies of scale can be attributed to the very fact of the use of the foodshare. As McClements (1977, p. 191) notes "there may be economies of scale in housing and durables consumption with increasing family size but no economies

47. For a strong attack to the nutritionist approach to the concept of "needs" see Atkinson (1983) and the discussion of chapter 4.

48. However, it should be remembered that the equivalence scales for the cost of a little child in 1982 are based on a coefficient which was found to be not significantly different from zero.

in the case of food expenditure". As was mentioned earlier, Muellbauer (1977) demonstrates that Engel's rationale for the use of the foodshare as an (inverse) indicator of welfare can be generalized for the use of any budget share and, particularly, for the use of necessities' share in the HH budget. However, an attempt to estimate the Engel model using as dependent variable the budget share of necessities consumed by all the HHs (Food and Housing, Light and Fuel) instead of the foodshare, turned out to be unsuccessful.

Concluding this section, it can be argued that in terms of economic intuition some of the estimated scales seem to be implausibly high.[49] A reasonable explanation for this may be that suggested by Nicholson (1976) mentioned in section 3, that since the foodshare of children is higher than the foodshare of adults and the Engel model compensates according to the HH foodshare it is likely to overstate the cost of children.

8. The estimation of the Rothbarth model of equivalence scales

Although the rationale of the Rothbarth model is very different from that of the Engel model, their estimation procedures are similar. The Rothbarth model is also a single equation model which requires the estimation of the Engel curve for adult goods instead of that for the foodshare. The Rothbarth scales depend to a large extent on the selection of adult goods, which is more or less arbitrary. Deaton et al (1985) propose a method for the selection of these goods based on a series of Wald-tests, which can reduce this arbitrariness somewhat. Although this method is not used here, the group of adult goods of the present work is very similar to that used by Deaton et al (1985), with one exception. In the Spanish HES used by them, some expenditures on entertainment out of home can be classified as adult goods. In the case of the HESs used here, there are no grounds to support such a classification. A detailed description of the group of goods and services classified as adult goods can be found in Appendix I.

Some 69 (78) HHs in 1974 (1982) did not report any expenditures on adult goods. Since some adult goods (such as "adult clothing and footwear") are certainly consumed by all HHs, it was decided to exclude these HHs from the analysis of the present section. Nevertheless, the equivalence scales estimated before and after their exclusion[50] were not substantially different. Among the HHs included in the analysis, the mean

49. Although high in absolute terms, the present Engel scales are relatively lower than the relevant scales estimated by other authors. See, for example, Deaton (1981a).

50. Using a different functional form for the Engel curve of the adult goods than the one used below.

expenditure on adult goods in constant January 1974 prices was 1546.7 (1951.2) drachmas in 1974 (1982) with a standard deviation of 1897.8 (2137.1). The mean budget share of the adult goods was 0.147 in 1974 but only 0.122 in 1982. Taking into account that between 1974 and 1982 the mean total expenditure rose, these figures may imply that the adult goods as a group are necessities, whereas it can be argued that Rothbarth implicitly claims that they should be luxuries. However, the Engel curves for the budget share of the adult goods are upward sloping in both years providing opposite evidence (that is, they are luxuries). Part of this discrepancy may be attributed to changes in the relative prices between adult and other goods between 1974 and 1982.

Although expenditure on adult goods is not a limited dependent variable in the same sense the foodshare is, its fitted value should neither drop below zero nor exceed the total expenditure. After experimenting with several functional forms the following equation

$$\ln X_A = \beta_0 + \beta_1 \ln X \qquad (45)$$

was found to give the best results. (45) is not compatible with (37) or its logistic transformation for the estimation of a complete system of demand equations. However, this is not a serious problem since we are only interested in the estimation of a single equation. More disturbing may be the fact that although (45) guarantees that the fitted value of the expenditure on adult goods cannot be negative at any level of total expenditure, it does not force this value to be less than total expenditure. Nevertheless, it can be easily checked that in the domains of our regressions the estimated Engel curves do not violate the latter condition.

The estimates of the Engel curves for the expenditure on adult goods are reported in Tables 2.6 and 2.7. The values of the t-ratios for the test of the hypothesis that the slope coefficients of the Engel curves of the couples with children are not significantly different from the relevant coefficient of the childless couples, are given in the last column of these Tables. The null hypothesis is rejected only twice in 1974 and once in 1982. Although the evidence is not as clear as in the case of the Engel curve for the foodshare, it was decided that it is, probably, legitimate to pool all the family types. The results of the regressions for the pooled sample are presented in equations 6.8 and 7.8. The model explains between 40% and 45% of the dependent variable's

TABLE 2.6 Engel curves for the expenditure on adult goods of different family types (1974)

Dependent Variable: $\ln(X_A)$

Equat No	Family Type	Intercept (α_0)	ln(X) (α_1)	F	R^2	N	H_0: α_1 = 1.106 t-statistic
6.1	Childless couple	-3.137 (9.70)	1.106 (30.11)	855.31	0.427	1146	
6.2	Couple with one LCH only	-5.155 (5.80)	1.331 (13.99)	265.84	0.430	352	2.37 (Rejected)
6.3	Couple with one BCH only	-3.443 (5.37)	1.155 (16.38)	232.88	0.413	331	0.70 (Not rejected)
6.4	Couple with two LCH only	-3.975 (4.13)	1.189 (11.53)	136.40	0.387	216	0.81 (Not rejected)
6.5	Couple with two BCH only	-4.702 (7.56)	1.269 (18.75)	380.37	0.393	587	2.41 (Rejected)
6.6	Couple with one LCH and one BCH only	-3.439 (3.87)	1.121 (11.53)	147.01	0.253	310	0.15 (Not rejected)
6.7	All other two adult couples	-4.152 (4.47)	1.209 (11.91)	203.72	0.410	293	1.01 (Not rejected)
6.8	All two adult couples	-3.535 (16.02)	1.148 (41.18)	2377.80	0.424	3235	

(t-ratios in parentheses)

variation and, unlike the Engel curve for the foodshare, performs better in 1982 than in 1974.

Once again, the next step is to introduce the two demographic variables. This is done in equations 8.1 and 9.1 of Tables 2.8 and 2.9. Like equations 3.1 and 4.1, all the coefficients of the demographic variables turn out to be statistically significant apart from that of LCH in 1982. In addition, all the significant coefficients have the expected sign (negative), indicating that the satisfaction of children's needs requires the reduction of resources available for the purchases of adult goods. In contrast, the statistically insignificant coefficient of LCH in 1982 is positive, implying that the parents consume more adult goods in the presence of little children![51] Another peculiar result is that in 1974 the coefficient of LCH is, in absolute terms, higher

51. This may be a possibility in Barten's model, but under Rothbarth's assumptions such a case is not possible.

TABLE 2.7 Engel curves for the expenditure on adult goods of different family types (1982)

Dependent Variable: $\ln(X_A)$

Equat No	Family Type	Intercept (α_0)	ln(X) (α_1)	F	R^2	N	H_0: $\alpha_1 = 1.326$ t-statistic
7.1	Childless couple	-5.424 (13.66)	1.326 (30.69)	840.49	0.444	1054	
7.2	Couple with one LCH only	-6.464 (6.79)	1.448 (14.76)	277.41	0.488	291	1.24 (Not rejected)
7.3	Couple with one BCH only	-5.235 (6.48)	1.306 (15.43)	221.78	0.441	281	0.24 (Not rejected)
7.4	Couple with two LCH only	-3.953 (3.83)	1.185 (11.03)	142.69	0.422	195	1.31 (Not rejected)
7.5	Couple with two BCH only	-5.615 (7.30)	1.326 (16.87)	291.41	0.384	466	0.01 (Not rejected)
7.6	Couple with one LCH and one BCH only	-5.590 (4.87)	1.332 (11.29)	134.63	0.388	212	0.05 (Not rejected)
7.7	All other two adult couples	-3.023 (3.25)	1.055 (10.94)	114.39	0.265	316	2.81 (Rejected)
7.8	All two adult couples	-4.980 (19.63)	1.274 (47.78)	2258.40	0.445	2815	

(t-ratios in parentheses)

than the coefficient of BCH, implying that little children have greater needs than big children.

Equations 8.2 and 9.2 introduce a quadratic term with the intention of capturing remaining nonlinearities. In both cases the coefficient of the quadratic term is statistically not significant, although marginally so in 1982. Apart from this, there is a dramatic drop in the t-ratios of lnX, indicating that equations 8.2 and 9.2 probably suffer from multicollinearity. Hence, we have to drop either lnX or $(\ln X)^2$ from the rest of this section's analysis. Using a Davidson-McKinnon (1981) J-test for testing non-nested hypotheses (45) was tested against

$$\ln X_A = \beta_0 + \beta_2(\ln X)^2 \qquad (46)$$

TABLE 2.8 Engel curve for the expenditure on adult goods

(All two-adult couples, 1974)

Dependent Variable $\ln(X_A)$
(N=3235)

Equat. No	*8.1*	*8.2*	*8.3*	*8.4*	*8.5*	*8.6*	*8.7*
Intercept	-3.705	-2.105	1.548	-4.560	1.104	-4.559	1.104
	(16.52)	(0.92)	(13.47)	(19.14)	(8.81)	(19.17)	(8.82)
$\ln(X)$	1.174	0.816		1.263		1.262	
	(46.59)	(1.60)		(48.63)		(48.77)	
$[\ln(X)]^2$		0.020	0.065		0.070		0.070
		(0.71)	(46.68)		(48.49)		(46.80)
LCH	-0.070	-0.068	-0.064	-0.066	-0.060		
	(3.08)	(2.99)	(2.84)	(2.98)	(2.71)		
BCH	-0.045	-0.043	-0.040	-0.059	-0.053		
	(2.74)	(2.61)	(2.43)	(3.64)	(3.27)		
CH						-0.061	-0.055
						(4.23)	(3.82)
R_2				0.272	0.271	0.273	0.271
				(5.91)	(5.88)	(5.94)	(5.90)
R_3				0.349	0.340	0.350	0.341
				(10.07)	(9.79)	(10.14)	(9.86)
S_2				-0.092	-0.090	-0.092	-0.090
				(2.17)	(2.12)	(2.17)	(2.13)
S_3				-0.092	-0.087	-0.092	-0.087
				(2.16)	(2.04)	(2.15)	(2.04)
S_4				-0.081	-0.078	-0.081	-0.078
				(1.97)	(1.91)	(1.97)	(1.90)
F	800.04	600.11	798.56	324.82	323.09	371.32	369.33
R^2	0.426	0.426	0.425	0.445	0.443	0.445	0.444

(t-ratios in parentheses)

for both years, but the results turned out to be inconclusive. Consequently, it was decided to use both (45) and (46). Estimates of the latter are given in equations 8.3 and 9.3. Although (45) seems to perform slightly better in terms of R^2 and F-ratios, in the context of the present analysis (46) has the advantage of allowing the equivalence scales to vary with the reference expenditure level.

Equations 8.4, 8.5 and 9.4, 9.5 introduce the regional and seasonal dummies discussed in the last

TABLE 2.9 Engel curve for the expenditure on adult goods

(All two-adult couples, 1982)

Dependent Variable $\ln(X_A)$ (N=2815)

Equat. No	9.1	9.2	9.3	9.4	9.5	9.6	9.7
Intercept	-5.263	-11.638	0.910	-5.606	0.774	-5.617	0.777
	(20.16)	(4.01)	(6.94)	(19.78)	(5.25)	(19.78)	(5.26)
$\ln(X)$	1.311	2.671		1.353		1.355	
	(46.84)	(4.33)		(45.71)		(45.69)	
$[\ln(X)]^2$		-0.072	0.069		0.071		0.072
		(1.97)	(46.52)		(45.33)		(45.32)
LCH	0.015	0.010	0.021	0.016	0.022		
	(0.68)	(0.45)	(0.95)	(0.69)	(0.95)		
BCH	-0.096	-0.099	-0.093	-0.102	-0.098		
	(5.53)	(5.68)	(5.32)	(5.89)	(5.66)		
CH						-0.067	-0.063
						(4.40)	(4.10)
R_2				0.135	0.133	0.134	0.132
				(2.69)	(2.63)	(2.69)	(2.62)
R_3				0.187	0.180	0.175	0.167
				(4.71)	(4.52)	(4.43)	(4.23)
S_2				-0.153	-0.151	-0.155	-0.153
				(3.38)	(3.32)	(3.40)	(3.35)
S_3				-0.068	-0.066	-0.071	-0.068
				(1.54)	(1.48)	(1.58)	(1.53)
S_4				-0.194	-0.194	-0.198	-0.198
				(4.41)	(4.40)	(4.48)	(4.46)
F	773.80	582.23	765.92	300.87	297.38	338.55	334.41
R^2	0.452	0.452	0.449	0.460	0.457	0.456	0.453

(t-ratios in parentheses)

section. There appears to be some regional variation in the consumption of adult goods, with the HHs from rural and semi-urban areas having higher expenditure on them than the urban HHs at similar levels of total expenditure. This pattern is more profound in 1974. Similarly, there seems to exist some (rather limited) seasonal variation in the expenditure on adult goods, which seems to be lower during the winter. Once more an attempt to introduce interaction terms and quadratic demographic variables failed to operate for the reasons explained in the last section. Further, in the last two columns of Tables 2.8 and 2.9 the two demographic

variables are merged into one (CH), so that the hypothesis of equal coefficients of the two demographic variables can be tested. The values of the F-ratios are 0.09 and 0.07 for 1974, and 20.64 and 21.29 for 1982. Since the relevant critical values of the F-distribution are 3.84 at the 5% level of significance and 6.63 at the 1% level of significance, the null hypothesis cannot be rejected in 1974 but is strongly rejected in 1982.

Using the results of equations 8.4 and 9.4, Rothbarth equivalence scales can be calculated from (45). According to this procedure, the estimated scales do not vary with the level of reference expenditure. For 1974 the cost of a little child appears to be 5.4% of the cost of a childless couple, whilst the relevant figure for a big child is only 4.8%. For 1982 the coefficient of LCH is positive, implying that little children have "negative costs". Clearly this lacks any intuitive appeal and, apart from this, the t-ratio of LCH is unacceptably low. Therefore, Rothbarth equivalence scales for the cost of little children in 1982 are not reported. Equation 9.4 suggests that the cost of a big child in 1982 was equal to 7.8% of the cost of a childless couple. Turning to the estimation of equivalence scales from the equations with the quadratic term, we should go back to (46) and equate the expenditures on adult goods of the reference HH and the HH under examination

$$\beta_0 + \beta_2(\ln X^0)^2 = \beta_0 + \beta_2(\ln X^h)^2 + \beta_3 LCH + \beta_4 BCH \Rightarrow$$

$$X^h = \exp\{[(\ln X^0)^2 - (\beta_3 LCH + \beta_4 BCH)/\beta_2]^{1/2}\} \qquad (47)$$

The equivalence scale is derived by dividing both sides of (47) by the reference expenditure level, X^0. The estimated scales are reported in Table 2.10.

Several comments can be made comparing the equivalence scales of Tables 2.10 and 2.5. As expected, the Rothbarth scales are lower than the Engel scales but, unlike the Engel scales, the Rothbarth scales exhibit very little variation when the reference expenditure level changes. Moreover, unlike the scales reported in Table 2.5, the estimated Rothbarth scales for the cost of big children appear to be higher in 1982 than in 1974, for a given expenditure level. As could be expected, the Rothbarth scales estimated from 8.5 and 9.5 are similar to those estimated from 8.4 and 9.4, with little children appearing to have higher needs than big children in 1974. In addition, some weak diseconomies of scale are also present. For example, according to 8.4 the cost of two little children, two big children, and one big plus one little child are 11.0%, 9.8% and 10.4% of a childless couple's costs, respectively. Similar results can be obtained from 8.5, 9.4 and 9.5, as

TABLE 2.10 Rothbarth equivalence scales for the cost of children

Reference Household: Two-adult childless couple = 1.00

Expenditure of the reference household in constant January 1974 prices	*Year and age of the child*		
	1974		*1982*
	0-5	*6-16*	*6-16*
3000	*0.055*	*0.048*	*0.090*
5000	*0.051*	*0.045*	*0.084*
7000	*0.049*	*0.044*	*0.081*
10000	*0.048*	*0.042*	*0.077*
15000	*0.046*	*0.040*	*0.074*
20000	*0.044*	*0.039*	*0.072*
5876 (median 1974 reference expend.)	*0.050*	*0.044*	
7714 (mean 1974 reference expend.)	*0.049*	*0.043*	
8857 (median 1982 reference expend.)			*0.079*
10832 (mean 1982 reference expend.)			*0.077*

well. In general, the estimated Rothbarth scales appear to be implausibly low. One reason for this can be found in the definition of parental welfare. Parents do not just derive welfare from the consumption of adult goods, as the Rothbarth model assumes, but also from the consumption of goods jointly consumed with their children. Another reason may be that suggested by Cramer (1969) mentioned in section 4, that the group of adult goods is not responsive enough to capture income effects.

9. The estimation of the Barten model of equivalence scales

To commence estimation of the Barten model, we have to select a system of demand equations. For our purposes it was decided to estimate the Barten scales by incorporating demographic effects in the demand equations of the Linear Expenditure System (LES).[52] The LES can be described as follows. The demand

52. See Stone (1954). For a survey of procedures of incorporating demographic variables into complete demand equations systems, see Pollak and Wales (1981).

equations for each of the n commodities (or commodity groups) are given by (i=1 ... n)

$$p_iq_i = p_i\alpha_i + \beta_i(X-\Sigma_i p_i\alpha_i) \quad (48)$$

with $\Sigma_i\beta_i=1$,

the direct utility function is

$$U(\mathbf{q}) = \Pi_i(q_i-\alpha_i)^{\beta i} \quad (49)$$

the indirect utility function is

$$V(X, \mathbf{p}) = (X-\Sigma_i p_i\alpha_i)/\Pi_i p_i^{\beta i} \quad (50)$$

and the cost function is

$$c(u, \mathbf{p}) = \Sigma_i p_i\alpha_i + U\Pi_i p_i^{\beta i} \quad (51)$$

The α_is of the LES are usually interpreted as the minimum required or "subsistence" quantities. However, this interpretation collapses if one or more of the α_is are negative (unless the commodities corresponding to negative a_is are regarded as "inessential commodities"). Nevertheless, if the α_is are positive, the demand equations have a simple interpretation. The HH buys first the subsistence quantities of all commodities and the residual "supernumerary" expenditure, $X-\Sigma_i p_i\alpha_i$, is allocated between commodities in the fixed proportions β_is (marginal budget shares).[53] Therefore, apart from the subsistence expenditure $\Sigma_i p_i\alpha_i$, total expenditure is divided in a constant pattern between commodities. Similarly, in the cost function (51) the first term, $\Sigma_i p_i\alpha_i$, can be interpreted as a "fixed cost" which does not allow any substitution between commodities, whereas the second term, $U\Pi_i p_i^{\beta i}$, indicates that utility can be "bought" at a constant price per unit. Turning to the utility functions (49) and (50), it can be noted that both imply that utility is derived from the supernumerary consumption only (not from the subsistence consumption). In addition, the indirect utility function indicates that the supernumerary expenditure should be deflated using a weighted geometric mean of prices.

In comparison with other complete systems of demand equations, the LES has the important advantage of containing relatively few parameters to be estimated. Taking into account the large size of the

53. Although the terms "subsistence" and "supernumerary" are used in the rest of this section's analysis, this terminology is theoretically correct only in special circumstances.

sample (6197 observations) and that the method of estimation is Maximum Likelihood, the use of another system of demand equations could make the estimation very expensive and the convergence to a global maximum very difficult. Apart from this, the LES has the advantage that it requires little price variation for the identification of its parameters. Nevertheless, the LES is known to have some disadvantages too. It is derived by algebraically imposing theoretical restrictions (adding up, homogeneity and symmetry) on a particular functional form and, as a result, these restrictions cannot be statistically tested. In addition, its cost function, (51), is concave only if all the β_is are non-negative and the total expenditure X is greater than the subsistence expenditure $\Sigma p_i\alpha_i$ (that is $\alpha_i<q_i$ for each and every commodity). Otherwise the cost function is not concave, so it cannot be derived from constrained utility maximization. Further, it can be shown that, in comparison with other systems, the LES is relatively restrictive in price responses.[54] Therefore, it is not very good for the estimation of price elasticities and if concavity is to hold, every commodity must be a substitute for every other commodity. However restrictive, the latter condition is not a serious problem in the level of commodity-aggregation used in the present work.[55]

As mentioned in section 5, the Barten model assumes that the presence of children affects the relative prices for the parents. Therefore, we can start by modifying the LES in the way suggested by Parks and Barten (1973),[56] by replacing $p_i\alpha_i$ by $p_i\mu_i\alpha_i$. It should be noted that in the case of the LES the modification of the Barten model suggested by Gorman (1976) is equivalent to the original Barten (1964) model (the demand equations to be estimated are exactly the same). Following Muellbauer (1977), we begin by introducing a single demographic variable, the number of children in the HH (CH), so that

$$p_i\mu_i\alpha_i = p_i\alpha_i(1+\psi_i CH) \qquad (52)$$

μ_i can be interpreted as the commodity-specific equivalence scale for commodity i and, after defining $\alpha_i^*=\alpha_i\psi_i$, equations (48)-(51) become

$$p_iq_i = p_i(\alpha_i+\alpha_i^*CH) + \beta_i[X-\Sigma_i p_i(\alpha_i+\alpha_i^*CH)] \qquad (53)$$

$$U(\mathbf{q}, z) = \Pi_i[q_i-(\alpha_i+\alpha_i^*CH)]^{\beta i} \qquad (54)$$

54. See Deaton (1974).

55. For good surveys of and comparisons between systems of demand equations see Brown and Deaton (1972) and Barten (1977).

56. See also Pollak and Wales (1978).

$$V(X, \mathbf{p}, z) = [X-\Sigma_i p_i(\alpha_i+\alpha_i^*CH)]/\Pi_i p_i^{\beta i} \quad (55)$$

$$c(u,\mathbf{p},z) = \Sigma_i p_i(\alpha_i+\alpha_i^*CH) + U\Pi_i p_i^{\beta i} \quad (56)$$

It can be noted that the specification of the commodity-specific equivalence scale

$$\mu_i = 1 + \alpha_i^*CH/\alpha_i \quad (57)$$

not only ignores age differences between children, but also enforces the marginal effect on μ_i of an extra child to be independent of the existence of other children in the HH.

The general equivalence scale is given by the ratio of the cost function of the HH under examination over the cost function of the reference HH (CH=0) at the utility level of the reference HH. After replacing the direct by the indirect utility in the cost function, the general equivalence scale is given by

$$\mu = \frac{c(u^0, \mathbf{p}^*)}{c(u^0, \mathbf{p}^0)} = \frac{\Sigma_i p_i(\alpha_i+\alpha_i^*CH) + [(X^0-\Sigma_i p_i\alpha_i)/\Pi_i p_i^{\beta i}]\Pi_i p_i^{\beta i}}{\Sigma_i p_i\alpha_i + [(X^0-\Sigma_i p_i\alpha_i)/\Pi_i p_i^{\beta i}]\Pi_i p_i^{\beta i}}$$

$$= 1 + (\Sigma_i p_i\alpha_i^*CH)/X^0 \quad (58)$$

At a practical level, there are some problems associated with (58). As Pollak and Wales (1981) point out, the usual interpretation of this version of the Barten model is that it allows the subsistence parameters of a demand system to depend on demographic variables. This implies that a child has some needs, which correspond to some fixed costs $\Sigma_i p_i\alpha_i^*$ at any level of total expenditure. This is quite legitimate for a given year but if we accept that needs is a social concept, these costs should vary in different circumstances. Moreover, in order to estimate the Barten model some variation in relative prices is required and since within a given year relative prices vary very little, more than one HES have to be used.[57] Between 1974 and 1982 the median expenditure of the reference HH (two adult childless couple) rose quite substantially (by 50.7%).[58] Accordingly, one would expect these fixed costs to be higher in 1982 than in 1974. However, our model rules out, a priori, such a possibility. Therefore, it can be asked what is the "proper" expenditure level to which this

57. An attempt to estimate the LES with demographics for 1974 and 1982 separately, failed due to singularities.
58. The relevant increase in the mean expenditure level of the reference HHs is less dramatic, 40.4%.

$\Sigma_i p_i \alpha_i^*$ corresponds. In our opinion this should be the median expenditure level of all the reference HHs at reference (January 1974) prices, that is 7196 drachmas.

Nine commodity groups have been used for the estimation of the Barten model, to accord with the nine monthly price indices which are components of the Retail Price Index published by the NSSG. All prices were indexed to January 1974. As noted earlier, expenditures on home improvements and purchases of means of transportation are excluded from the analysis. In addition, some reclassification of goods and services was required to harmonize the content of the nine groups in both HESs.[59] We start by estimating the parameters of the nine demand equations (53). The method of estimation is Non-Linear Full Information Maximum Likelihood. The computations were performed using the NLFIML program written by Deaton (1981b). To ensure that the results correspond to the global (not local) optimum, the program was run using several alternative sets of starting values. The results are reported in Table 2.11.

It is useful to start the discussion of these results by comparing them with the results of the estimation of the LES without demographics shown in Appendix III. Only two of the new explanatory variables (α_i^*s) turn out to be statistically significant. In addition, after the introduction of the new variables, five of the α_is do not retain their significance and most of the asymptotic t-ratios of the β_is decline marginally. The joint significance of the new variables can be tested using the likelihood ratio test. The likelihood ratio test statistic is asymptotically χ^2-distributed with 9 degrees of freedom. Since there is a difference of 307.5 between the double log likelihoods before and after the inclusion of the variables and the relevant critical point at the 1% level is 21.7, the null hypothesis that the new explanatory variables are not jointly significant must be rejected.

All the β_is have the expected (positive) signs and all but one of the α_is and the α_i^*s are also positive. Note, however, the decline in the values of the α_is after the introduction of the demographic variables. This decline can be considered to be consistent with the interpretation of the α_is as "subsistence quantities". The α_is of Appendix III are the subsistence quantities of all the HHs in the sample, while those of Table 2.11 are the subsistence quantities of the two adult childless couples only. Naturally, the latter should be lower than the former. The positive signs of all the α_i^*s imply that the presence of children increases the needs of the HH for

59. These reclassifications are reported in Appendix II. The nine commodity groups are those used in chapter 1 for the comparison of HESs and National Accounts estimates.

TABLE 2.11 Parameter estimates of the LES with demographics, ignoring children's age differences (N=6197)

Commodity Group	β_i	α_i	α_i^*
Food	0.191	2498.1	833.2
	(60.21)	(7.18)	(2.87)
Alcohol and Tobacco	0.014	334.8	67.2
	(22.34)	(8.93)	(2.19)
Clothing and Footwear	0.161	198.0	474.4
	(58.92)	(0.62)	(1.78)
Housing, Light and Fuel	0.108	1623.5	343.3
	(60.07)	(7.57)	(1.93)
Durable goods	0.161	250.0	344.3
	(60.51)	(0.66)	(1.08)
Personal and Medical Care	0.084	127.1	156.1
	(37.28)	(0.84)	(1.25)
Education and Recreation	0.110	-106.2	329.0
	(55.64)	(0.50)	(1.87)
Transport and Communications	0.119	224.9	342.7
	(56.08)	(0.83)	(1.51)
Other goods and services	0.053	34.7	50.1
	(34.37)	(0.47)	(0.81)
2*log likelihood -479760.3			

(t-ratios in parentheses)

all commodity groups.[60] The Barten-Gorman explanation is that these increases should be attributed not only to children's needs but also to changes in the relative prices faced by the parents. These changes cause substitution away from goods consumed by children and make the commodities consumed exclusively by adults relatively cheaper. The latter can, probably, explain the positive sign of the α_i^* associated with Alcohol and Tobacco. Note also that since the amount of supernumerary expenditure is relatively high, the LES implies that the behaviour of a large proportion of the HHs in the sample is not the result of constrained utility maximization.

Taking into account the magnitude of both the α_is and the α_i^*s and the statistical insignificance of most of them, it was decided to avoid the calculation of commodity-specific equivalence scales. The only

60. This is not necessarily true for each particular commodity as well.

commodity groups for which both the α_i and the α_i^* are significant at the 5% level are Food, Alcohol and Tobacco, and Housing, Light and Fuel.[61] The commodity-specific equivalence scales for these groups are 1.334, 1.201, and 1.211, respectively. These estimates seem to be high in comparison with the relevant estimates reported by other authors.[62] If we are prepared to accept the results of Table 2.11, the cost of a child, $\Sigma_i p_i \alpha_i^*$, is 2940.3 drachmas at reference prices.[63] The general equivalence scale associated with this figure at different expenditure levels of the reference HH are reported in the first column of Table 2.15. The substantial drop in the size of the scale as the reference expenditure level rises is a consequence of the definition of the general equivalence scale. However, the size of the scale at median expenditure levels seems implausibly high. It implies that a child costs as much as 81.8% of an adult's costs. This estimate is substantially higher than the corresponding estimates of Barten scales reported elsewhere.[64]

Taking into account the implausibly high value of the general scale and the fact that most of the α_is are not significantly different from zero, it was decided to modify the basic model. In the first modification, instead of introducing a single demographic variable, children are disaggregate by age, so that (52) becomes

$$p_i\mu_i\alpha_i = p_i\alpha_i(1+\psi_{1i}LCH+\psi_{2i}BCH) \qquad (59)$$

Similarly, we can define $\alpha_{1i}=\psi_{1i}\alpha_i$ and $\alpha_{2i}=\psi_{2i}\alpha_i$ and replace α_i^*CH by $(\alpha_{1i}LCH+\alpha_{2i}BCH)$ in equations (53)-(56). The estimated demand equations, then, become

$$p_iq_i = p_i(\alpha_i+\alpha_{1i}LCH+\alpha_{2i}BCH) + \beta_i[X-\Sigma_i p_i(\alpha_i+\alpha_{1i}LCH+\alpha_{2i}BCH)] \qquad (60)$$

The results of the estimation of these equations are reported in Table 2.12. Although the new β_is are similar to those of Table 2.11 in terms of magnitude and t-ratios, the new α_is are similar to those of Appendix III.[65] The coefficients of the demographic variables are disappointing. Only three of the α_{1i}s and one of the α_{2i}s turn out to be statistically significant at the 5% level. In addition, all the α_{1i}s and four of the α_{2i}s are

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61. More precisely, the α_i^* for Housing, Light and Fuel just fails to be significant at the 5% level.

62. See, for example, Muellbauer (1977).

63. Once again, it should be stressed that most of the α_i^*s are not significantly different from zero.

64. See section 5 of this chapter for references.

65. To ensure that the results of Tables 2.11, 2.12 and Appendix III (which seem to be incompatible with each other) do not suffer from faulty programing or local optima, the computer programs used were checked carefully several times and different combinations of starting values were tried. Whenever the convergence criterion of the program was satisfied the final values of the parameters were very close to those reported in the above tables.

TABLE 2.12 Parameter estimates of the LES with demographics, disaggregating children by age (N=6197)

Commodity Group	β_i	α_i	α_{1i}	α_{2i}
Food	0.192	3163.7	-272.3	444.8
	(60.70)	(12.01)	(0.97)	(1.97)
Alcohol and Tobacco	0.014	400.2	-3.4	9.1
	(22.19)	(13.98)	(0.11)	(0.38)
Clothing and Footwear	0.161	803.3	-475.1	91.9
	(59.01)	(3.36)	(1.85)	(0.44)
Housing, Light and Fuel	0.107	2015.1	-147.5	30.5
	(60.16)	(12.37)	(0.86)	(0.22)
Durable goods	0.161	963.8	-654.7	-166.4
	(60.57)	(3.37)	(2.15)	(0.68)
Personal and Medical Care	0.084	396.9	-141.0	-82.8
	(37.13)	(3.45)	(1.16)	(0.85)
Education and Recreation	0.110	304.7	-479.8	159.0
	(56.46)	(1.88)	(2.87)	(1.15)
Transport and Communications	0.119	725.5	-391.2	-38.4
	(55.90)	(3.51)	(1.46)	(0.22)
Other goods and services	0.053	172.5	-151.7	-45.0
	(34.37)	(3.05)	(2.51)	(0.93)
2*log likelihood -479612.6				

(t-ratios in parentheses)

negative, suggesting that the cost of a little child is negative and that of a big child only marginally positive.[66] In view of these results it was decided to avoid calculating general or specific equivalence scales. Nevertheless, from the point of view of demand analysis, the results of Table 2.12 constitute an improvement over the results of Table 2.11. The double log likelihood increased by 147.7, indicating that it is not legitimate to merge all the children of each HH into one demographic group.

The second modification of the basic model attempted here can be thought of as an extension of Gorman's modification of the Barten model. What it suggests is that in addition to the fixed costs associated with the presence of children in the HH, parents may change their consumption patterns, while remaining at

66. Negative coefficients of demographic variables are not unusual in similar studies; see, for example, Pollak and Wales (1978). See also the study of Muellbauer and Pashardes reported in Ray (1983, 1986) which found the cost of a child to be enormously negative.

TABLE 2.13 Parameter estimates of the LES with demographics, ignoring children's age differences (N=6197)

Commodity Group	α_i	β_i^*	α_i	α_i^*
Food	0.184	0.0054	2835.1	461.6
	(35.77)	(1.86)	(15.37)	(6.93)
Alcohol and Tobacco	0.017	-0.0025	349.2	47.8
	(17.25)	(4.38)	(13.33)	(4.88)
Clothing and Footwear	0.157	0.0025	496.0	144.7
	(35.60)	(1.02)	(2.92)	(2.39)
Housing, Light and Fuel	0.118	-0.0078	1768.4	172.2
	(40.93)	(4.80)	(13.68)	(4.44)
Durable goods	0.169	-0.0058	553.1	1.5
	(39.35)	(2.39)	(2.59)	(0.01)
Personal and Medical Care	0.065	0.0138	329.1	-26.2
	(37.13)	(3.45)	(1.16)	(0.85)
Education and Recreation	0.087	0.0165	170.5	37.3
	(27.25)	(9.28)	(1.79)	(0.80)
Transport and Communications	0.126	-0.0054	431.7	104.7
	(36.82)	(2.79)	(2.72)	(2.08)
Other goods and services	0.076	-0.0169	33.0	39.2
	(31.12)	(12.31)	(0.57)	(2.15)
2*log likelihood -479473.1				

(t-ratios in parentheses)

the same utility level. For example, in the presence of children parents may substitute expenditure on durables (videos, televisions) for expenditure on entertainment out of house (meals in restaurants) without changing their welfare level. In the context of the LES this can be done by allowing the size of the β_is to vary with the number of children in the HH. Therefore, the demand equations (53) can be modified to

$$p_i q_i = p_i(\alpha_i+\alpha_i^*CH) + (\beta_i+\beta_i^*CH)[X-\Sigma_i p_i(\alpha_i+\alpha_i^*CH)] \qquad (61)$$

with $\Sigma_i\beta_i=1$ and $\Sigma_i\beta_i^*=0$.

Similarly, β_i should be replaced by $\beta_i+\beta_i^*CH$ in equations (54), (55), (56). The fact that $\Sigma_i\beta_i^*=0$ guarantees that the sum of the marginal budget shares is equal to one for each HH. The results of the estimation of these demand equations are reported in Table 2.13.

Comparing these results with the results of Table 2.11 it can be noted that although all the β_is remain highly significant, their t-ratios are reduced, sometimes substantially. Further, all but two of the α_is turn out to be statistically significant and are all positive. Among the parameters of the demographic variables only two of the β_i^*s and three of the α_i^*s fail to be significant at the 5% level. So, at first sight, the introduction of the β_i^*s seems to substantially improve the results. This can be confirmed with a χ^2-test for the joint significance of the new explanatory variables. The increase in the double log likelihood is 287.2, whereas the critical point of the χ^2-distribution with 8 degrees of freedom at the 1% level of significance is 20.1.[67]

With the respecification the general equivalence scale is now

$$\mu = \frac{\Sigma_i p_i(\alpha_i+\alpha_i^* CH) + [(X^0-\Sigma_i p_i\alpha_i)/\Pi_i p_i^{(\beta i+\beta i^* CH)}]\Pi_i p_i^{\beta i}}{\Sigma_i p_i\alpha_i + [(X^0-\Sigma_i p_i ai)/\Pi_i p_i^{\beta i}]\Pi_i p_i^{\beta i}}$$

$$= \frac{\Sigma_i p_i(\alpha_i+\alpha_i^* CH) + (X^0-\Sigma_i p_i\alpha_i)/\Pi_i p_i^{\beta i^* CH}}{X^0} \qquad (62)$$

Since the reference prices are equal to one, $\Pi_i p_i^{\beta i^* CH}$ for the reference period is equal to one and, hence, the general equivalence scale remains equal to $1+\Sigma_i p_i\alpha_i^* CH/X^0$.

The parameter estimates of Table 2.13 imply that the cost of a child, $\Sigma_i p_i\alpha_i^*$, is equal to 982.8 drachmas at reference prices. The general scales associated with this figure for different expenditure levels of the reference HH are shown in column II of Table 2.15. Note that the estimated equivalence scale for a HH with one child in median reference expenditure levels is 1.137, which is not very different from the Barten scales estimated by other authors. It is not very clear whether the ratio $(\alpha_i+\alpha_i^*)/\alpha_i$ can be interpreted as a commodity-specific equivalence scale. However, if we are prepared to accept such an interpretation, the estimated commodity-specific scales for these commodity-groups for which both the α_i and the α_i^* are statistically significant have a reasonable size. They are 1.163 for Food, 1.137 for Alcohol and Tobacco, 1.292 for Clothing and Footwear, 1.097 for Housing, Light and Fuel and 1.243 for Transport and Communications.

The final version of the Barten model to be estimated here allows the marginal budget shares to vary

67. Only eight of the β_i^*s are independent since $\Sigma_i\beta_i^*=0$.

TABLE 2.14 Parameter estimates of the modified LES with demographics, disaggregating children by age (N=6197)

Commodity Group	β_i	β_{1i}	β_{2i}	α_i	α_{1i}	α_{2i}
Food	0.186	0.0002	0.0067	2863.0	199.5	548.7
	(36.56)	(0.04)	(2.10)	(15.41)	(1.98)	(8.59)
Alcohol	0.017	-0.0032	-0.0022	348.5	70.0	36.5
and Tobacco	(17.56)	(3.78)	(3.61)	(13.23)	(4.27)	(3.53)
Clothing	0.157	0.0061	0.0014	527.5	100.4	215.7
and Footwear	(35.72)	(1.59)	(0.52)	(3.12)	(1.05)	(3.82)
Housing, Light	0.118	-0.0173	-0.0035	1772.0	267.1	121.9
and Fuel	(41.33)	(6.96)	(1.93)	(13.63)	(4.53)	(3.22)
Durable goods	0.168	0.0104	-0.0127	582.9	-293.1	79.4
	(39.45)	(2.84)	(4.80)	(2.71)	(2.49)	(1.26)
Personal and	0.063	0.0360	0.0044	337.8	-41.6	-20.8
Medical Care	(17.61)	(11.55)	(1.96)	(5.00)	(2.85)	(0.67)
Education and	0.090	-0.0181	0.0312	182.6	20.1	57.7
Recreation	(29.35)	(6.83)	(16.23)	(1.86)	(0.37)	(1.00)
Transport and	0.126	-0.0088	-0.0037	440.6	110.7	86.4
Communications	(37.00)	(2.98)	(1.74)	(2.77)	(1.43)	(1.78)
Other goods	0.075	-0.0053	-0.0216	42.9	-61.4	69.5
and services	(31.20)	(2.51)	(14.28)	(0.74)	(2.22)	(3.44)
2*log likelihood	-478657.8					

(t-ratios in parentheses)

with HH composition and, in addition, disaggregates children by age. Therefore, equations (61) become

$$p_iq_i = p_i(\alpha_i+\alpha_{1i}LCH+\alpha_{2i}BCH)+(\beta_i+\beta_{1i}LCH+\beta_{2i}BCH)[X-\Sigma_i p_i(\alpha_i+\alpha_{1i}LCH+\alpha_{2i}BCH)] \quad (63)$$

with $\Sigma_i\beta_i=1$ and $\Sigma_i\beta_{1i}=\Sigma_i\beta_{2i}=0$.

The cost function and the utility functions are also modified in a similar way. The parameter estimates of the demand equations (63) are presented in Table 2.14.

From a statistical point of view the results of Table 2.14 should be compared with those of Table 2.13. The double log likelihood increased by 815.3, whereas the critical value of the χ^2-distribution with 17 degrees of freedom at the 1% level of significance is 33.4; another confirmation that it is improper to merge all the children in one demographic group. Most of the coefficients of the demographic variables (α_{1i}s, α_{2i}s, β_{1i}s,

TABLE 2.15 Barten equivalence scales for the cost of children

Reference Household: Two-adult childless couple = 1.00

Expenditure of the reference household in constant January 1974 prices	*Age of the child*			
	0-16	*0-16*	*0-5*	*6-16*
(From Table:	*2.11*	*2.13*	*2.14*	*2.14)*
3000	*0.980*	*0.328*	*0.124*	*0.398*
5000	*0.588*	*0.179*	*0.074*	*0.239*
7000	*0.420*	*0.140*	*0.053*	*0.171*
10000	*0.294*	*0.098*	*0.037*	*0.120*
15000	*0.196*	*0.066*	*0.025*	*0.080*
20000	*0.147*	*0.049*	*0.019*	*0.060*
7196 (median reference expenditure)	*0.409*	*0.137*	*0.052*	*0.166*
9221 (mean reference expenditure)	*0.319*	*0.107*	*0.040*	*0.129*

β_{2i}s) turn out to be statistically significant and most of the α_{1i}s and α_{2i}s are positive. It is interesting to consider the impact of the presence of children on the consumption patterns of the HH. In the case of three commodity groups (Alcohol and Tobacco, Housing, Light and Fuel and Transport and Communications) the presence of children increases the subsistence quantities demanded by the HH but reduces the HH's marginal propensity to consume the commodities of these groups. For two other groups (Food, Clothing and Footwear) the presence of children causes an increase in both the subsistence quantities and the marginal propensity to consume these commodities. In the case of Personal and Medical care the size of the marginal budget share increases but the subsistence quantity demanded declines. For the rest of the commodity groups the effects depend on the age of the children.

The fixed cost associated with the presence of a little child in the HH, $\Sigma_i p_i \alpha_{1i}$, according to the results of Table 2.14, is only 371.7 drachmas at January 1974 prices. The corresponding figure for a big child is 1195.0 drachmas. The general equivalence scales derived from these figures for different levels of reference consumption expenditure are reported in the last two columns of Table 2.15. Although the general equivalence

TABLE 2.16 Commodity-specific equivalence scales for the cost of one child

Reference Household: Two adult childless couple = 1.000

Commodity Group	Couple with only one child, aged 0-5 years	Couple with only one child, aged 6-16 years
Food	1.070	1.192
Alcohol and Tobacco	1.201	1.104
Clothing and Footwear	1.190b	1.409
Housing, Light and Fuel	1.151	1.069
Durable goods	0.497	1.136c
Personal and Medical Care	0.877	0.938c
Education and Recreation	1.110ab	1.316ac
Transport and Communicat.	1.251b	1.196c
Other goods and services	(negative)a	2.620a

a Derived from a statistically not significant α_i
b Derived from a statistically not significant α_{1i}
c Derived from a statistically not significant α_{2i}

scale for a big child is of reasonable size, the general equivalence scale for a little child seems rather low. The commodity-specific equivalence scales corresponding to the results of Table 2.14 are given in Table 2.16.[68] Only three of these commodity-specific scales seem to be implausible: the scale for Durable goods in the case of little children and both the scales for Other goods and services. For the latter the explanation may be that the α_i of Table 2.14 for Other goods and services turns out to be highly insignificant. For the former there is no obvious explanation. Among the other commodity groups, only for Personal and Medical care do the needs of the HH obviously decrease in the presence of children. One possible explanation for this may be that the two adult childless couples include a large number of old age childless couples who have relatively high needs for Medical care and, therefore, "artificially" increase the value of the α_i for this commodity group. Hence, the negative α_{1i} and α_{2i} may partially reflect the lower needs for Personal and Medical care of younger

68. It should be mentioned again that it is not clear whether the expressions $(\alpha_i+\alpha_{1i})/\alpha_i$ and $(\alpha_i+\alpha_{2i})/\alpha_i$ can be given the interpretation of commodity-specific scales. This ambiguity is due to the fact that in demand equations (63) the demographic variables affect not only the relative prices but the marginal propensities to consume, as well.

parents in comparison with the needs of older childless couples.[69]

Recapitulating, it can be noted that in terms of economic intuition the estimated general equivalence scales of this section, at median reference expenditure levels, seem low. Nevertheless, they are in line with the relevant scales obtained by other authors who have estimated the Barten model. In the context of the present work the low values of the equivalence scales can be attributed to several factors, including the following:

a) Despite its advantages, which have been mentioned earlier, the LES might not be an appropriate system of demand equations for the purposes of the present study. Note, in particular, that for a large proportion of the sample total expenditure is lower than the estimated subsistence expenditure. Hence, according to the LES, their expenditure patterns are not consistent with constrained utility maximization. Further, the LES assumption of linear Engel curves, might be considered as very restrictive.[70]

b) It is possible that the demographic variables affect the parameter estimates of the LES non-linearly rather than linearly.

c) Finally, of course, the Barten hypothesis itself may be wrong.

From a different viewpoint, our results indicate that the introduction of demographic variables in complete demand equation systems can greatly improve their performance.[71]

10. Conclusions

The equivalence scales for the cost of children estimated in this chapter seem to vary substantially across models. The Engel scales are generally higher than the Rothbarth scales, while the Barten scales lie somewhere in between. Although the use of different functional forms or systems of demand equations could have produced different estimates, the difference in the size of the estimated scales should be attributed mainly to the welfare-identifying assumptions of the models.

Until now there have been no estimates of equivalence scales for the cost of children in Greece.

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69. The high value of β_{1i} for Personal and Medical care suggests that the marginal propensity to consume the goods and services included in this commodity group depends heavily on the number of little children in the HH.

70. Although this assumption is partially relaxed in the last part of this section, it remains intact for homogeneous groups of HHs.

71. The difference in the estimated double log likelihoods of Appendix III and Table 2.14 is 1410.0 compared with the critical value of the χ^2-distribution with 34 degrees of freedom which is only 56.0.

Among the studies surveyed in chapter 1, only Pashardes (1980a, 1980b), Athanasiou (1984) and Kanellopoulos (1986) take into account differences in needs between children and adults. Pashardes uses the equivalence scales of the 1971 U.K. Supplementary Benefits Commission: a couple is set to be equal to one, every extra adult equal to 0.55, every child under 5 equal to 0.14 and every child between 6 and 13 equal to 0.22.[72] Athanasiou assigns the value of one to each person aged over 16 and the value of 0.40 to each person below this age. Kanellopoulos does not distinguish between adults and children, but assigns the value of one to the HH head and the value of 0.7 to each additional HH member.[73]

The question can be posited whether the empirical findings of this chapter can be used for adjusting the distribution of consumption expenditure. In answering this question, it should be kept in mind that equivalence scales are used in order to make comparisons between HHs of different size and composition but, ultimately, welfare comparisons must be based on the welfare levels of persons, not HHs. The equivalence scales estimated in this chapter tell us about the effects of children on the welfare of their parents, but they do not tell us about the welfare of the children themselves. In addition, such aspects as potential economies of scale in consumption due to the presence of additional adults in the HH have not been examined here. However, it would be rather nihilistic to say that because of these deficiencies we should not take into account any differences in needs between adults and children. In our opinion, the findings of this chapter indicate what the approximate size of the equivalence scales should be, at least in the case of big children.

Before deciding on the size of the equivalence scales to be used in this study, two more decisions need to be made. The first is whether different scales should be used for little and big children. Although the empirical evidence of sections 7, 8, and 9 is not always clear, it seems to suggest that little children have different needs from big children. It was, therefore, decided to assign different values to the respective equivalence scales. The second is whether the equivalence scales should vary with the welfare level, that is whether a child costs proportionally more to a poor than to a rich family (or vice versa). As noted earlier, this seems to be plausible if it is assumed that either all or some of the costs associated with the presence of a child

72. Note that these scales imply economies of scale when moving from the one adult-no children HH to the two adult-no children HH, but diseconomies of scale when moving from the latter to the three adult-no children HH.

73. As noted in chapter 1, Kanellopoulos (1986) uses these scales only in the part of his work related to inequality.

TABLE 2.17 Crosstabulation of deciles of individuals ranked by per capita and per equivalent adult expenditure (1974)

Deciles of individuals ranked by per equivalent adult expenditure	Deciles of individuals ranked by per capita expenditure									
	1	2	3	4	5	6	7	8	9	10
1	80.4	19.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	18.5	46.5	31.4	3.6	0.0	0.0	0.0	0.0	0.0	0.0
3	1.0	28.3	29.8	30.3	10.7	0.0	0.0	0.0	0.0	0.0
4	0.1	5.2	28.7	26.8	25.4	13.9	0.0	0.0	0.0	0.0
5	0.1	0.4	8.2	28.7	22.4	27.4	12.9	0.0	0.0	0.0
6	0.0	0.0	1.7	9.8	31.2	23.2	25.8	8.4	0.0	0.0
7	0.0	0.0	0.2	0.8	10.1	29.1	23.7	34.6	1.5	0.0
8	0.0	0.0	0.0	0.1	0.4	6.3	32.4	27.9	33.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.2	5.1	28.6	44.6	21.5
10	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6	20.9	78.5

in the HH are fixed costs. Although our empirical results do not seem to reject such an idea,[74] it was decided to use uniform equivalence scales for all the HHs. Otherwise, on top of the arbitrariness of the selection of a figure for the value of the equivalence scale additional arbitrariness would be introduced for defining what is a "poor" or a "rich" HH and what is the cost of a child for these HHs.

Taking into account the above factors, the empirical findings of this chapter and the size of the equivalence scales used in similar studies, both for Greece and for other countries, it was decided to assign the value of one to each adult, the value of 0.25 to each child aged less than 6 and the value of 0.40 to each child in the age bracket 6 to 16.[75] The size of the equivalence scale for big children seems to be easily defensible on the basis of the empirical results of this chapter. This is not equally true for the figure assigned to the equivalence scale for little children. The estimates of the cost of little children derived in this chapter seem to

74. The evidence from the estimates of the Barten model is not "real evidence" because in that case the general equivalence scale is forced to vary substantially with the welfare level by definition.

75. These scales are not dramatically different from the relevant scales of Pashardes (1980a, 1980b) and Athanasiou (1984), but they differ substantially from those of Kanellopoulos (1986).

TABLE 2.18 Crosstabulation of deciles of individuals ranked by per capita and per equivalent adult expenditure (1982)

Deciles of individuals ranked by per equivalent adult expenditure	Deciles of individuals ranked by per capita expenditure									
	1	2	3	4	5	6	7	8	9	10
1	75.2	24.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	22.7	36.7	31.0	9.5	0.0	0.0	0.0	0.0	0.0	0.0
3	2.1	28.3	31.3	22.5	15.8	0.0	0.0	0.0	0.0	0.0
4	0.0	9.8	23.4	28.4	21.2	17.3	0.0	0.0	0.0	0.0
5	0.0	0.5	12.2	23.4	19.2	24.9	19.9	0.0	0.0	0.0
6	0.0	0.0	2.1	13.7	27.2	19.8	23.9	13.4	0.0	0.0
7	0.0	0.0	0.0	2.3	14.5	24.1	22.5	33.1	3.4	0.0
8	0.0	0.0	0.0	0.2	2.1	13.5	27.2	22.9	34.1	0.0
9	0.0	0.0	0.0	0.0	0.0	0.4	6.3	28.5	39.1	25.8
10	0.0	0.0	0.0	0.0	0.0	0.0	0.4	2.1	23.4	74.2

be quite diverse and not always statistically significant. Nevertheless, the figure of 0.25 appears to be both intuitively appealing and not substantially different from the figure used in some official sources.[76]

The effect of changes in the definition of consuming unit on aggregate inequality is examined in the next chapter. As an epilogue to this chapter, it is examined whether the use of equivalence scales causes major reclassifications of individuals in the distribution of consumption expenditure. The simplest way to do so is by cross-tabulating individuals by decile according to their pc and pea expenditures. In the former (latter) case, each HH member is ascribed the pc (pea) HH expenditure of the HH to which he /she belongs.[77] These distributions can be considered as better approximations to the distribution of economic welfare among the members of a population than the distribution of HHs by pc or pea HH expenditure[78] and the latter of them

76. See, for example, the scales used by the Supplementary Benefits Commission in Great Britain.

77. An implicit assumption is that the distribution of consumption expenditure among HH members is equal (for the pc distribution) or according to HH members' needs (for the pea distribution). This assumption might be strong, but until now we have neither any theory to explain satisfactorily nor sufficient evidence about intra-family allocation of resources. Therefore it is, probably, the best assumption we can make. For a theoretical presentation and empirical investigation of aspects of intra-family allocation of resources see Rosenzweig (1986) and the references cited there.

78. As noted earlier, what we are really interested in is to make welfare comparisons across individuals, not HHs.

TABLE 2.19 Consumption expenditure shares of decile groups of households and individuals before and after the use of equivalence scales

Decile	1974 Total expenditure				1982 Total expenditure			
	pc HH (1)	pea HH (2)	pc (3)	pea (4)	pc HH (5)	pea HH (6)	pc (7)	pea (8)
1	2.6	2.7	2.8	2.8	3.1	3.1	3.2	3.2
2	4.1	4.2	4.3	4.3	4.6	4.6	4.8	4.8
3	5.2	5.3	5.3	5.5	5.6	5.7	5.8	5.9
4	6.2	6.3	6.4	6.5	6.6	6.8	6.8	6.9
5	7.2	7.4	7.5	7.6	7.6	7.8	7.8	8.0
6	8.5	8.7	8.7	8.8	8.8	9.0	9.0	9.1
7	10.0	10.3	10.2	10.3	10.3	10.5	10.5	10.6
8	12.2	12.4	12.3	12.3	12.4	12.5	12.4	12.4
9	15.7	15.8	15.6	15.6	15.6	15.5	15.5	15.4
10	28.3	27.0	27.0	26.3	25.4	24.5	24.2	23.7

will be used extensively in the next chapters.[79] The cross-tabulations are presented in Tables 2.17 and 2.18 for 1974 and 1982. These tables show that only 40.4% (36.9%) of the individuals in 1974 (1982) remain in the same decile after using the equivalence scales. Although most reclassifications are between adjacent deciles and the majority are in the central deciles, a few individuals do undergo major reclassifications. These results suggest that the use of equivalence scales affects the identification of the poor. It is likely that many individuals classified as poor according to pc expenditure would not be so according to pea expenditure and vice versa.

Finally, Table 2.19 gives the percentage shares of total expenditure by decile groups ranked by consumption expenditure pc and pea. In columns 1, 2, 5 and 6 the consuming unit is the HH and in columns 3, 4, 7 and 8 it is the HH member. It can be noticed that the move from the pc distributions to the corresponding pea distributions is associated with a slight increase in the shares of the bottom and middle deciles and a decrease in the share of the top decile. Hence, one can expect a decline in aggregate inequality as we move

Ceteris paribus, a large HH on poverty should be given more weight than a smaller HH in the same conditions.

79. This is a usual practice in studies using pea distributions. See, for example, Deaton (1981a), Cowell (1984) and Morris and Preston (1986). Note that the total expenditure of the distribution of consumption expenditure pea is not equal to the actual total consumption expenditure.

from pc distributions to pea distributions. These changes are, presumably, due to the fact that larger HHs usually contain a higher number of children and, therefore, have relatively lower pc expenditure, whereas the use of equivalence scales partially compensates for this. It can, also, be noted that the changes in expenditure shares are relatively larger in 1974 than in 1982.

APPENDIX I. Goods and services classified as "adult goods" for the estimation of the Rothbarth model

All items in "Alcoholic drinks"

All items in "Tobacco"

All items in "Men's clothing"

All items in "Women's clothing"

All items in "Men's footwear"

All items in "Women's footwear"

Toilet requisites and cosmetics

Coffee

Newspapers, magazines and periodicals.

Tobacco-pipes, lighters, etc

Legal charges and licenses

Betting and lotteries

APPENDIX II. Reclassification of goods and services for the estimation of the Barten model

In the 1982 HES all the items in "Summer and other holiday expenditures" and "Betting and lotteries" were moved from Group 9 ("Other goods and Services") to Group 7 ("Education and Recreation"). In addition, "House and furniture insurance" was moved from Group 9 to Group 4 ("Housing, Light and Fuel"). In both HESs all items in "Televisions, radios, tape recorders, musical instruments, cameras, etc" were moved from Group 7 to Group 5 ("Durable goods").

APPENDIX III Parameter estimates and expenditure elasticities of the LES without demographics (N=6197)

Commodity Group	β_i	α_i	Expenditure elasticity
Food	0.204	3312.1	0.62
	(66.26)	(16.41)	
Alcohol and Tobacco	0.014	401.8	0.37
	(23.78)	(19.03)	
Clothing and Footwear	0.161	672.1	1.39
	(61.74)	(3.90)	
Housing, Light and Fuel	0.108	1965.5	0.58
	(63.18)	(16.62)	
Durable goods	0.154	608.7	1.39
	(60.36)	(3.10)	
Personal and Medical Care	0.082	286.7	1.58
	(37.68)	(3.53)	
Education and Recreation	0.110	221.2	2.04
	(58.29)	(1.90)	
Transport and Communications	0.117	571.3	1.29
	(57.55)	(3.92)	
Other goods and services	0.050	88.5	2.17
	(33.71)	(2.27)	
2*log likelihood -480067.8			

(t-ratios in parentheses)

CHAPTER THREE

THE MEASUREMENT AND DECOMPOSITION OF INEQUALITY IN GREECE

1. Introduction. The problem of inequality measurement

As the term suggests, "inequality" can be viewed as a departure from an ideal case of "equality". Sen (1973, pp 1-2) indicates that "the concepts of equity and justice have changed remarkably over history and, as the intolerance of stratification and differentiation has grown, the very concept of inequality has gone through radical transformation". Therefore, there exist a number of different interpretations of the meaning of equality and inequality. In everyday language inequality is associated with a notion of "difference" and "injustice"; it also has an emotive meaning, something like "unfairness". Nevertheless, for the purposes of the present study inequality is interpreted as any departure from the situation where each member of a population receives an equal share of what is to be distributed; let us assume it is income.[1] For convenience, it will be assumed that all distributions have the same mean and that all the population members have some positive income.

An index of income inequality can be defined as a "scalar representation of interpersonal differences in income within a given population".[2] As Kanbur (1984) points out, there are two general approaches to the measurement of inequality; a positive and a normative. The first attempts to describe the pattern of income distribution and to summarize it in a single statistic. The second bases explicitly the measurement of inequality on value judgments related to the welfare lost due to the existence of inequality. As early as 1920, Dalton was arguing that underlying any index of inequality there is some concept of social welfare. Therefore, a comparison between the estimates of a particular index for two distributions involves an implicit or explicit normative judgment as to whether one distribution is to be preferred to another. Then, one can ask whether it is possible to rank unambiguously two distributions without using a specific index of inequality (and, hence, a

1. Although, following the terminology of the theoretical literature in this area, in the theoretical part of this chapter we refer to the "distribution of income", the measurement and decomposition of inequality performed in the empirical part of the chapter are in terms of consumption expenditure pea.

2. Cowell (1977, p. 9).

specific Social Welfare Function). In order to answer this question, some diversion to the Lorenz curve is required. The Lorenz curve is defined as the relationship between the cumulative proportion of population members (arranged in ascending order of their incomes) and the cumulative proportion of their incomes. Hence, it is a convex function of the cumulative proportion of the population. In the case of perfect equality the Lorenz curve coincides with the 45^0 line and in the case of maximum inequality it coincides with the lower horizontal and the right vertical axis. Atkinson (1970) demonstrates that, if the Social Welfare Function underlying the inequality index is symmetric and equal to the sum of individual utility functions which, in turn, are increasing concave functions of the individual's income, a necessary and sufficient condition to rank two distributions without selecting a particular index is that their Lorenz curves do not intersect.[3] In this case, the distribution corresponding to the Lorenz curve closer to the line of perfect equality has a lower level of inequality. However, if the Lorenz curves of two distributions intersect, different indices might give different rankings and, therefore, in order to rank them we should, first, select an index of inequality.

Although various authors have suggested different sets of desirable properties for inequality indices, there seems to exist a rather general agreement that an index should satisfy the following axioms:

Symmetry axiom: Any permutation of incomes should leave the index unaffected.

Income-unit independence axiom: If the incomes of all population members change by the same proportion, the value of the index should remain unaffected.

Population-size independence axiom: If two or more identical populations are pooled, the value of the index should remain unaffected.

Transfer axiom: A regressive transfer of income between two population members which does not reverse their relative ranking should increase the index.

The fact that these axioms seem to be generally accepted does not imply that they are not controversial. Some authors suggest that the symmetry axiom may be undesirable because it does not take into account the process of income generation and the different circumstances faced by different population members.[4] The income-unit independence axiom implies that the Social Welfare Function underlying the inequality index should be homogeneous of degree one with respect to the vector of incomes, which may be controversial. It has been

3. Dasgupta et al (1973) show that this result holds even under the weaker assumption of S-concave utility functions.

4. See Sen (1979a) and Cowell (1980). All the indices presented in this section satisfy this axiom.

suggested, instead, that the value of the index should remain unaffected if there are additions of equal amounts to all incomes.[5] However, if an index violates the income-unit independence axiom the degree of inequality depends on the unit of measurement of income, which is generally unacceptable.[6] The transfer axiom (which is also known in the literature as the "*principle of transfers*" or the "*Dalton-Pigou condition*") is considered by some authors as rather weak.[7] According to them the impact on the index of a regressive transfer of a given amount of income should be greater if the transfer takes place at a lower income level ("*strong principle of transfers*").[8] Doubts have also been expressed about the desirability of the population-size independence axiom.[9] A particularly desirable property for the purposes of the present work is additive decomposability. This property is discussed in the next section. In the rest of this section some of the most commonly used indices of inequality are presented, grouped into three categories: positive, entropy and normative.[10]

1i. Positive indices of inequality

These are indices of dispersion of incomes around a reference income level (usually the mean income of the population). Most of them are derived from statistical theory. As Kanbur (1984) points out, they are constructed in the following way. Firstly, a reference income level is selected. Secondly, the gap between the income of each population member and this reference level is calculated and weighted using an appropriate weighting system. Thirdly, the weighted gaps are summed and the mean weighted gap is calculated. Finally, this weighted gap is expressed as a fraction of the mean income.

Intuitively, an obvious candidate to be used as index of inequality is the relative mean deviation

$$R = \Sigma_i |\mu - y_i| / n\mu \qquad (1)$$

where y_i: the income of individual i (i=1, ... n)

n: the size of the population

μ: the arithmetic mean income of the population [$\mu=\Sigma_i(y_i/n)$]

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5. See Dalton (1920), Kolm (1976a, 1976b).

6. Following the example of Kakwani (1980, p. 65), if we accept the "equal additions" instead of the "income-unit independence" rule, inequality can be diminished by, simply, calculating all incomes in cents instead of dollars.

7. See Sen (1973) and Kakwani (1980a).

8. For stronger versions of the transfer axiom, assigning more weight to transfers at the lower than at the top end of the distribution, see Shorrocks and Foster (1987).

9. See Cowell (1977, pp 63-64). All the indices presented in this section satisfy this axiom.

10. For good surveys of issues related to properties of inequality indices see Sen (1973, ch. 2), Cowell (1977, chs 2 and 3), Kakwani (1980a, ch. 5) and Kanbur (1984).

However, R is insensitive to transfers of income, as long as the persons involved are situated on the same side of the mean income and, hence, violates the transfer axiom. Several authors have suggested and used variants of R, which also violate the transfer axiom, as indices of inequality.[11] Another common statistical measure of dispersion of frequency distributions which can be used as index of inequality is, of course, the variance[12]

$$V = \Sigma_i(\mu - y_i)^2/n \qquad (2)$$

V has the appealing characteristic of attaching higher weights to larger gaps. As a result, a transfer of a given amount of income in the middle of the distribution has a much smaller impact on V relative to the transfer of the same amount at very high or very low income levels. However, as can be seen in (2), V depends on the mean income and, hence, violates the income-unit independence axiom. If V is divided by the mean income the squared coefficient of variation is derived, which does not violate the income-unit independence axiom.[13]

$$C = \Sigma_i(\mu - y_i)^2/n\mu \qquad (3)$$

Another popular index of inequality is the variance of the logarithms of incomes

$$L = \Sigma_i(\ln\mu^* - \ln y_i)^2/n \qquad (4)$$

where μ^*: the geometric mean income of the population

Since the expression inside the parenthesis in (4) can be written as $\ln(\mu^*/y_i)$, L satisfies the income-unit independence axiom. However, Creedy (1977) demonstrates that a regressive transfer between two population members with incomes in excess of 2.72 times the mean income (in the case of natural logarithms) reduces the value of L instead of decreasing it. Therefore, L violates the transfer axiom. Nevertheless, Creedy also points out that the probability of a "violating transfer" is very low for most empirical distributions.

A common characteristic of R, V, C and L is the use of the mean income as reference income level. An alternative is to use each income in turn as reference level and calculate the mean of the resulting n^2 gaps

11. See, for example, Kuznets (1957) and Elteto and Frigyes (1968). For a variant of R which satisfies the transfer axiom see Ebert (1988).

12. The square root of V (standard deviation) has also been used as index of inequality.

13. The square root of C has also been used as index of inequality.

as a fraction of the mean income. The resulting index is known as the relative mean difference (j=1,...n)

$$J = \Sigma_j\Sigma_i |y_i - y_j| / n^2\mu \qquad (5)$$

Although (5) is similar to (1), it is easy to check that, unlike R, J satisfies the transfer axiom for any transfer of income. A summary measure of inequality closely related to J is the Gini index. This is undoubtedly the most well-known and widely used index of inequality. It is directly related to the Lorenz curve and can be defined as the ratio of the area included between the Lorenz curve and the line of perfect equality over the area included between the lines of perfect equality and complete inequality. Several formulae for the Gini index have been suggested by different authors. The most well-known are the following[14]

$$G = \Sigma_j\Sigma_i |y_i - y_j| / 2n^2\mu \qquad (6i)$$

$$G = 1 - \Sigma_j\Sigma_i \min(y_i, y_j) / n^2\mu \qquad (6ii)$$

$$G = 1 + 1/n - 2[ny_1 + (n-1)y_2 + \ldots + 2y_{n-1} + y_n]/n^2\mu \qquad (6iii)$$

where $y_1 \leq y_2 \leq \ldots \leq y_n$

Comparison of (5) and (6i) suggests that G is one half of J. G can be interpreted in a number of different ways. According to Sen (1973), if we take any pair-wise comparisons over the entire income distribution and assume that the person with the lower income suffers a depression (on finding his income to be lower) proportional to the income differential, then G is equal to the arithmetic mean of all such depressions in all possible pair-wise comparisons. Pyatt (1976) gives an interpretation of G which can be considered as the optimistic version of Sen's interpretation, within a game theoretic framework. He proposes a game in which each population member draws an income at random from the actual income distribution. If this income is higher than his own actual income he takes it, otherwise he retains his own. The mean expected gain of this game for the entire population expressed as a proportion of the mean income is equal to G. (6iii) implies that the Social Welfare Function underlying G is a weighted sum of the incomes of the population members. The weights are determined by the rank-order position of each member in the income scale. Consequently, the sensitivity of G to the transfer of a given amount of income does not depend on the size of the incomes of the two population members involved in the transfer, but on the number of population members between them in the income scale. Newbery (1970) demonstrates that if the individual utility functions are differentiable and strictly

14. For other formulae for the Gini index and rigorous treatment of its properties see Anand (1983, Appendix B).

concave, then, there exists no additively separable Social Welfare Function ranking income distributions in the same order as G. Dasgupta et al (1973) show that the same result holds also for strictly quasi-concave utility functions. This fact makes G unacceptable if a utilitarian approach is adopted. However, as Sheshinski (1972) points out, additivity is a rather strong condition for a Social Welfare Function and if it is relaxed at least one Social Welfare Function ranking income distributions in the same order as G can be found.[15]

In recent years several authors have attempted the construction of "ethically flexible" generalizations of G. These are indices based on the Lorenz curve, incorporating a "distributionally sensitive" parameter.[16] For example, Donaldson and Weymark (1980, 1983) present their class of "S-Ginis" which takes the form

$$G_S = (1/\mu)\{\mu - (1/n^{\delta})\Sigma_i[(n-i+1)^{\delta} - (n-i)^{\delta}]y_i\} \qquad (7)$$

δ is the distributionally sensitive parameter ($\delta \geq 1$). The higher its value the more sensitive the index to changes at the lower end of the distribution. If $\delta=1$, $G_S=0$ that is, the index is distributionally insensitive and, therefore, violates the transfer axiom. It is easy to show that for $\delta=2$ G_S becomes the known Gini index. As δ tends to infinity G_S tends to correspond to a Rawlsian type of Social Welfare Function where the level of social welfare is determined exclusively by the level of income of the least well-off population member. G_S is usually presented as a Lorenz curve-based alternative to the Atkinson index of inequality which is presented below, but until now it has not been used extensively in empirical work.[17]

1ii. Entropy indices of inequality

The concept of "entropy" was initially developed in information theory. It can be described, briefly, in the following way.[18] Assume that there are n independent events, each one with probability p_i ($0 \leq p_i \leq 1$). When event i occurs, a number $h(p_i)$ is assigned to this information. If event i is likely $h(p_i)$ is low, that is $[dh(p)/dp]<0$. In addition, since any two events are independent, the probability that both events i and j occur simultaneously is p_ip_j and if it is further assumed that the information gain is additive, then $h(p_ip_j)=h(p_i)+h(p_j)$. The function that satisfies these properties is $h(p)=-\ln p$. Then, the individual information can be aggregated

15. Note, however, that the non-additive Social Welfare Function used by Sheshinski (1972) is quasi-concave but not strictly quasi-concave.

16. Therefore, these indices combine characteristics of both positive and normative indices of inequality.

17. See, also, the class of "extended Gini" indices suggested by Chakravarty (1988).

18. See Theil (1967), Cowell (1977) and Kanbur (1984).

into a single number in order to calculate the average "information content" of the system using as weights the probabilities of the events. The resulting number $\Sigma_i p_i h(p_i) = -\Sigma_i p_i \ln p_i$ is known as the entropy of the system. Theil (1967) argues that the n events can be interpreted as the n population members and each probability p_i as the income share of member i, $y_i/n\mu$. Perfect equality ($y_i=\mu$ for each member) yields the maximum value of the entropy. Then, an index of inequality can be derived by subtracting the actual from the maximum entropy

$$\begin{aligned} T &= -\Sigma_i(1/n)\ln(1/n) + \Sigma_i(y_i/n\mu)\ln(y_i/n\mu) \\ &= -\ln(1/n) + (1/n)\Sigma_i(y_i/\mu)\ln(y_i/\mu) + (1/n)\Sigma_i(y_i/\mu)\ln(1/n) \\ &= \ln(1/n)[\Sigma_i(y_i/n\mu)-1] + (1/n)\Sigma_i(y_i/\mu)\ln(y_i/\mu) \\ &= (1/n)\Sigma_i(y_i/\mu)\ln(y_i/\mu) \end{aligned} \qquad (8)$$

Theil (1967) also proposes another entropy index of inequality, in which the roles of population shares and income shares in expression (8) are reversed

$$\begin{aligned} N &= \Sigma_i(1/n)\ln[(1/n)/(y_i/n\mu)] \\ &= (1/n)\Sigma_i\ln(\mu/y_i) \end{aligned} \qquad (9)$$

Both T and N satisfy the axioms of symmetry, transfer, income-unit independence and population-size independence. However, a number of authors argue that they are very arbitrary and lack any intuition as indices of inequality. An additional disadvantage is that they do not have a constant upper bound. If one population member receives the total income, T takes the value of ln(n) whereas N cannot be calculated. In fact, even if a single population member has income close to zero, N tends to infinity.

1iii. Normative indices of inequality

The pioneering article on the construction of inequality indices explicitly based on Social Welfare Functions is that of Dalton (1920). According to the utilitarian approach used by Dalton, social welfare is the sum of individual utilities which are strictly concave functions of individual incomes (the same utility function for all individuals). As a result, the maximum level of social welfare is achieved when the - exogenously given - total income is equally distributed among all population members. Any departure from this situation reduces the level of social welfare. Dalton's index of inequality can, then, be defined as the difference

between the maximum (potential) and the actual level of welfare over the maximum welfare level[19]

$$D = 1 - \Sigma_i U(y_i)/nU(\mu) \tag{10}$$

D has the disadvantage of not being invariant with respect to linear transformations of the utility function used in it. In order to avoid this problem, Atkinson (1970) introduces the concept of "equally distributed equivalent income per capita" (y_{EDE}), that is the level of income which if received by every population member would generate a level of social welfare equal to the level of social welfare generated by the actual distribution.

$$nU(y_{EDE}) = \Sigma_i U(y_i) \tag{11}$$

Then, Atkinson's index of inequality can be defined as the difference between the arithmetic mean income and the "equally distributed equivalent income per capita" over the arithmetic mean income.

$$A = 1 - y_{EDE}/\mu \tag{12}$$

If this index is to satisfy the income-unit independence axiom, the concave utility function U(y) must be limited to the "constant elasticity of the marginal utility" form ($\varepsilon>0$)

$$U(y) = \begin{cases} (y^{1-\varepsilon})/(1-\varepsilon) & \text{for } \varepsilon \neq 1 \\ \ln y & \text{for } \varepsilon = 1 \end{cases} \tag{13}$$

Therefore, the Social Welfare Function, $W(\mathbf{y})=\Sigma_i U(y_i)$, selected by Atkinson (1970) is homothetic, symmetric and additively separable to individual utilities and ε is the "inequality aversion parameter". The larger the ε the larger the weight attached to lower incomes. If it is equal to zero equal weights are attached to all individual incomes, whereas if it tends to infinity the Social Welfare Function tends to a Rawlsian type of Social Welfare Function. Combining (11) and (13), y_{EDE} ($\varepsilon \neq 1$) is given by

$$(y_{EDE})^{1-\varepsilon}/(1-\varepsilon) = [(1/n)\Sigma_i(y_i^{1-\varepsilon})]/(1-\varepsilon)$$

$$y_{EDE} = [(1/n)\Sigma_i(y_i^{1-\varepsilon})]^{1/(1-\varepsilon)} \tag{14}$$

and the Atkinson index of inequality is

$$A = 1 - (1/\mu)[(1/n)\Sigma_i(y_i^{1-\varepsilon})]^{1/(1-\varepsilon)} \tag{15}$$

19. Dalton himself suggested a slightly different formulation of this index.

If $\varepsilon=0$, A violates the transfer axiom.[20] Otherwise, A satisfies the axioms of symmetry, transfer, population-size independence and income-unit independence and has a straightforward interpretation. For example, if A=0.3 70% of the actual total income would be sufficient to generate the present level of social welfare, if it was equally distributed. Nevertheless, A has been criticized on two grounds. Firstly, it has been argued that the utilitarian assumption of additive separability used by Atkinson (1970) for the construction of the Social Welfare Function underlying A is very strong and that non-individualistic, symmetric quasi-concave Social Welfare Functions can be used instead.[21] Secondly, Sen (1978) argues that the tasks of measuring inequality and the welfare loss due to the existence of inequality are completely different. However, the normative or "ethically flexible" inequality indices such as A, D, and G_S implicitly confuse these two tasks.[22]

1iv. A selection amongst inequality indices

Since each inequality index corresponds to a different Social Welfare Function and the selection of a particular Social Welfare Function depends on one's value judgments, it becomes evident that a single ideal index satisfying everybody's value judgments simply cannot exist. As a result, it was decided to base the measurement and decomposition of inequality on more than one index. Indices from all three groups mentioned above (positive, entropy and normative) are utilized. Since one of the main objectives of the present work is to provide a comprehensive decomposition analysis of inequality in Greece, some preference was given to decomposable indices. More specifically, the following indices are used: the Gini index G, the Atkinson index A, the two Theil indices T and N and the variance of the logarithms L. The last three are additively decomposable. In common with most empirical studies, the value of $\varepsilon=2$ is used for the calculation of y_{EDE} in A.[23] The selected indices satisfy the axioms of symmetry, transfer, population-size independence and income-unit independence, apart from L which violates the transfer axiom at very high income levels. It is interesting to examine the type of transfers to which these indices are relatively more responsive. Using several hypothetical distributions, Champernowne (1974) demonstrates that A, N and L appear to be relatively

20. If ε is greater than one and there are population members with zero incomes, social welfare tends to minus infinity, y_{EDE} cannot be defined and A cannot be calculated. If $\varepsilon=1$ A is equal to one minus the ratio of the geometric to the arithmetic mean income and if $\varepsilon=2$ it is equal to one minus the ratio of the harmonic to the arithmetic mean income.

21. See Sen (1973), Pyatt (1985).

22. "The idea of measuring inequality on the basis of an overall Social Welfare Function is fundamentally misconceived. It leads to a clearcut answer but to a question different from the one posed" [Sen (1978, p. 92)].

23. See Stern (1977).

more responsive to transfers at the bottom, G more responsive to transfers in the middle and T more responsive to transfers at the top of a distribution.[24] Hence, it can be argued that the combined use of G, A, T, N and L satisfies a wide range of tastes regarding the responsiveness of an index to different types of inequality.

2. Inequality decomposition[25]

In many studies judgments are made about the association of different factors with aggregate inequality. In recent years, a systematic attempt has been made to construct indices capable of decomposing aggregate inequality into its contributory components. In general, two types of inequality decomposition analysis can be distinguished. The first examines the contribution of inequality in the distribution of income from different sources to aggregate inequality ("*inequality decomposition by factor components*").[26] The second examines the relationship between aggregate inequality and the levels of inequality of different population subgroups ("*inequality decomposition by population subgroups*").[27] Since we are interested in the measurement and decomposition of inequality in the distribution of consumption expenditure, it seems reasonable to consider only the second type of decomposition analysis. Of course, consumption expenditure inequality could also be decomposed by factor components. For instance, the contribution of inequality in the distribution of consumption expenditure on necessities or luxuries on aggregate inequality could be assessed. However, from an economic point of, this kind of decomposition analysis is not very appealing.

Decomposability of an inequality index means that if the population is grouped according to any external criterion into non-overlapping exhaustive groups, aggregate inequality can be decomposed into "between-groups" and "within-groups" inequality. The "between-groups" component of inequality can be defined as the value of the inequality index if every person in each group receives the mean income of that group (but the group mean incomes remain unchanged). The "within-groups" component is constructed from the population share, the income share and the inequality index of each particular group, as an additively

24. In fact, Champernowne (1974) did not use these indices but some transformation of them.

25. This section draws on Anand (1983, Appendix C).

26. See Mangahas (1975), Fei, Ranis and Kuo (1978), Pyatt, Chen and Fei (1980), Shorrocks (1982,).

27. For theoretical and empirical studies on the decomposition of inequality by population subgroups see Theil (1967), Fishlow (1972), Pyatt (1976), Bourguignon (1979), Fields (1979a), Shorrocks (1980, 1984), van Ginneken (1980a), Blackorby, Donaldson and Auersperg (1981), Cowell and Kuga (1981), Das and Parikh (1982), Anand (1983), Mohan (1984), Cowell (1984, 1985), Adelman and Levy (1984, 1985), de Kruijk and van Leeuwen (1985), Glewwe (1986, 1988), Meager and Dixon (1987) and some unpublished works reported in Fields (1979b). See, also, Cowell (1980) who considers a class of decomposable indices which allow differential treatment of population subgroups.

separable function over groups. Therefore, the contribution of each particular group to aggregate inequality can be identified. If the value of an index can be expressed as a weighted sum of the "within-groups" inequalities plus the "between-groups" inequality, the index is termed "weakly additively decomposable". Hence, if we have knowledge of changes in particular population groups, we can use a weakly additively decomposable index to evaluate their impact on aggregate inequality.

The choice of different indices, inevitably, changes the relative importance of the "between-groups" and the "within-groups" components. Hence, it was decided to base our decomposition analysis on more than one index. Among the indices presented in the last section V, C, L, T and N, are weakly additive decomposable.[28] However, V violates the income-unit independence axiom and in the case of C the weights used for the construction of the "within-groups" component of inequality do not add up to unity and depend on the size of the "between-groups" component.[29] Therefore, it was decided to use only T, N and L for our decomposition analysis (even though the latter violates the transfer axiom at very high income levels). The next subsections present the decomposition of these indices.

2i. The decomposition of Theil's T index

Assume that a population of n individuals belonging to K income classes can be assigned to J groups according to another variable (for example, region of residence or educational level). Then, the joint distribution of individuals by income and this variable can be given in the form of a matrix presenting the absolute frequencies n_{jk} of individuals in each cell (j, k) (j=1, ... J, k=1, ... K). Assume, also, that each individual in the kth income class receives the mean income y_k of that class.[30] Therefore, total income in cell (j, k) is $n_{jk}y_k$ and $\Sigma_j\Sigma_k n_{jk}y_k = \Sigma_j Y_j = Y$ is the total income of the population. $Y_j=\Sigma_k n_{jk}y_k$ is the total income of group j. Similarly, the total population size is given by $n = \Sigma_j\Sigma_k n_{jk} =\Sigma_j n_j$ and $n_j=\Sigma_k n_{jk}$ is the population size of group j. The population and income shares of cell (j, k) are given by n_{jk}/n and y_{jk}/Y, respectively.

28. Although A is not weakly additively decomposable, some variants of A are; see Shorrocks (1980, p. 622)

29. The one-way decomposition of variance can be found in any standard statistical textbook; see for example Freud and Walpole (1980, ch. 15). For multivariate decomposition analysis of variance see Scheffe (1959, ch. 4). For the decomposition of the squared coefficient of variation see Theil (1967, p. 125).

30. This is not very restrictive because we can construct as many income classes as individuals. In fact, all the estimates of inequality indices presented below have been calculated from all the observations in the sample.

Extending (8), the first Theil index can be written as

$$T = \Sigma_j\Sigma_k(y_{jk}/Y)\ln[(y_{jk}/Y)/(n_{jk}/n)] \qquad (16)$$

T can be decomposed into "between-groups" and "within-groups" components as follows

$$\begin{aligned} T &= \Sigma_j\Sigma_k(y_{jk}/Y)\ln[(y_{jk}/Y)/(n_{jk}/n)] \\ &= \Sigma_j(Y_j/Y)\Sigma_k(y_{jk}/Y_j)\{\ln[(y_{jk}/Y_j)/(n_{jk}/n_j)] + \ln[(Y_j/n_j)/(Y/n)]\} \\ &= \Sigma_j(Y_j/Y)\{\Sigma_k(y_{jk}/Y_j)\ln[(y_{jk}/Y_j)/(n_{jk}/n_j)]\} + \Sigma_j(Y_j/Y)\{\Sigma_k(y_{jk}/Y_j)\ln[(Y_j/n_j)/(Y/n)]\} \end{aligned} \qquad (17)$$

The last term in (17) can be rewritten as $\Sigma_j(Y_j/Y)\ln[(Y_j/n_j)/(Y/n)]\Sigma_k(y_{jk}/Y_j)$, but since $\Sigma_k(y_{jk}/Y_j)=1$ for each j, it is equal to $\Sigma_j(Y_j/Y)\ln[(Y_j/n_j)/(Y/n)]$ and (17) can be written as

$$T = \Sigma_j(Y_j/Y)\{\Sigma_k(y_{jk}/Y_j)\ln[(y_{jk}/Y_j)/(n_{jk}/n_j)]\} + \Sigma_j(Y_j/Y)\ln[(Y_j/n_j)/(Y/n)] \qquad (18)$$

$\Sigma_k(y_{jk}/Y_j)\ln[(y_{jk}/Y_j)/(n_{jk}/n_j)]$ are the Theil indices T_j for each j and $\Sigma_j(Y_j/Y)\ln[(Y_j/n_j)/(Y/n)]$ is the value of T if every individual in j receives the arithmetic mean income of that group. Therefore

$$T = \Sigma_j(Y_j/Y)T_j + \Sigma_j(Y_j/Y)\ln[(Y_j/Y)/(n_j/n)] = T_W + T_B \qquad (19)$$

where $T_j = \Sigma_k(y_{jk}/Y_j)\ln[(y_{jk}/Y_j)/(n_{jk}/n_j)]$

$T_W = \Sigma_j(Y_j/Y)T_j$

and $T_B = \Sigma_j(Y_j/Y)\ln[(Y_j/Y)/(n_j/n)]$

T_W is the "within-groups" component of inequality, which is a weighted average of the group indices T_j, the weights being the income shares Y_j/Y of each group j. T_B is the "between-groups" component of inequality which is derived if the "within-groups" income differences are suppressed.

2ii. The decomposition of Theil's N index

As noted in section 1, N reverses the roles of the income share y_{jk}/Y and the population share n_{jk}/n in the formula of T. Therefore, keeping the notation unchanged and noting that for each j $\Sigma_k n_{jk}/n_j=1$, N can be decomposed as follows

$$N = \Sigma_j\Sigma_k(n_{jk}/n)\ln[(n_{jk}/n)/(y_{jk}/Y)]$$

$$= \Sigma_j(n_j/n)\Sigma_k(n_{jk}/n_j)\{\ln[(n_{jk}/n_j)/(y_{jk}/Y_j)] + \ln[(Y/n)/(Y_j/n_j)]\}$$

$$= \Sigma_j(n_j/n)\{\Sigma_k(n_{jk}/n_j)\ln[(n_{jk}/n_j)/(y_{jk}/Y_j)]\} + \Sigma_j(n_j/n)\{\Sigma_k(n_{jk}/n_j)\ln[(Y/n)/(Y_j/n_j)]\}$$

$$= \Sigma_j(n_j/n)\{\Sigma_k(n_{jk}/n_j)\ln[(n_{jk}/n_j)/(y_{jk}/Y_j)]\} + \Sigma_j(n_j/n)\ln[(Y/n)/(Y_j/n_j)]$$

$$= \Sigma_j(n_j/n)N_j + \Sigma_j(n_j/n)\ln[(n_j/n)/(Y_j/Y)] = N_W + N_B \qquad (20)$$

where $N_j = \Sigma_k(n_{jk}/n_j)\ln[(n_{jk}/n_j)/(y_{jk}/Y_j)]$

$N_W = \Sigma_j(n_j/n)N_j$

and $N_B = \Sigma_j(n_j/n)\ln[(n_j/n)/(Y_j/Y)]$

Naturally, since there exists a reversal in the roles of income and population shares between T and N, the weights in the "within-groups" component of inequality, N_W, are the population shares of the groups, n_j/n.

2iii. The decomposition of the variance of logarithms L

In order to proceed to the decomposition of L, further notation is required. Let $x_{jk}=\ln y_k$ (the same for all j); then, $x_{..}=(1/n)\Sigma_j\Sigma_k n_{jk}x_{jk}$ is the overall mean of x_{jk} and $x_{j.}=\Sigma_k n_{jk}x_{jk}/\Sigma_k n_{jk}$ is the mean of x_{jk} over k. Therefore, L can be decomposed in the following way

$$L = (1/n)\Sigma_j\Sigma_k n_{jk}(x_{jk} - x_{..})^2$$

$$= (1/n)\Sigma_j\Sigma_k n_{jk}[(x_{jk}-x_{j.}) + (x_{j.}-x_{..})]^2$$

$$= (1/n)\Sigma_j\Sigma_k n_{jk}[(x_{jk}-x_{j.})^2 + (x_{j.}-x_{..})^2 + 2(x_{jk}-x_{j.})(x_{j.}-x_{..})]$$

$$= \Sigma_j(n_j/n)\Sigma_k[(n_{jk}/n_j)(x_{jk}-x_{j.})^2 + (1/n)\Sigma_j(x_{j.}-x_{..})^2\Sigma_k n_{jk} + (2/n)\Sigma_j(x_{j.}-x_{..})\Sigma_k n_{jk}(x_{jk}-x_{j.}) \quad (21)$$

Since $\Sigma_k n_{jk}=n_j$ and $\Sigma_k n_{jk}(x_{jk}-x_{j.})=0$, (21) can be expressed as

$$L = \Sigma_j(n_j/n)\Sigma_k[(n_{jk}/n_j)(x_{jk}-x_{j.})^2] + \Sigma_j(n_j/n)(x_{j.}-x_{..})^2$$

$$= \Sigma_j(n_j/n)L_j + \Sigma_j(n_j/n)(x_{j.}-x_{..})^2 = L_W + L_B \qquad (22)$$

where $L_j=\Sigma_k[(n_{jk}/n_j)(x_{jk}-x_{j.})^2]$

$L_W=\Sigma_j(n_j/n)L_j$

and $L_B=\Sigma_j(n_j/n)(x_{j.}-x_{..})^2$

Like N, the weights of the "within-groups" component of inequality in L are the population shares,

n_j/n. In addition, since $x_{jk}=\ln y_k$, x_j. is the logarithm of the geometric mean income of group j. Therefore, L is decomposable around the geometric (not the arithmetic) mean income.

Division of the "between-groups" ("within-groups") component by the total value of the index yields the "between-groups" ("within-groups") contribution to aggregate inequality. The higher the contribution of the "between-groups" component when the population is grouped by a particular variable, the stronger the association of that variable with aggregate inequality. It should be stressed that this is a mere statistical association which should not be interpreted as causality running from that variable to inequality (unless there is an underlying economic reasoning to support the idea of causality). Note, also, that the decomposition of T and N is purely descriptive (not based on statistical theory). However, since most income distributions are approximately lognormally distributed, the ratio of the "between-groups" to the "within-groups" variance of the logarithms of incomes follows an F-distribution and, therefore, its significance can be tested statistically.[31]

2iv. Strictly additively decomposable inequality indices

The class of strictly additively decomposable inequality indices is derived from the class of the weakly additively decomposable indices by changing the definition of the "within-groups" component. By symmetry to the definition of the "between-groups" component, the "within-groups" component is now defined as the value of the index if the group mean incomes are set equal to the overall mean income through an equiproportionate change in the income of every person within a group. In other words, the "between-groups" component is the value of the index for the hypothetical distribution where the "within-groups" inequality has been eliminated and vice versa. Let us examine whether the three indices considered in the previous subsections are strictly additively decomposable.

Taking into account that $Y_j=n_j\mu_j$ and $Y=n\mu$ (where μ_j and μ are the mean incomes of group j and the entire population, respectively) (19) can be expressed as

$$T = \Sigma_j(n_j\mu_j/n\mu)T_j + \Sigma_j(n_j\mu_j/n\mu)\ln(\mu_j/\mu) = T_W + T_B \qquad (23)$$

31. In section 3 it is shown that the distributions used in this study are approximately lognormally distributed. Nevertheless, in the one-way decomposition of inequality presented in the next sections, all the "between-groups" contributions turn out to be highly statistically significant. Therefore, these tests are not reported in the relevant tables.

If all the "between-groups" inequalities are suppressed by setting all μ_j equal to μ, but the "within-groups" inequalities remain unchanged, T is equal to $\Sigma_j(\mu_j/\mu)T_j$, which is different from the "within-groups" component ($T_W=\Sigma_j(n_j\mu_j/n\mu)T_j$). Hence, the elimination of "between-groups" inequalities reduces aggregate inequality by an amount different from T_B. $[T-\Sigma_j(\mu_j/\mu)T_j=T_B+(T_W-\Sigma_j(\mu_j/\mu)T_j)\neq T_B]$ Therefore, the "within-groups" component of inequality is not equal to the value of T when all the "between-groups" differences are eliminated and, as a result, T is not strictly additively decomposable.

Similarly, (20) can be written as

$$N = \Sigma_j(n_j/n)N_j + \Sigma_j(n_j/n)\ln(\mu_j/\mu) = N_W + N_B \qquad (24)$$

Setting all μ_j equal to μ through equiproportionate changes in the income of every person within a group, so that "within-groups" inequalities do not change, N reduces to $\Sigma_j(n_j/n)N_j$ which is equal to the "within-groups" component of inequality, N_W. Hence, N is strictly additively decomposable.

Finally, if all the group geometric mean incomes in (22) are set equal to the overall geometric mean income (and, hence, all $x_{j\cdot}$ equal to $x_{\cdot\cdot}$), but "within-groups" inequalities remain intact, L is equal to $\Sigma_j(n_j/n)L_j$ which is, indeed, the "within-groups" component. Therefore, L is also strictly additively decomposable.

The fact that L is decomposable around the geometric instead of the arithmetic mean of the distribution and does not satisfy the transfer axiom over the entire range of incomes makes N the only inequality index which is strictly additively decomposable around the arithmetic mean and satisfies the four basic desirable axioms. For this reason Shorrocks (1980, p.625) calls N "the most satisfactory of the decomposable measures". However, one may also require an index of inequality to have some intuitive justification and, as Fields (1979b, p.424) points out "why ... [N] should be used as a measure of economic inequality is far from transparent". It can be noticed that in both N and L the weights of the "within-groups" component are the group population shares, which are unaffected when "between-groups" inequality is eliminated. By contrast, the weights of the "within-groups" component of T are the income shares of these groups, which change after the equalization of the group mean incomes. The advantage of the strictly additively decomposable indices over the weakly additively decomposable indices can be illustrated by the

following example. Consider the following questions (a) By how much would inequality decline if regional inequalities were eliminated? and (b) How much less inequality would be observed if regional differences were the only source of variation in the distribution of income? Strictly additively decomposable indices give the same answer to both questions, whereas weakly additively decomposable indices do not. Hence, it can be argued that only those inequality indices additive in the strict sense give an unambiguous measurement of the contribution of any particular variable (grouping) to aggregate inequality.

3. Measurement and one-way decomposition of inequality in Greece

We start this section by presenting the 1974 and 1982 distributions of consumption expenditure in Greece in terms of frequencies in twenty intervals. These are shown in Tables 3.1 for 1974 and 3.2 for 1982. The expenditures are in terms of average 1974 and 1982 prices. The last column of these tables reports the expected relative frequencies for the relevant expenditure intervals if the distributions were lognormally distributed. Using the information of the last two columns of each table, a χ^2 goodness-of-fit test can be performed in order to test the hypothesis that the distributions are approximately lognormally distributed. The relevant χ^2 values are 0.473 for 1974 and 0.419 for 1982. Since the critical value of the χ^2 distribution at the 1% level of significance with 19 degrees of freedom is 36.2, the hypothesis of lognormality cannot be rejected.

Before proceeding to the measurement and decomposition of inequality by various socioeconomic factors it is interesting to examine how aggregate inequality changes when different concepts of the consuming unit and consumption expenditure are used. In Tables 3.3 and 3.4 estimates of G, A, T, N and L are presented along with sample sizes and arithmetic mean consumption expenditures for the following distributions:

a) The distribution of HHs by total HH expenditure

b) The distribution of HHs by pc HH expenditure

c) The distribution of HHs by pea HH expenditure

d) The distribution of individuals by pc expenditure

e) The distribution of individuals by pea expenditure

In both years the move from the first of the above distributions to the last, is associated with a gradual decline in the estimates of all the indices, with one exception. Moving from the distribution of HHs by total HH expenditure to the distribution of HHs by pc HH expenditure A, N and L indicate a reduction in inequality,

TABLE 3.1 Distribution of consumption expenditure per equivalent adult

Absolute and relative frequencies (1974 drachmas per month)

Expenditure interval	Absolute number of persons	Relative Frequency	Expected Lognormal Frequency
Less than 800	421	1.7	1.7
800-1199	1315	5.2	5.6
1200-1499	1531	6.1	6.0
1500-1749	1429	5.7	5.9
1750-1999	1604	6.4	6.6
2000-2249	1675	6.6	6.5
2250-2499	1762	7.0	6.3
2500-2749	1427	5.7	5.8
2750-2999	1644	6.5	5.6
3000-3249	1327	5.3	5.2
3250-3499	1122	4.4	4.7
3500-3999	2036	8.1	7.8
4000-4499	1656	6.6	6.5
4500-4999	1303	5.2	5.2
5000-5999	1757	7.0	7.5
6000-6999	1116	4.4	4.4
7000-7999	722	2.9	3.0
8000-9999	671	2.7	3.1
10000-12499	391	1.5	1.5
More than 12500	342	1.4	1.1
Total	25251	100.0	100.0

whilst T and G (in 1974 only) indicate an increase. This implies that the Lorenz curves for these distributions intersect and, therefore, different indices give different rankings. Since the results of Champernowne (1974) suggest that N, L and A (ε=2) are relatively more sensitive to changes at the lower end of the distribution, whereas T is relatively more sensitive to changes at the upper end and G is more sensitive to changes in the middle, it might be plausible to assume that the distribution of HHs by pc HH expenditure is derived from the distribution of HHs by total HH expenditure by redistributing expenditure away from the middle and towards both ends of the distribution. It should be noted that in the following tables, wherever the Lorenz curves of two distributions intersect, T gives (in most cases) a different ranking from those of A, N and L.

The decline in aggregate inequality when moving from distributions where the consuming (or income recipient) unit is the HH to distributions where the consuming unit is the individual, is in line with the results

TABLE 3.2 Distribution of consumption expenditure per equivalent adult

Absolute and relative frequencies (1982 drachmas per month)

Expenditure interval	Absolute number of persons	Relative Frequency	Expected Lognormal Frequency
Less than 5000	344	1.7	1.5
5000-7499	996	5.0	5.7
7500-9999	1950	9.8	9.6
10000-11999	1728	8.7	9.6
12000-13999	2054	10.4	9.5
14000-15999	1854	9.4	9.6
16000-17999	1716	8.7	8.1
18000-19999	1420	7.2	7.0
20000-21999	1317	6.6	6.4
22000-23999	1091	5.5	5.6
24000-25999	843	4.3	4.4
26000-27999	749	3.8	3.8
28000-29999	624	3.1	3.1
30000-32999	701	3.5	3.8
33000-35999	571	2.9	3.0
36000-39999	543	2.7	2.6
40000-44999	470	2.4	2.3
45000-49999	289	1.5	1.5
50000-59999	270	1.4	1.6
More than 60000	285	1.4	1.3
Total	19815	100.0	100.0

of similar work both for Greece and for other countries.[32] Similarly, the Diamond Commission reports that in the U.K. the distribution of income pea is less unequal than the distribution of income pc.[33] The results of Tables 3.3 and 3.4 also show that the various indices are not equally responsive to changes in the concepts of the consuming unit and consumption expenditure. For example, in 1974, the move from the distribution of HHs by total HH expenditure to the distribution of individuals by pea expenditure reduces L by 22.8%, while the relevant reduction in G is only 5.0%.

Some of the Gini indices of Table 3.3 are roughly comparable with the Gini indices estimated by authors cited in the introduction. They are not strictly comparable, however, because in the present work some items of consumption expenditure and some HHs have been excluded from the analysis, expenditures have

32. See, for example, Athanasiou (1984), Deaton (1981a), Anand (1983), Cowell (1984), Morris and Preston (1986). For opposite evidence see the results of C. Morrisson reported in Berry (1985, p.344, note 19).

33. See Morris and Preston (1986, p.287).

TABLE 3.3. The effect of changes in the concepts of consuming unit and consumption expenditure on the degree of inequality (1974)

Distribution of	Sample size	Mean expend.	Gini index G	Atkinson index A (ε=2)	Theil index T	Theil index N	Variance of logs L
HHs by total HH expenditure	7404	10202	0.360	0.401	0.219	0.232	0.501
HHs by per capita HH expenditure	7404	3316	0.369	0.358	0.238	0.228	0.439
HHs by per equiv. adult expenditure	7404	3859	0.356	0.345	0.217	0.213	0.420
Individuals by per capita expend.	25251	2991	0.353	0.337	0.216	0.209	0.406
Individuals by per equiv. adult expenditure	25251	3647	0.342	0.323	0.200	0.196	0.387

been adjusted for inflation and the equivalence scales used differ (sometimes substantially) from those used by these authors. In addition, the estimates of Table 3.3 have been derived from microdata whereas most of those reported by the authors cited in the introduction have been derived from grouped data. Taking these factors into account, we can compare the Gini index for the distribution of HHs by total HH expenditure in 1974 (0.360) with those of Athanasiou (1984) (0.361), Carantinos (1981) (0.344) and Kanellopoulos (1986) (0.373). The fact that Carantinos' estimate is lower than ours should be attributed mainly to the fact that he estimates the Gini index from nine expenditure classes only. In contrast, our estimate is not very different from those of Athanasiou and Kanellopoulos because their estimates are also derived from microdata. Pashardes (1980a, 1980b) reports a Gini index of 0.430 for a distribution which is effectively the "distribution of HHs by equivalent HH expenditure".[34] Although this distribution is not the same as any of those in Table 3.3, it could be expected that its level of inequality should not be markedly different from that of the distribution of HHs by pea expenditure (0.356). No obvious explanation can be offered for the relatively large difference between the two estimates. Athanasiou (1984) also estimates the Gini index of the distribution of individuals by pea expenditure to be 0.301. This is considerably lower than the corresponding estimate of Table 3.3. This is surprising in view of the fact that Athanasiou's estimate of the Gini index for the distribution of HHs by total

34. Pashardes (1980a, 1980b) scales up the total expenditure of each HH by a factor which is equal to the number of HH members divided by the number of equivalent adults in the HH.

TABLE 3.4. The effect of changes in the concepts of consuming unit and consumption expenditure on the degree of inequality (1982)

Distribution of	Sample size	Mean expend.	Gini index G	Atkinson index A (ε=2)	Theil index T	Theil index N	Variance of logs L
HHs by total HH expenditure	6020	54066	0.331	0.356	0.180	0.196	0.432
HHs by per capita HH expenditure	6020	18126	0.331	0.301	0.188	0.182	0.355
HHs by per equiv. adult expenditure	6020	21046	0.321	0.294	0.174	0.173	0.345
Individuals by per capita expend.	19815	16426	0.316	0.281	0.169	0.164	0.328
Individuals by per equiv. adult expenditure	19815	20084	0.309	0.273	0.159	0.159	0.318

HH expenditure is so similar to the relevant estimate in Table 3.3, his equivalence scales are not very different from those used here and he also derives his estimates from microdata.

The following subsections are devoted to the measurement of the level of inequality of particular socioeconomic groups and to the decomposition of aggregate inequality. This decomposition is achieved with reference to a set of factors (variables), taken one at a time (one-way decomposition of inequality). These factors are regional, occupational, demographic, and educational. Ideally, it would be desirable to group the population in equal numbers of groups according to any of these factors (that is, equal numbers of regions, educational groups and so on) because, ceteris paribus, the larger the number of groups the larger the proportion of aggregate inequality attributable to "between-groups" inequality. However, this is not always possible. The primary data of the HESs are given in such a way that for some factors (for instance, demographic) many groups can be constructed, while for some others (for instance, educational) this is impossible. An attempt has been made to construct as many groups as possible, but with an upper limit of nine for each factor. Further, for the purposes of the decomposition analysis, all the characteristics of the HH head are ascribed to each HH member. This is in line with the practice of those of the works mentioned earlier, which perform the decomposition analysis on a per capita basis (that is, those which use as unit of analysis the individual, not the HH).

3i. Measurement and decomposition of inequality by regional factors

We start our measurement and decomposition analysis by examining the impact of regional/geographical factors on aggregate inequality. Two different interpretations can be given to the term "regional inequality". The first is the inequality that arises due to differences in the welfare levels enjoyed by the residents of different geographical regions of a particular country. The second is the inequality that arises due to differences in the welfare levels between cities and villages or between rural and urban areas. In the first case the grouping criterion is the administrative area where an individual resides, whereas in the second it is the size of his municipality or commune. In this subsection, inequality is decomposed according to both criteria. As noted in the introduction, some Greek economists [Geronymakis (1970), Prodromidis (1975), Voloudakis and Panourgias (1980)] - and many politicians - claim that a large part of the observed inequalities in Greece result from regional disparities. However, they rely on aggregate per capita data and do not substantiate their claim through decomposition analysis.

In the top part of Table 3.5 the sample of the 1974 HES is split into nine groups according to the region of residence of the population member. Differences in regional mean expenditures appear to be quite substantial. The ratio of the mean expenditure pea of the richest region (Greater Athens) over the relevant figure of the poorest region (East Macedonia and Thrace) is 1.88. Therefore, at first sight, the above authors seem to be right in pointing out that there are serious differences in the welfare levels enjoyed in different regions of Greece. According to the same results, in two regions (Thessaly and Epirus) inequality was higher than in the entire population. In addition, no clear relationship between inequality and mean regional expenditure can be observed.

The decomposable inequality indices (T, N and L) are given in the last three columns of Table 3.5. For each region the figures in parentheses under these indices are the percentage contributions of inequality "within" each region to aggregate inequality, according to the relevant index.[35] The contributions of "within-regions" and "between-regions" inequalities to aggregate inequality are reported below the results for individual regions. No index gives a contribution of "between-regions" inequality to aggregate inequality higher than 14%. This result is important because it means that even if the government could redistribute

35. Figures may not add up to 100 due to rounding errors.

TABLE 3.5 Measurement and decomposition of inequality by regional factors (1974)

Characteristic of Household Member or Household Head	Populat. Share n_j	Mean Expend. of the group μ_j	Gini Index G	Atkinson Index (ε=2) A	Theil Index T	Theil Index N	Variance of Logs L
REGION							
Greater Athens	0.317	4682	0.318	0.277	0.173 (35.3)	0.166 (26.9)	0.321 (26.3)
East Mainland and Islands	0.108	3729	0.314	0.285	0.164 (9.0)	0.165 (9.1)	0.335 (9.3)
Greater Salonica	0.073	3887	0.311	0.264	0.171 (6.7)	0.160 (6.0)	0.303 (5.7)
Central and West Macedonia	0.097	2859	0.311	0.280	0.160 (6.1)	0.162 (8.0)	0.329 (8.2)
Peloponnese and West Mainland	0.131	3269	0.318	0.285	0.180 (10.6)	0.165 (11.0)	0.334 (11.3)
Thessaly	0.098	2991	0.351	0.329	0.220 (8.8)	0.207 (10.3)	0.394 (9.9)
Crete	0.051	2914	0.328	0.294	0.190 (3.8)	0.179 (4.6)	0.341 (4.5)
Epirus	0.048	2811	0.343	0.326	0.206 (3.8)	0.199 (4.9)	0.389 (4.8)
East Macedonia and Thrace	0.078	2488	0.321	0.289	0.172 (4.6)	0.172 (6.8)	0.341 (6.7)
"Within-groups" component of inequality					0.177 (88.7)	0.172 (87.6)	0.337 (86.7)
"Between-groups" component of inequality					0.023 (11.3)	0.024 (12.4)	0.050 (13.3)
SIZE OF MUNICIPALITY OR COMMUNE							
Greater Athens	0.317	4682	0.318	0.277	0.173 (35.3)	0.166 (26.9)	0.321 (26.3)
Greater Salonica	0.073	3887	0.311	0.264	0.171 (6.7)	0.160 (6.0)	0.303 (5.7)
Other with more than 30000	0.095	3679	0.321	0.289	0.176 (8.4)	0.172 (8.3)	0.337 (8.3)
10000-29999	0.082	3675	0.321	0.310	0.171 (7.1)	0.177 (7.4)	0.369 (7.8)
5000-9999	0.035	3624	0.321	0.298	0.167 (2.9)	0.173 (3.1)	0.355 (3.3)

(continued)

2000-4999	0.076	3201	0.329	0.296	0.183	0.179	0.349
					(6.1)	(6.9)	(6.8)
1000-1999	0.085	2830	0.326	0.291	0.195	0.179	0.335
					(6.5)	(7.8)	(7.4)
Less than 1000	0.236	2599	0.319	0.286	0.171	0.169	0.335
					(14.4)	(20.3)	(20.4)
"Within-groups" component of inequality					0.175	0.170	0.333
					(87.3)	(86.7)	(86.0)
"Between-groups" component of inequality					0.025	0.026	0.054
					(12.7)	(13.3)	(14.0)
Urban (more than 10000)	0.568	4266	0.324	0.292	0.179	0.174	0.342
					(59.5)	(50.4)	(50.2)
Rural (less than 10000)	0.432	2834	0.327	0.297	0.184	0.179	0.350
					(30.9)	(39.5)	(39.1)
"Within-groups" component of inequality					0.181	0.176	0.346
					(90.4)	(89.9)	(89.3)
"Between-groups" component of inequality					0.019	0.020	0.041
					(9.6)	(10.1)	(10.7)
GREECE	1.000	3647	0.342	0.323	0.200	0.196	0.387

consumption expenditure so that the mean consumption expenditure pea for each region was equal to the national mean, but the level of inequality within each region remained unchanged (that is, if regional disparities were completely eliminated) aggregate inequality would not be reduced by more than 14%. In other words, in 1974 more than 85% of the existing inequality was due to the unequal distribution of consumption expenditure within the regions of Greece. Hence, our analysis contradicts the conclusions of Geronymakis (1970), Prodromidis (1975), and Voloudakis and Panourgias (1980). Note also that for most regions the percentage contributions of "within-regions" inequalities to aggregate inequality according to N and L are very similar and rather different from the percentage given by T. In addition, the higher the mean expenditure of a region the higher its "within-region" component of inequality according to T vis-a-vis its "within-region" component indicated by N and L. This pattern is observed in all the following tables of this section. Taking into account, firstly, that T is relatively more sensitive to the existence of very high expenditures whilst N and L are relatively more sensitive to the existence of very low expenditures and, secondly, that the weights of the "within-groups" component of inequality are the expenditure shares in the case of T but the population shares in the case of L and N, these results are hardly surprising.

In the next part of Table 3.5, the 1974 HES sample is split into eight groups according to the size of municipality or commune of the individual's residence. In no group is the level of inequality higher than aggregate inequality. What is, perhaps, more interesting is the apparent linear relationship between the rank of the mean expenditure pea and the rank of the size of the locality. Similar relationships have been observed in many other countries.[36] Again, the decomposition analysis indicates that the percentage of aggregate inequality which can be attributed to "between-groups" inequality is only 12.7% (T), 13.3% (N) or 14.0% (L). The major part of inequality is due to inequalities within each group.

The last part of Table 3.5 reports estimates of inequality for the urban and the rural areas and decomposes aggregate inequality accordingly. In 1974 mean expenditure pea in urban areas was more than 50% higher than in rural areas and inequality was slightly higher in the later areas. This is in line with the findings of Pashardes (1980a, 1980b) Carantinos (1981) and Athanasiou (1984), although our results indicate a far smaller inequality differential than the results of these authors.[37] This result (inequality being higher in rural than in urban areas) is rather unusual. Jain (1975) presents several (income) distributions for many countries for urban and rural areas separately and in most cases inequality appears to be higher in urban areas. A satisfactory explanation of why the evidence in Greece appears to be different might be the one offered by Pashardes (1980b). He argues that part of the Greek high income (and, therefore, high expenditure) classes reside in suburban areas around big cities (Athens, Salonica). According to our classification these areas have been included in the group of rural areas along with other agricultural municipalities or communes of similar or smaller size. This results in a bimodal distribution with high measures of inequality for rural areas.

Carantinos (1981) attempts a decomposition of aggregate inequality into "between-groups" and "within-groups" components according to the dichotomy urban/rural areas, using Theil's T index. He finds that 40.7% of aggregate inequality was due to inequality within urban areas, 33.4% to inequality within rural areas and 25.9% to inequality between urban and rural areas. These estimates are strikingly different from the

36. See for example van Ginneken (1980a) (Mexico), Deaton (1981a) (Sri Lanka) and Anand (1983) (Malaysia).

37. According to Pashardes (1980a, 1980b) the Gini indices for the distribution of HHs by equivalent HH expenditure of the urban and rural areas in 1974 were 0.430 and 0.451, respectively. The relevant estimates of Carantinos (1981) for the distribution of HHs by total HH expenditure are 0.322 and 0.344. Athanasiou (1984) calculates the Gini index for the distribution of HHs by total HH expenditure to be 0.341 for the urban and 0.364 for the rural areas and the corresponding Gini indices for the distribution of individuals by pea expenditure to be 0.270 and 0.287.

relevant estimates of Table 3.5. The difference in the contribution of the "between-groups" component should be attributed to the fact that Carantinos uses a very limited number of expenditure classes for his analysis. As noted earlier, the "between-groups" component of T is calculated using the group mean expenditures and the expenditure shares of the groups. Therefore, it is not affected by the fact that grouped data are used. However, the "within-groups" components are calculated using all the information available. Hence, the existence of some individuals with very high or very low expenditures within urban or rural areas increases the relevant T indices. If grouped data are used, these extreme expenditures affect only marginally the means of the relevant expenditure classes. Hence, in the study of Carantinos the estimates of T for urban and rural areas are downwards biased and the contribution of "between-groups" inequality is overstated.[38]

Table 3.6 is the equivalent of Table 3.5 for 1982. However, the regional classifications of the two HESs are not identical. In the 1974 HES some Aegean Islands are grouped with Thessaly and some others with East Mainland and Islands, whereas in the 1982 HES all of them are grouped with East Mainland and Islands. The first comment that can be made comparing the top panels of Tables 3.5 and 3.6 is that between 1974 and 1982 inequality declined in every region of Greece, according to all the indices used here. In addition, the ratio of the mean expenditure pea of the highest expenditure region (Greater Athens) to that of the lowest expenditure region (Epirus)[39] declined from 1.88 to 1.54. Three regions (East Macedonia and Thrace, Epirus and East Mainland and Islands) exhibit levels of inequality higher than the national average and none of the decomposable indices attributes more than 9% of the overall inequality to "between-regions" disparities. This percentage is even lower than the corresponding 1974 percentage and is in sharp contrast with both the claims of Geronymakis (1970), Prodromidis (1975), and Voloudakis and Panourgias (1980) and the popular belief that a large part of the existing inequalities in Greece are due to inter-regional disparities.

The results of the second panel of Table 3.6 show that between 1974 and 1982 inequality declined in all the groups of localities. Decomposition analysis shows that in 1982 "between-locational-groups" disparities contributed only 11%-12% of aggregate inequality. Between 1974 and 1982 the share of urban

38. The use of grouped data gives relatively low estimates of the ratio of "within-groups" inequality over total inequality in the case of other studies, as well; see for example van Ginneken (1980a).

39. Note that the region with the lowest mean expenditure pea in 1974 (East Macedonia and Thrace) is ranked higher than Epirus, Thessaly and Central and West Macedonia according to this criterion in 1982.

TABLE 3.6 Measurement and decomposition of inequality by regional factors (1982)

Characteristic of Household Member or Household Head	Populat. Share n_j	Mean Expend. of the group μ_j	Gini Index G	Atkinson Index (ε=2) A	Theil Index T	Theil Index N	Variance of Logs L
REGION							
Greater Athens	0.319	24696	0.290	0.239	0.139 (34.3)	0.138 (27.7)	0.273 (27.4)
East Mainland and Islands	0.126	18296	0.310	0.279	0.160 (11.6)	0.160 (12.7)	0.323 (12.8)
Greater Salonica	0.072	20874	0.278	0.211	0.133 (6.3)	0.125 (5.7)	0.238 (5.4)
Central and West Macedonia	0.096	16686	0.282	0.238	0.129 (6.5)	0.132 (8.0)	0.271 (8.2)
Peloponnese and West Mainland	0.136	18167	0.304	0.258	0.153 (11.8)	0.151 (12.9)	0.299 (12.8)
Thessaly	0.081	16668	0.298	0.255	0.151 (6.4)	0.148 (7.5)	0.291 (7.4)
Crete	0.050	19136	0.278	0.261	0.126 (3.8)	0.135 (4.2)	0.292 (4.6)
Epirus	0.042	16024	0.316	0.285	0.163 (3.5)	0.167 (4.4)	0.342 (4.5)
East Macedonia and Thrace	0.078	17253	0.317	0.281	0.171 (7.2)	0.167 (8.2)	0.327 (8.0)
"Within-groups" component of inequality					0.145 (91.4)	0.145 (91.3)	0.290 (91.1)
"Between-groups" component of inequality					0.014 (8.6)	0.014 (8.7)	0.028 (8.9)
SIZE OF MUNICIPALITY OR COMMUNE							
Greater Athens	0.319	24696	0.290	0.239	0.139 (34.3)	0.138 (27.7)	0.273 (27.4)
Greater Salonica	0.072	20874	0.278	0.211	0.133 (6.3)	0.125 (5.7)	0.238 (5.4)
Other with more than 30000	0.117	21298	0.289	0.253	0.135 (10.6)	0.140 (10.3)	0.289 (10.7)
10000-29999	0.082	19676	0.313	0.285	0.164 (8.3)	0.165 (8.5)	0.336 (8.7)
5000-9999	0.037	18199	0.290	0.247	0.139 (2.9)	0.141 (3.2)	0.287 (3.3)

(continued)

2000-4999	0.069	17453	0.300	0.264	0.151 (5.7)	0.151 (6.7)	0.306 (6.7)
1000-1999	0.087	16028	0.275	0.212	0.129 (5.7)	0.124 (6.8)	0.238 (6.5)
Less than 1000	0.216	15311	0.294	0.255	0.144 (14.9)	0.145 (19.7)	0.292 (19.8)
"Within-groups" component of inequality					0.141 (88.7)	0.141 (88.6)	0.281 (88.5)
"Between-groups" component of inequality					0.018 (11.3)	0.018 (11.4)	0.037 (11.5)
Urban (more than 10000)	0.591	22854	0.296	0.252	0.145 (61.3)	0.145 (53.9)	0.290 (53.9)
Rural (less than 10000)	0.409	16087	0.293	0.251	0.144 (29.7)	0.143 (36.8)	0.286 (36.8)
"Within-groups" component of inequality					0.145 (91.0)	0.144 (90.7)	0.288 (90.7)
"Between-groups" component of inequality					0.014 (9.0)	0.015 (9.3)	0.030 (9.3)
GREECE	1.000	20084	0.309	0.273	0.159	0.159	0.318

population rose by 2.3% and the ratio between the mean expenditure pea of the urban and the rural areas declined from 1.51 to 1.42. All indices point out that inequality declined in both urban and rural areas, but more substantially in the latter. As a result, in 1982 inequality was higher in the urban than in the rural areas of Greece. Only 9.0%-9.3% of aggregate inequality can be attributed to disparities between urban and rural areas. In addition, all the decomposable indices show an increase in the percentage of inequality attributable to the "within-urban-areas" component of inequality between 1974 and 1982. This increase is due to the fact that between 1974 and 1982 both the expenditure and the population share of the urban sector rose and - unlike 1974 - in 1982 its inequality was higher than that of the rural sector.

Kuznets (1963), using evidence from Italy and the USA, proposed that during the process of economic development inequality might follow an inverse U-shaped pattern at a regional level. This is an extension of the basic Kuznets (1955) hypothesis that national inequality follows an inverse U-shaped pattern during the process of economic development. The latter hypothesis has been scrutinized by a number of

authors in recent years.[40] The hypothesis that inequality follows an inverse U-shaped pattern at a regional level has been tested by Ahmad (1981) for Pakistan and by Anand (1983) for Malaysia. Both studies found very little support for it. The following equations attempt to test this hypothesis for Greece for 1974 and 1982 separately and pooling data from both years using the nine regions as observations and the Gini index as summary measure of inequality. All the regional mean expenditures pea are in 1974 prices.

(1974) $G = \underset{(0.92)}{-0.883} + \underset{(0.14)}{0.325}\ln X - \underset{(0.15)}{0.022}(\ln X)^2$ $F=0.57$ $R^2=0.160$

(1982) $G = \underset{(0.52)}{11.702} - \underset{(0.50)}{2.601}\ln X + \underset{(0.49)}{0.149}(\ln X)^2$ $F=0.74$ $R^2=0.198$

(both years) $G = \underset{(0.12)}{-0.364} + \underset{(0.28)}{0.214}\ln X - \underset{(0.35)}{0.016}(\ln X)^2$ $F=8.56$ $R^2=0.533$

where X: regional mean expenditure pea

(t-ratios in parentheses)

A simple quadratic functional form was also tried instead of the quadratic logarithmic form and the results were very similar. An attempt to use other inequality indices instead of G produced almost identical results. Clearly, the hypothesis that inequality follows an inverse U-shaped pattern at a regional level cannot be accepted either for 1974 or for 1982. When the samples are pooled the t-ratios remain very low but both R^2 and the F-ratio appear to be relatively high. This is a consequence of the high degree of correlation between lnX and $(\ln X)^2$. Then, the same equations were reestimated after dropping the quadratic term.

(1974) $G = \underset{(2.38)}{0.555} - \underset{(1.14)}{0.029}\ln X$ $F=1.30$ $R^2=0.156$

(1982) $G = \underset{(2.06)}{0.698} - \underset{(1.18)}{0.047}\ln X$ $F=1.40$ $R^2=0.167$

(both years) $G = \underset{(7.37)}{0.730} - \underset{(4.24)}{0.051}\ln X$ $F=17.99$ $R^2=0.500$

Once again, no clear relationship between inequality and regional mean expenditure pea can be established,

40. See, for example, Ahluwalia (1976), Anand and Kanbur (1981), Saith (1983), Papanek and Kyn (1986), Tsakloglou (1988). See, also, Williamson (1965) who stresses the importance of "between-regions" disparities for the generation of the inverse U-shaped process at a national level.

either for 1974 or for 1982. However, when the samples are pooled there seems to appear a strong negative association between G and lnX. It is far from clear that this negative correlation establishes a relationship and, even if it does, this is certainly not the inverse U-shaped relationship suggested by Kuznets (1963).

The main point of this subsection is that, contrary to the popular opinion, most of the observed welfare inequalities in Greece are due to inequalities within regions and/or within urban and rural areas. Inequalities between regions and between urban and rural areas play a far less important role in the determination of aggregate inequality.

3ii. Measurement and decomposition of inequality by occupational factors

The classification of the HESs allows the measurement and decomposition of inequality by four occupational factors: sector of employment, type of profession and occupational status of HH head and number of economically active HH members. Among the authors cited in the introduction, Germidis and Negreponti-Delivanis (1975) support the idea that a large part of the existing inequality in Greece arises from the substantial income differentials between sectors of economic activity; particularly between agricultural and non-agricultural activities. However, they only look at average figures without examining the level of "within-sectors" inequality. Since their analysis refers to income (not consumption expenditure) it is not strictly comparable to the present one. However, a direct implication of their argument is that a large part of the observed inequalities should be attributed to "between-sectors-of-employment" inequalities.

The measurement and decomposition of inequality by sector of employment of HH head is presented in the top panel of Table 3.7. The relatively fine groups of the original 1974 HES data set have been regrouped into nine sectoral groups. The group labelled "Other" includes members of HHs headed by housewives, students, unemployed, unpaid family workers and other. Only two groups exhibit levels of inequality higher than the national average: "Retired" and "Other". This is not surprising since both groups are very heterogeneous; particularly "Other", which exhibits the highest level of inequality. The sector of employment whose members enjoy by far the highest mean expenditure level is "Banks and Insurances". This is in line with the widespread belief among the members of the public in Greece that jobs in the banking sector are

TABLE 3.7 Measurement and decomposition of inequality by occupational factors (1974)

Characteristic of Household Member or Household Head	Populat. Share n_j	Mean Expend. of the group μ_j	Gini Index G	Atkinson Index (ε=2) A	Theil Index T	Theil Index N	Variance of Logs L
SECTOR OF EMPLOYMENT OF HOUSEHOLD HEAD							
Agriculture	0.225	2505	0.305	0.261	0.157 (12.1)	0.153 (17.5)	0.301 (17.5)
Manufacturing/ Handicraft	0.149	3820	0.308	0.265	0.164 (12.8)	0.157 (12.0)	0.304 (11.7)
Mining etc*	0.100	3659	0.293	0.257	0.146 (7.3)	0.146 (7.6)	0.294 (7.6)
Commerce/Hotels/ Restaurants	0.119	4153	0.327	0.293	0.178 (12.0)	0.176 (10.7)	0.347 (10.7)
Transport/ Communications	0.075	4028	0.300	0.241	0.161 (6.6)	0.147 (5.6)	0.273 (5.3)
Banks/Insurances	0.022	6156	0.327	0.291	0.175 (3.3)	0.175 (2.0)	0.344 (2.0)
Services	0.109	4739	0.315	0.269	0.167 (11.9)	0.161 (9.0)	0.312 (8.8)
Retired	0.130	3214	0.356	0.351	0.217 (12.4)	0.215 (14.3)	0.430 (14.5)
Other	0.070	3959	0.381	0.401	0.245 (9.4)	0.250 (9.0)	0.509 (9.3)
"Within-groups" component of inequality					0.176 (87.8)	0.172 (87.7)	0.338 (87.4)
"Between-groups" component of inequality					0.024 (12.2)	0.024 (12.3)	0.049 (12.6)
TYPE OF PROFESSION OF HOUSEHOLD HEAD							
Professional or Technical	0.048	6503	0.306	0.262	0.158 (6.8)	0.154 (3.8)	0.301 (3.8)
Executive or Manager	0.014	7374	0.277	0.209	0.127 (1.7)	0.121 (0.8)	0.228 (0.8)
Clerical worker	0.063	4618	0.292	0.229	0.143 (5.7)	0.137 (4.4)	0.260 (4.3)
Sales worker	0.086	4259	0.334	0.304	0.186 (9.4)	0.184 (8.1)	0.362 (8.1)

(continued)

Service worker	0.063	3601	0.286	0.236	0.138	0.135	0.267
					(4.3)	(4.3)	(4.3)
Farmer	0.224	2499	0.304	0.260	0.156	0.152	0.300
					(12.0)	(17.4)	(17.4)
Production or Transport worker	0.294	3551	0.283	0.236	0.136	0.134	0.267
					(19.5)	(20.1)	(20.3)
Retired	0.130	3214	0.356	0.351	0.217	0.215	0.430
					(12.4)	(14.3)	(14.5)
Other	0.070	4188	0.379	0.403	0.240	0.248	0.515
					(10.7)	(9.8)	(10.4)
"Within-groups" component of inequality					0.165	0.163	0.325
					(82.5)	(83.0)	(83.9)
"Between-groups" component of inequality					0.035	0.033	0.062
					(17.5)	(17.0)	(16.1)
OCCUPATIONAL STATUS OF HOUSEHOLD HEAD							
Employer	0.060	5692	0.315	0.286	0.169	0.167	0.334
					(7.9)	(5.1)	(5.2)
Self-employed (agric. sector)	0.201	2441	0.296	0.250	0.148	0.145	0.287
					(10.0)	(14.9)	(14.9)
Self-employed (non-agric. sector)	0.178	3876	0.330	0.296	0.190	0.181	0.347
					(17.9)	(16.4)	(15.9)
Employee	0.359	3964	0.304	0.261	0.157	0.153	0.300
					(30.7)	(28.1)	(27.9)
Retired	0.130	3214	0.356	0.351	0.217	0.215	0.430
					(12.4)	(14.3)	(14.5)
Other	0.072	3965	0.380	0.420	0.244	0.249	0.507
					(9.5)	(9.1)	(9.4)
"Within-groups" component of inequality					0.177	0.172	0.340
					(88.4)	(87.9)	(87.8)
"Between-groups" component of inequality					0.023	0.024	0.047
					(11.6)	(12.1)	(12.2)
NUMBER OF ECONOMICALLY ACTIVE HOUSEHOLD MEMBERS							
None	0.106	3689	0.393	0.418	0.263	0.267	0.542
					(14.1)	(14.4)	(14.8)
1	0.508	3903	0.329	0.303	0.184	0.181	0.358
					(50.1)	(47.0)	(47.0)
2	0.268	3446	0.335	0.307	0.192	0.187	0.366
					(24.3)	(25.5)	(25.3)
More than 2	0.118	2963	0.336	0.298	0.201	0.187	0.349
					(9.6)	(11.3)	(10.6)

(continued)

"Within-groups" component of inequality					*0.196 (98.1)*	*0.192 (98.2)*	*0.378 (97.7)*
"Between-groups" component of inequality					*0.004 (1.9)*	*0.004 (1.8)*	*0.009 (2.3)*
GREECE	*1.000*	*3647*	*0.342*	*0.323*	*0.200*	*0.196*	*0.387*

* *Mining/Electricity/Gas/Water/Construction/Public Utilities*

highly remunerated.[41] The lowest mean expenditure pea is observed among members of agricultural HHs, whose mean expenditure is only 63% of the relevant figure of all the non-agricultural groups together. The mean expenditure of HHs headed by persons employed in "Banks and Insurances" is 2.46 times higher than that of members of agricultural HHs. Hence, it can be argued that Germidis and Negreponti-Delivanis (1975) may be right in suggesting that there exist large differentials between sectors of employment which might cause significant "between-sectors" inequalities. However, all the decomposable indices suggest that the "between-sectors" component of inequality is around 12.5% of overall inequality. This percentage is rather low and does not lend support to the above argument.[42] The relatively low percentage of the "between-sectors" component of inequality can be explained if we look at the mean expenditures and the population and expenditure shares of the various sectors. With the exception of "Banks and Insurances" the mean expenditures of the other sectors cluster around the national mean. Since population or expenditure shares are used as weights for the calculation of the "between-sectors" component of inequality and the shares of "Banks and Insurances" in total expenditure and population are only 3.8% and 2.2% respectively, one could expect that the "between-sectors" component would not be very high.

In the next panel of Table 3.7, the population is grouped according to the type of profession of HH head in nine broad (one-digit) categories. With the exception of "Retired" and "Other", the disparities within professions are not as large as the overall disparities. Members of HHs headed by "Farmers" have the lowest mean expenditure, whereas the mean expenditures of individuals belonging to HHs headed by "Executives or Managers" and "Professional and Technical workers" are strikingly high. In particular the mean expenditure pea of the tiny "Executives and Managers" group is more than twice the national mean and almost three times

41. See Athanasiou (1984, pp 57-58) for salary differentials between the banking sector and other sectors.

42. Athanasiou (1984), also, asserts that a substantial part of the observed level of inequality may be due to oligopolistic profits in activities related to commerce. The results of Table 3.7 do not seem to support this assertion.

the mean expenditure of "Farmers". In addition, inequality in the distribution of expenditure within the "Executives and Managers" group is substantially lower than that of any other group. The "between-professions" contribution to inequality in 1974 was 17.5% by T, 17.0% by N and 16.1% by L. Note, also, that although the level of inequality among members of HHs headed by "Production and Transport workers" is relatively low, the percentage contribution of this group to the "within-profession" component of inequality is the highest among all the groups. This is a consequence of the high population and income share of the group.

The third panel of Table 3.7 reports the results of measurement and decomposition of inequality when the population is grouped according to the occupational status of HH head. For the purposes of the present analysis it was decided to split the rather heterogeneous group of "Self-employed" into two homogeneous groups according to the sector of employment of the HH head. As one could expect taking into account the experience of other countries, the highest mean expenditure is observed among members of HHs headed by "Employers" and the lowest among members of HHs headed by "Self-employed in the agricultural sector". Decomposition analysis shows that the "between-groups" component of inequality contributes around 12% to aggregate inequality. Once again, this percentage does not seem to be impressively high.

In the last part of Table 3.7 the population is split up into four groups according to the number of economically active HH members. More than half the population was living in HHs with one economically active member in 1974. The mean expenditures of the four groups do not vary substantially around the national average. In addition, the levels of inequality within three of these groups are only marginally lower than the national average, whilst inequality within the fourth group (members of HHs with no economically active members) is considerably higher than the national average.[43] As a result of these factors, the "between-groups" component of inequality is rather negligible (around 2.0%).

Table 3.8 presents the results of measurement and decomposition of inequality by occupational factors in 1982. These results are fairly similar to those of Table 3.7. The ranking of the various socioeconomic groups according to their mean expenditure and degree of inequality is largely similar to the corresponding ranking in 1974. However, the level of inequality within most of these groups was substantially

43. The high level of inequality among members of HHs with no economically active HH members is consistent with the high levels of inequality within the groups "Retired" and "Other" observed in the previous panels of Table 3.7.

TABLE 3.8 Measurement and decomposition of inequality by occupational factors (1982)

Characteristic of Household Member or Household Head	Populat. Share n_j	Mean Expend. of the group μ_j	Gini Index G	Atkinson Index (ε=2) A	Theil Index T	Theil Index N	Variance of Logs L
SECTOR OF EMPLOYMENT OF HOUSEHOLD HEAD							
Agriculture	0.185	15193	0.290	0.244	0.142 (12.5)	0.140 (16.3)	0.277 (16.1)
Manufacturing/ Handicraft	0.151	20787	0.273	0.214	0.124 (12.2)	0.122 (11.6)	0.241 (11.4)
Mining etc*	0.106	19237	0.302	0.257	0.154 (9.8)	0.151 (10.1)	0.298 (9.9)
Commerce/Hotels/ Restaurants	0.118	22843	0.305	0.266	0.157 (13.2)	0.155 (11.5)	0.309 (11.4)
Transport/ Communications	0.071	21612	0.271	0.205	0.122 (5.9)	0.117 (5.2)	0.226 (5.1)
Banks/Insurances	0.025	31357	0.253	0.198	0.103 (2.6)	0.104 (1.7)	0.212 (1.7)
Services	0.111	25532	0.282	0.235	0.130 (11.6)	0.132 (9.2)	0.267 (9.3)
Retired	0.156	16798	0.306	0.269	0.155 (12.7)	0.156 (15.3)	0.314 (15.4)
Other	0.077	21077	0.320	0.295	0.170 (8.6)	0.173 (8.3)	0.352 (8.5)
"Within-groups" component of inequality					0.142 (89.1)	0.142 (89.2)	0.282 (88.8)
"Between-groups" component of inequality					0.017 (10.9)	0.017 (10.8)	0.036 (11.2)
TYPE OF PROFESSION OF HOUSEHOLD HEAD							
Professional or Technical	0.070	30818	0.284	0.254	0.131 (8.8)	0.138 (6.0)	0.290 (6.4)
Executive or Manager	0.018	32000	0.290	0.250	0.138 (2.5)	0.147 (1.7)	0.313 (1.8)
Clerical worker	0.059	24457	0.267	0.207	0.117 (5.3)	0.116 (4.3)	0.230 (4.2)
Sales worker	0.083	23711	0.297	0.250	0.147 (9.0)	0.146 (7.6)	0.292 (7.6)

(continued)

Service worker	0.053	20551	0.287	0.241	0.146	0.138	0.265
					(5.0)	(4.6)	(4.5)
Farmer	0.183	15084	0.286	0.238	0.135	0.135	0.272
					(11.6)	(15.5)	(15.6)
Production or Transport worker	0.296	19190	0.267	0.214	0.117	0.118	0.238
					(20.8)	(22.0)	(22.2)
Retired	0.156	16798	0.306	0.269	0.155	0.156	0.314
					(12.7)	(15.3)	(15.4)
Other	0.082	21859	0.319	0.303	0.169	0.173	0.355
					(9.5)	(9.0)	(9.2)
"Within-groups" component of inequality					0.135	0.137	0.276
					(85.2)	(86.0)	(86.9)
"Between-groups" component of inequality					0.024	0.022	0.042
					(14.8)	(14.0)	(13.1)
OCCUPATIONAL STATUS OF HOUSEHOLD HEAD							
Employer	0.069	27694	0.303	0.255	0.151	0.150	0.296
					(9.0)	(6.5)	(6.4)
Self-employed (agric. sector)	0.161	14614	0.278	0.227	0.127	0.128	0.258
					(9.4)	(13.0)	(13.1)
Self-employed (non-agric. sector)	0.151	20256	0.295	0.249	0.142	0.143	0.286
					(13.6)	(13.6)	(13.6)
Employee	0.382	22063	0.287	0.241	0.137	0.136	0.273
					(36.2)	(32.7)	(32.8)
Retired	0.156	16798	0.306	0.269	0.155	0.156	0.314
					(12.7)	(15.3)	(15.4)
Other	0.081	21207	0.322	0.303	0.175	0.175	0.354
					(9.4)	(8.9)	(9.0)
"Within-groups" component of inequality					0.144	0.143	0.287
					(90.3)	(90.0)	(90.3)
"Between-groups" component of inequality					0.015	0.016	0.031
					(9.7)	(10.0)	(9.7)
NUMBER OF ECONOMICALLY ACTIVE HOUSEHOLD MEMBERS							
None	0.133	18732	0.340	0.318	0.196	0.193	0.381
					(15.3)	(16.2)	(16.0)
1	0.500	20723	0.299	0.256	0.150	0.148	0.294
					(48.6)	(46.5)	(46.2)
2	0.278	20530	0.315	0.284	0.163	0.165	0.333
					(29.1)	(28.8)	(29.1)
More than 2	0.089	17148	0.273	0.241	0.121	0.127	0.270
					(5.8)	(7.1)	(7.6)

(continued)

"Within-groups"					*0.157*	*0.157*	*0.315*
component of inequality					*(98.8)*	*(98.6)*	*(98.9)*
"Between-groups"					*0.002*	*0.002*	*0.003*
component of inequality					*(1.2)*	*(1.4)*	*(1.1)*
GREECE	*1.000*	*20084*	*0.309*	*0.273*	*0.159*	*0.159*	*0.318*

* *Mining/Electricity/Gas/Water/Construction/Public Utilities*

lower in 1982 than in 1974. The first inequality decomposition by occupational factors for 1982 is that by sector of employment of HH head, which is given in the top panel of Table 3.8. As in 1974, the mean expenditure pea is highest among HHs headed by persons employed in "Banks and Insurances" and lowest among HHs whose heads work in the agricultural sector. However, the ratio between the mean expenditures of these groups declined from 2.46 in 1974 to 2.06 in 1982. As in 1974, the distribution of consumption expenditure pea of the "Other" group is more unequal than that of the entire population. Unlike 1974, although inequality within the group of members of HHs headed by "Retired" persons is the second highest among all the groups, it is lower than the national average. At the other extreme, inequality in the group "Banking and Insurance" is substantially lower than that of any other group whichever index is used. For all sectors inequality appears to be lower in 1982 than in 1974, with one exception: this is the sector of "Mining, etc" whose inequality according to all the indices used in our analysis, apart from A, rose between the two years. The "between-sectors" component accounts for less than 12% of aggregate inequality by any decomposable summary measure of inequality. Hence, the arguments of Germidis and Negreponti-Delivanis (1975) are not supported by our empirical findings for 1982 either.

According to the next panel of Table 3.8, in 1982 members of HHs headed by "Executives or Managers" and "Farmers" had, respectively, the highest and the lowest levels of mean consumption expenditure pea when individuals are grouped according to the type of profession of HH head. Although this ranking is exactly the same as the relevant ranking for 1974, the ratio between the mean expenditures of these groups declined from 2.95 to 2.12 between these years. In two groups inequality was higher in 1982 than in 1974: "Executives and Managers" and "Service workers". In the latter the 1974 and 1982 Lorenz curves intersect and, unlike the other indices, L ranks the 1982 distribution as more equal than the 1974 distribution. The contribution of the "between-professions" component of inequality is 14.8% (T), 14.0% (N) or 13.1% (L).

The third part of Table 3.8 presents a breakdown of the distribution of consumption expenditure pea by occupational status of HH head for 1982. All the "within-group" inequalities are lower in 1982 than in 1974 and the ranking of the groups by mean expenditure pea is very similar for the two years. Occupational status accounts for 9.7% (T and L) or 10.0% (N) of aggregate inequality . Thus, it cannot be claimed that "between-occupational-groups" disparities account for more than a small proportion of the observed inequality in 1982 either. The last panel of Table 3.8 reports the results of measurement and decomposition of inequality in 1982 when the grouping variable is the number of economically active HH members. Inequality within two of the four groups (members of HHs with two and, particularly, with no economically active members) is substantially higher than the national average, and in the rest of the groups it is not far below this average. As a result, "within-groups" inequality accounts for more than 98.5% of aggregate inequality.

In general, there is a rather clear conclusion that can be drawn from the results of the decomposition analysis of Tables 3.7 and 3.8. With the possible exception of the type of profession, occupational factors do not seem to play a very important role in the determination of the level of welfare inequality in Greece. Even for the type of profession of HH head the "between-groups" component of inequality accounts only for between 13.0% and 17.5% of aggregate inequality, depending on the index and the year under consideration.

3iii. Measurement and decomposition of inequality by demographic factors

The information contained in the HESs allows three types of inequality decomposition by demographic factors: by age and sex of HH head and by number of HH members. This analysis is performed below. However, it must be stressed that the results of this section are affected, to a very large extent, by the particular equivalence scales used. If different values were assigned to the equivalence scales for the cost of children, or different assumptions were made regarding economies of scale in consumption, or was assumed that needs differ between age and/or sex groups of adults, the results of this subsection could have been very different. None of the authors who have worked on inequality in Greece has stressed the impact of disparities between age groups on aggregate inequality. However, authors whose research focuses on other countries have stressed this impact. Probably, the most notable example is Paglin (1975) who essentially argues that, from a normative point of view, the impact of life-cycle factors should be removed when inequality is

TABLE 3.9 Measurement and decomposition of inequality by demographic factors (1974)

Characteristic of Household Member or Household Head	Populat. Share nj	Mean Expend. of the group mj	Gini Index G	Atkinson Index (e=2) A	Theil Index T	Theil Index N	Variance of Logs L
AGE OF HOUSEHOLD HEAD							
Less than 25	0.013	4802	0.295	0.249	0.169	0.148	0.279
					(1.3)	(1.0)	(0.9)
25-34	0.135	4266	0.318	0.286	0.167	0.168	0.337
					(13.2)	(11.6)	(11.8)
35-44	0.292	3847	0.332	0.311	0.189	0.186	0.369
					(29.1)	(27.7)	(27.8)
45-54	0.248	3582	0.339	0.306	0.201	0.190	0.363
					(24.5)	(24.1)	(23.3)
55-64	0.167	3349	0.335	0.314	0.189	0.188	0.375
					(14.5)	(16.0)	(16.2)
65-74	0.108	3150	0.361	0.344	0.230	0.218	0.415
					(10.8)	(12.1)	(11.6)
More than 74	0.037	2648	0.383	0.370	0.267	0.246	0.457
					(3.5)	(4.6)	(4.3)
"Within-groups" component of inequality					0.194	0.190	0.371
					(96.9)	(97.1)	(95.9)
"Between-groups" component of inequality					0.006	0.006	0.016
					(3.1)	(2.9)	(4.1)
NUMBER OF HOUSEHOLD MEMBERS							
1	0.025	5080	0.431	0.484	0.315	0.326	0.666
					(5.4)	(4.1)	(4.3)
2	0.130	3939	0.383	0.391	0.249	0.249	0.495
					(17.5)	(16.5)	(16.7)
3	0.189	4160	0.337	0.325	0.192	0.193	0.392
					(20.7)	(18.6)	(19.2)
4	0.317	3775	0.308	0.275	0.161	0.160	0.319
					(26.4)	(25.8)	(26.1)
5	0.190	3335	0.324	0.292	0.178	0.174	0.343
					(15.5)	(16.9)	(16.9)
6	0.095	2821	0.314	0.266	0.169	0.161	0.308
					(6.2)	(7.8)	(7.5)

(continued)

More than 6	*0.054*	*2283*	*0.285*	*0.259*	*0.143*	*0.143*	*0.294*
					(2.4)	*(3.9)*	*(4.1)*
"Within-groups" component of inequality					*0.188* *(94.1)*	*0.183* *(93.6)*	*0.367* *(94.8)*
"Between-groups" component of inequality					*0.012* *(5.9)*	*0.013* *(6.4)*	*0.020* *(5.2)*
SEX OF HOUSEHOLD HEAD							
Male	*0.916*	*3622*	*0.338*	*0.315*	*0.195*	*0.191*	*0.376*
					(88.7)	*(89.2)*	*(88.9)*
Female	*0.084*	*3923*	*0.381*	*0.399*	*0.246*	*0.249*	*0.506*
					(11.2)	*(10.7)*	*(11.0)*
"Within-groups" component of inequality					*0.1998* *(99.9)*	*0.1958* *(99.9)*	*0.3866* *(99.9)*
"Between-groups" component of inequality					*0.0002* *(0.1)*	*0.0002* *(0.1)*	*0.0004* *(0.1)*
GREECE	*25251*	*3647*	*0.342*	*0.323*	*0.200*	*0.196*	*0.387*

measured. Therefore, the "between-age-groups" component of (income) inequality should be subtracted from aggregate inequality.[44] Several authors have disputed both the theoretical and the empirical validity of Paglin's arguments. Moreover, it is debatable whether these argument apply to the distribution of consumption expenditure, particularly within a "life-cycle hypothesis" framework. However, since our analysis is descriptive rather than normative, it was decided to attempt a decomposition analysis in this context.

In the top panel of Table 3.9 the 1974 HES sample is grouped into seven groups according to the age of the HH head. Two relationships become apparent. The first is that, ceteris paribus, as the age of the HH head increases the mean expenditure pea falls. The second is a positive relationship between age of HH head and inequality "within-age-groups". For two groups (members of HHs headed by persons in the age brackets "65-74" and "More than 74") inequality is higher than the national average. This is consistent with the findings of the previous subsection that inequality is high within the group of members of HHs headed by "Retired" persons. Many studies on inequality in other countries report an inverse U-shaped relationship

44. Nevertheless, Paglin (1975) uses the Gini index rather than a decomposable index.

between age of HH head and total HH income or expenditure.[45] Such a relationship can be observed in Greece, too. The relationship reported in Table 3.9 is not inverse U-shaped because the concept of expenditure used there is expenditure pea (not total HH expenditure). Ceteris paribus, HHs headed by younger persons are smaller than HHs headed by middle-aged persons. For example, the average size of HHs headed by persons in the age group "Less than 25" is 1.72 equivalent adults, whilst the relevant figure for HHs headed by persons in the age group "35-44", where total HH expenditure is at its maximum, is 3.09. Therefore, division of total HH expenditure by the number of equivalent adults in the HH ranks HHs headed by younger persons as having higher mean expenditure pea. For the positive relationship between age of HH head and inequality "within-age-groups" no obvious explanation can be offered. The results of decomposition analysis suggest that disparities "between-age-groups" play a rather unimportant role in the determination of the national level of inequality. Only 3.1% (T), 2.9% (N) or 4.1% (L) of aggregate inequality can be attributed to these disparities.

The next panel of Table 3.9 presents the results of measurement and decomposition of inequality when the population is grouped according to the number of HH members. Among the authors cited in the introduction, Kanellopoulos (1986) examines the distribution of income within groups of HHs of different size, although he does not claim that an important part of the observed inequality should be attributed to inequality between these groups. The results of this section of Table 3.9 point out a clear negative relationship between HH size and consumption expenditure pea.[46] In addition, it seems that the relationship between HH size and inequality in the distribution of consumption expenditure pea is also negative. Note, in particular, the extremely high level of inequality within the members of one-member and two-member HHs. The "between-groups" component of inequality accounts for 5.9% (T), 6.4% (N) and 5.2%(L).

The last section of Table 3.9 reports the results of measurement and decomposition of inequality when the grouping variable is the sex of HH head. As noted in chapter 1, since in the case of married couples the husband is, almost, automatically considered as the HH head, the overwhelming majority of the population is classified as living in HHs headed by males. It is interesting to note, however, that the mean consumption expenditure of the group of persons living in HHs headed by females is 8.3% higher than that of the group of

45. See, for example, Paglin (1975), van Ginneken (1980a), Cowell (1984).

46. This negative relationship may indicate that there exist economies of scale in consumption which are not captured by the equivalence scales used.

TABLE 3.10 Measurement and decomposition of inequality by demographic factors (1982)

Characteristic of Household Member or Household Head	Populat. Share n_j	Mean Expend. of the group μ_j	Gini Index G	Atkinson Index (ε=2) A	Theil Index T	Theil Index N	Variance of Logs L
AGE OF HOUSEHOLD HEAD							
Less than 25	0.014	24076	0.253	0.202	0.102	0.102	0.203
					(1.0)	(0.9)	(0.9)
25-34	0.161	23106	0.286	0.265	0.150	0.151	0.306
					(17.5)	(15.3)	(15.5)
35-44	0.262	21421	0.302	0.257	0.150	0.149	0.297
					(26.4)	(24.6)	(24.5)
45-54	0.258	19800	0.307	0.273	0.157	0.157	0.316
					(25.1)	(25.5)	(25.6)
55-64	0.157	18678	0.295	0.246	0.146	0.144	0.284
					(13.4)	(14.2)	(14.0)
65-74	0.104	16905	0.308	0.264	0.162	0.156	0.302
					(8.9)	(10.2)	(9.8)
More than 74	0.044	14012	0.319	0.297	0.167	0.170	0.348
					(3.2)	(4.7)	(4.8)
"Within-groups" component of inequality					0.152	0.152	0.302
					(95.5)	(95.4)	(95.1)
"Between-groups component of inequality					0.007	0.007	0.016
					(4.5)	(4.6)	(4.9)
NUMBER OF HOUSEHOLD MEMBERS							
1	0.030	27009	0.387	0.421	0.260	0.264	0.543
					(6.5)	(5.0)	(5.1)
2	0.147	20659	0.340	0.324	0.189	0.193	0.392
					(18.0)	(17.9)	(18.2)
3	0.195	21698	0.303	0.268	0.150	0.153	0.311
					(19.8)	(18.7)	(19.0)
4	0.314	21627	0.287	0.233	0.133	0.133	0.266
					(28.3)	(26.3)	(26.3)
5	0.179	17966	0.275	0.223	0.126	0.126	0.253
					(12.7)	(14.2)	(14.2)
6	0.088	15478	0.286	0.243	0.138	0.137	0.277
					(5.9)	(7.6)	(7.7)

(continued)

More than 6	*0.047*	*13575*	*0.279*	*0.229*	*0.126*	*0.129*	*0.264*
					(2.5)	*(3.8)*	*(3.9)*
"Within-groups" component of inequality					*0.149*	*0.149*	*0.300*
					(93.7)	*(93.5)*	*(94.4)*
"Between-groups component of inequality					*0.010*	*0.010*	*0.018*
					(6.3)	*(6.5)*	*(5.6)*
SEX OF HOUSEHOLD HEAD							
Male	*0.918*	*19907*	*0.306*	*0.267*	*0.156*	*0.155*	*0.310*
					(89.3)	*(89.5)*	*(89.5)*
Female	*0.082*	*22081*	*0.334*	*0.335*	*0.184*	*0.192*	*0.404*
					(10.4)	*(9.8)*	*(10.4)*
"Within-groups" component of inequality					*0.1585*	*0.1579*	*0.3177*
					(99.7)	*(99.3)*	*(99.9)*
"Between-groups component of inequality					*0.0005*	*0.0011*	*0.0003*
					(0.3)	*(0.7)*	*(0.1)*
GREECE	*19815*	*20084*	*0.309*	*0.273*	*0.159*	*0.159*	*0.318*

persons living in HHs headed by males. In addition, the former group's level of inequality appears to be substantially higher than that of the latter group. The contribution of the "between-groups" component of inequality, is negligible. It amounts to only 0.1%-0.7% of aggregate inequality.[47]

Table 3.10 is the counterpart of Table 3.9 for 1982. The results of these tables are similar. Most of the relationships that can be observed in the 1974 sample can, also, be observed in the 1982 sample, although in the latter they are usually less clear. Note, however, that the proportion of aggregate inequality attributable to inequality "between-demographic-groups" is marginally higher in the 1982 than in the 1974 sample, although in economic terms it remains unimportant.

3iv. Measurement and decomposition of inequality by educational factors

Many books and articles stressing the role of education in the personal distribution of income can be

47. Even though from an economic viewpoint the "between-sexes" component of inequality is unimportant, from a statistical point of view it is not. The relevant F-ratio with (1, 25250) [(1, 19814)] degrees of freedom is equal to 23.84 (18.71) for 1974 (1982), whereas the corresponding critical value at the 1% level of significance is 6.63.

found in the literature. Almost all of them refer to labour incomes and are related to "human capital" theory. The only similar studies for Greece are those of Leibenstein (1967), Kanellopoulos (1980, 1985, 1986) and Psacharopoulos (1982). Leibenstein (1967) and Kanellopoulos (1980, 1985) use 1964 earnings data for private sector employees living in the Greater Athens area. The data used by Psacharopoulos (1982) come from a 1977 labour market survey covering the urban areas of the country. Kanellopoulos (1986) estimates earnings functions using the income data of the 1974 HES. The results of these studies suggest that education alone explains around 20% of the variation in the logarithms of earnings in their samples.

If educational factors affect the distribution of income, they may affect the distribution of consumption expenditure, as well. Therefore, it was decided to attempt to measure and decompose inequality in the distribution of consumption expenditure by educational factors. Nevertheless, it should be noted that although the human capital theory suggests that, ceteris paribus, in a perfectly competitive economy the incomes of persons with different educational characteristics should differ, their consumption expenditure levels should not. Different levels of consumption expenditure can arise either because of imperfections in the markets for factors of production (capital, labour) or because education is related with some other characteristic of the individual (for example, ability).

The only educational variable recorded in the two HESs and used here is the educational level of the HH head. In the 1974 HES individuals are classified in eight educational groups whereas in the 1982 HES, there are only four such groups. For the purposes of the present study, the 1974 HES sample is grouped into eight groups for comparisons with the rest of the 1974 decompositions and is regrouped into four groups in order to facilitate comparisons with the 1982 HES. The corresponding results of decomposition analysis are given in the first and the second panel of Table 3.11. Three interesting relationships emerge from the information of this table. Firstly, there exists a strong positive relationship between educational level of HH head and mean expenditure pea. Secondly, "within-educational-groups" inequalities are considerably lower than the national average for almost all groups. Thirdly, there are substantial differences in the expenditure levels between groups. For example, according to the eight-group classification the ratio between the mean expenditures of the highest ("University graduates") and the lowest ("Illiterate") expenditure groups is 3.07. In addition (at least in the four-group classification) there seems to exist a negative relationship between

TABLE 3.11 Measurement and decomposition of inequality by educational factors (1974)

Characteristic of Household Member or Household Head	Populat. Share n_j	Mean Expend. of the group μ_j	Gini Index G	Atkinson Index (ε=2) A	Theil Index T	Theil Index N	Variance of Logs L
EDUCATIONAL LEVEL OF HOUSEHOLD HEAD							
University graduate	0.064	7050	0.292	0.237	0.142 (8.7)	0.139 (4.5)	0.272 (4.5)
Some years of tertiary educ.	0.006	5871	0.267	0.185	0.119 (0.6)	0.112 (0.3)	0.210 (0.3)
Secondary educ. completed	0.122	5310	0.300	0.251	0.153 (13.6)	0.148 (9.2)	0.286 (9.0)
At least three years of second. educ.	0.059	4417	0.278	0.229	0.126 (4.5)	0.128 (3.8)	0.259 (3.9)
Primary educ. completed	0.488	3246	0.297	0.251	0.150 (32.6)	0.146 (36.3)	0.288 (36.3)
Some years of primary educ.	0.164	2710	0.303	0.271	0.152 (9.3)	0.154 (12.9)	0.315 (13.4)
No educ. but not illiterate	0.039	2368	0.309	0.300	0.155 (2.0)	0.166 (3.3)	0.356 (3.6)
Illiterate	0.058	2293	0.327	0.304	0.175 (3.2)	0.179 (5.3)	0.363 (5.4)
"Within-groups" component of inequality					0.149 (74.5)	0.148 (75.6)	0.296 (76.4)
"Between-groups" component of inequality					0.051 (25.5)	0.048 (24.4)	0.091 (23.6)
University graduate	0.064	7050	0.292	0.237	0.142 (8.7)	0.139 (4.5)	0.272 (4.5)
Secondary educ. completed	0.128	5336	0.298	0.248	0.151 (14.1)	0.146 (9.5)	0.283 (9.4)
Primary educ. completed	0.547	3372	0.300	0.256	0.152 (38.4)	0.149 (41.6)	0.295 (41.7)
Primary educ. not completed or no education	0.262	2566	0.311	0.288	0.160 (14.7)	0.164 (21.9)	0.339 (22.9)
"Within-groups" component of inequality					0.152 (75.9)	0.152 (77.5)	0.304 (78.5)
"Between-groups" component of inequality					0.048 (24.1)	0.044 (22.5)	0.083 (21.5)
GREECE	25251	3647	0.342	0.323	0.200	0.196	0.387

TABLE 3.12 Measurement and decomposition of inequality by educational factors (1982)

Characteristic of Household Member or Household Head	Populat. Share nj	Mean Expend. of the group mj	Gini Index G	Atkinson Index (e=2) A	Theil Index T	Theil Index N	Variance of Logs L
EDUCATIONAL LEVEL OF HOUSEHOLD HEAD							
University graduate	0.091	31854	0.267	0.211	0.115 (10.5)	0.118 (6.8)	0.242 (7.0)
Secondary educ. completed	0.165	26081	0.283	0.229	0.133 (18.0)	0.131 (13.6)	0.259 (13.5)
Primary educ. completed	0.556	18179	0.279	0.229	0.129 (40.8)	0.129 (45.1)	0.258 (45.1)
Primary educ. not completed or no education	0.187	14707	0.288	0.251	0.134 (11.6)	0.139 (16.4)	0.289 (17.0)
"Within-groups" component of inequality					0.129 (80.9)	0.130 (81.9)	0.263 (82.6)
"Between-groups component of inequality					0.030 (19.1)	0.029 (18.1)	0.055 (17.4)
GREECE	19815	20084	0.309	0.273	0.159	0.159	0.318

educational level of HH head and inequality among members of the relevant educational group.

Since inequalities "within-educational-groups" are relatively low and there are substantial differences in the mean expenditures of the educational groups the "between-groups" component of inequality is relatively high. According to the results of the lower panel of Table 3.11, the proportion of aggregate inequality attributable to disparities "between-educational-groups" is 24.1% (T), 22.5% (N) or 21.5% (L). Of course, these percentages are even higher when the population is classified into eight groups (25.5%, 24.4% and 23.6%). Although in absolute terms the "between-educational-groups" component of inequality is less than one third of the "within-educational-groups" component, it is much higher than all the other "between-groups" components reported in previous tables. Hence, these results lend support to the (implicit) arguments of Kanellopoulos (1980, 1985, 1986) and Psacharopoulos (1982) that differences in educational endowments affect seriously the level of inequality in Greece.

The results of measurement and decomposition of inequality by educational factors for 1982 are presented in Table 3.12. Between 1974 and 1982 there was an improvement in the general educational level in Greece. This improvement is reflected in the educational levels of the HH heads of the two samples. In the 1982 HES a larger proportion of the sample belongs to HHs headed either by "University graduates" or by persons with "Secondary education completed" and fewer HHs are headed by persons with "Primary education not completed or no education". The results of Table 3.12 show that the relationships observed in 1974 can be observed in 1982, as well. However, the ratio between the mean expenditures pea of the highest and the lowest expenditure groups declined from 2.75 to 2.17 between the two years. The "between-educational-groups" component of inequality accounts for 19.1% (T), 18.1% (N) or 17.4% (L). Although these contributions are lower than the corresponding contributions in 1974, they are considerably higher than all the other "between-groups" contributions in 1982. The fact that inequality in the distribution of consumption expenditure "between-educational-groups" is found to be relatively high has some interesting policy implications. These implications are discussed briefly in the last chapter of this study.

4. Multivariate decomposition of inequality

Last section's results indicate that none of the factors (variables) used there has a contribution of more than 25% to the determination of aggregate inequality in the distribution of consumption expenditure pea.[48] Therefore, it may be interesting to investigate whether the combined contribution of these factors is substantially higher. This can be determined through a multivariate decomposition of inequality. A description of how multivariate decomposition of inequality works can be illustrated with the following example. Assume that in a certain survey the population is grouped into n_1 regions, n_2 educational groups and n_3 occupational groups. Then, the total population can be split in $n_1n_2n_3$ regional-educational-occupational groups and aggregate inequality can be decomposed into the relevant "within-groups" and "between-groups" components. The combined contribution of these variables to aggregate inequality is given by the "between-groups" component. The multivariate "between-groups" component is always greater than or equal to each of the one-way "between-groups" components and less than or equal to their sum. The more uncorrelated the variables the closer the multivariate "between-groups" component to the sum of the one-way "between-groups"

48. This result is in line with the results of the empirical works on one-way decomposition of inequality using microdata mentioned in footnote 27 of this chapter.

components. In the extreme case of orthogonality of the variables, the multivariate "between-groups" component is equal to the sum of the one-way "between-groups" components. The percentage contribution of the multivariate "between-groups" component to aggregate inequality is similar to the R^2 in multiple regression analysis. In regression analysis the R^2 rises when new explanatory variables are added to the estimated equation. Similarly, in inequality decomposition analysis the contribution of the "between-groups" component rises as the partition of the population becomes finer with the addition of more factors (variables). In regression analysis R^2 tends to 100% as the number of explanatory variables approaches the number of observations. Similarly, in inequality decomposition analysis the contribution of the "between-groups" component to aggregate inequality tends to 100% as the number of non-empty population groups approaches the number of population members. However, unlike linear regression analysis where partial correlation coefficients can be used in order to measure the correlation between any two variables holding the effect of the other variables constant, inequality decomposition does not, generally, allow the measurement of the pure contribution of a particular variable to aggregate inequality. For example, according to the results of the top panel of Table 3.5, 11.3% to 13.3% is the *total* contribution of regions to inequality in 1974 - not the contribution of regions with all other factors held constant.

All the decomposable indices can be used for the purposes of the multivariate decomposition of inequality.[49] However, since the distributions used in this study are approximately lognormally distributed, the use of L has some advantages over T and N because it allows tests of statistical significance for the variables involved in the analysis. Then, the effect of any particular variable on personal expenditure can also be calculated. For example, using L we can estimate by how much residence in the "Greater Athens" region increases expenditure, other things being equal. Theil's indices would establish that region of residence is associated with inequality, but they would tell us nothing about the magnitude or the direction in which expenditure is affected by living in a particular region. Hence, it was decided to use only L for the multivariate decomposition of inequality.

The multivariate decomposition analysis is performed using as many as possible of the factors used in the one-way decomposition of inequality. Among the three occupational variables "Sector of employment",

49. Nevertheless, see the arguments and counter-arguments related to the multivariate decomposition of Theil's T index in Adelman and Levy (1984, 1985) and Cowell (1985).

"Type of profession" and "Occupational status" of HH head, only one can be used. This is because all of them contain the group "Retired". Hence, inclusion of more than one of them would produce a singular matrix, which does not allow the estimation of interaction effects.[50] Since both "Type of profession" and "Sector of employment" of HH head are highly correlated with the rest of the factors included in the analysis, "Occupational status" of HH head was selected to be included in the multivariate decomposition analysis. In addition, multivariate analysis of variance for many factors and many groups requires enormous computer space. Consequently, we were obliged to reduce further the number of factors included in the analysis and the number of groups within each factor. Ideally, it would be desirable to have the same number of groups for each factor, and each group to contain approximately the same number of individuals. It is relatively easy to satisfy the first of these requirements without merging unrelated groups. However, the satisfaction of the second requirement is impossible in some cases and in others does not make sense from an economic viewpoint. After extensive experimentation it was decided to use the following factors and groups:

a) Location (LOC)

1. Urban (Municipalities with population more than 10000)
2. Rural (Municipalities or communes with population up to 10000)

b) Region (REG)

1. Eastern Central (Greater Athens, East Mainland and Islands)
2. Northern (Greater Salonica, Central and West Macedonia, East Macedonia and Thrace).
3. South and South West (Peloponnese and West Mainland, Crete)
4. Western Central (Thessaly and Epirus)

c) Occupational Status of HH head (OCC)

1. Employer
2. Self-employed
3. Employee
4. Other

d) Age of HH head (AGE)

1. Less than 41
2. 41-50

50. Similar problems, also, arise with the "Other" group, although it does not contain exactly the same individuals in all three groupings.

3. 51-60

4. More than 60

e) Educational level of HH head (EDUC)

1. University

2. Secondary

3. Primary

4. Primary not completed or no education

"Sex of HH head" is not among the factors included in the analysis because of the very low value of its "between-groups" component in the one-way decomposition of inequality. "Number of economically active HH members" is excluded because all the HHs with "No economically active members" are headed by persons belonging either to the "Retired" or to the "Other" group which for the purposes of the multivariate decomposition have been merged into one group. Hence, inclusion of both "Occupational status of HH head" and "Number of economically active HH members" would produce a singular matrix. Further, "Number of HH members" is also excluded because the size of the relevant "between-groups" component in the one-way decomposition of inequality is influenced by the size of the equivalence scales used.

Using the standard analysis of variance, the total sum of squares is decomposed into a sum of squares due to main effects (LOC, REG, OCC, AGE, and EDUC), a sum of squares due to interactions between any two factors used in the analysis (2-way interactions), a sum of squares due to interactions between any three factors (3-way interactions), and a sum of squares due to variation within groupings (cells). Normally, 4-way and 5-way interactions should have been included in the analysis, too. However, the existence of many empty cells in the sample makes the estimation of these interactions impossible. Nevertheless, as will become obvious later, the results are not seriously affected by the non-inclusion of these interactions, either from a statistical or from an economic point of view. Since the variables included are not orthogonal, there is some covariance at each level of analysis (main effects, 2-way interactions, 3-way interactions). The method of analysis of variance used in this section ("Classic experimental") does not attribute the covariance term to any of the variables. There exists another method of analysis of variance ("Hierarchical") which exhausts the covariance term by attributing it to the various factors in a hierarchical order. However, this order is arbitrarily

determined by the researcher. For example, assume that the first factor included in the 1974 multivariate decomposition analysis is education. The hierarchical approach would attribute to education all the variation in the logarithms of expenditures explained by education alone (21.5%), then it would go to the second factor to explain some part of the remaining variation, then to the third factor and so on. Obviously, the a priori determination of the importance of the factors by the hierarchical approach affects the results seriously. Hence, it is not used in the present analysis.

The results of the multivariate decomposition of inequality for 1974 are reported in Table 3.13. All the factors combined account for 33.74% of aggregate inequality; a percentage not dramatically higher than that of the "between-educational groups" component of inequality in the one-way decomposition analysis. Most of this percentage is attributable to the main effects (30.55%). More than two fifths of the main effects' percentage is due to the positive covariance term. The last column of Table 3.13 indicates that each of the main effects of the variables included is highly significant at any conventional level of significance. Education is by far the most important of these variables in explaining the variation in the logarithms of expenditures. Looking at the column of percentages it can be argued that although the rest of the variables are statistically significant, they do not seem to be very important from an economic point of view.[51]

Below the main effects are the 2-way and 3-way interaction effects. Taking the example of age-location, the interpretation of the relevant interaction effect is that it allows for the possibility that either the effect of age of HH head on expenditure pea may depend on the size of locality or, alternatively, that the effect of size of locality on expenditure pea may depend on the HH head's age. Only four of the twenty 2-way and 3-way interaction effects turn out to be statistically not significant at the 1% level. Hence, the effects of the variables used in the analysis are not independent of one another. However, although both the 2-way and the 3-way interactions add significantly to the multivariate decomposition of inequality, together they account for only 3.19% of the variation in the logarithms of expenditures. Due to the existence of empty cells in the sample, no 4-way and 5-way interaction effects could be calculated. Nevertheless, the relevant cells may not be empty in the total population of Greece and, therefore, the "between-groups" component reported in Table

51. However, the high value of the covariance term does not allow very strong statements.

TABLE 3.13 Multivariate decomposition of inequality (1974)

Decomposition of the variance of the logarithms of expenditures

Source of variation	Sum of squares	Percentage	Degrees of freedom	F-ratios
Main effects	2988.3	30.55%	13	886.83
Location (LOC)	110.9	1.13%	1	427.70
Region (REG)	226.9	2.32%	3	291.81
Occupation (OCC)	161.8	1.65%	3	208.04
Age (AGE)	75.2	0.77%	3	96.74
Education (EDUC)	1076.0	11.00%	3	1383.80
Covariance	1337.5	13.68%		
2-way interactions	133.9	1.37%	66	7.83
AGE-LOC	12.3	0.13%	3	15.79
AGE-EDUC	14.4	0.15%	9	6.16
AGE-OCC	7.5	0.08%	9	3.21
AGE-REG	4.8	0.05%	9	2.05*
LOC-EDUC	1.4	0.01%	3	1.78*
LOC-OCC	17.0	0.17%	3	21.80
LOC-REG	16.5	0.17%	3	21.27
EDUC-OCC	9.5	0.10%	9	4.08
EDUC-REG	19.4	0.20%	9	8.33
OCC-REG	13.2	0.13%	9	5.65
Covariance	18.0	0.20%		
3-way interactions	178.4	1.82%	162	4.25
AGE-LOC-EDUC	11.0	0.11%	9	4.73
AGE-LOC-OCC	12.6	0.13%	9	5.40
AGE-LOC-REG	10.3	0.11%	9	4.40
AGE-EDUC-OCC	26.7	0.27%	27	3.81
AGE-EDUC-REG	17.8	0.18%	27	2.54
AGE-OCC-REG	43.6	0.45%	27	6.27
LOC-EDUC-OCC	5.5	0.06%	9	2.34*
LOC-EDUC-REG	5.4	0.06%	9	2.32*
LOC-OCC-REG	11.1	0.11%	9	4.78
EDUC-OCC-REG	27.1	0.28%	27	3.87
Covariance	7.9	0.06%		
"Between-groups"	3300.5	33.74%	241	52.84
"Within-groups"	6482.3	66.26%	25009	
TOTAL	9782.8	100.00%	25250	

*Not significant at the 1% level of significance

3.13 may underestimate the true "between-groups" component.

Tables 3.14 and 3.15 report the results of the multivariate decomposition of inequality in 1974, for urban and rural areas separately. There are two reasons for showing these results; firstly, for an investigation

TABLE 3.14 Multivariate decomposition of inequality

(1974, urban areas only)

Decomposition of the variance of the logarithms of expenditures

Source of variation	*Sum of squares*	*Percentage*	*Degrees of freedom*	*F-ratios*
Main effects	*1337.1*	*27.28%*	*12*	*452.82*
Region (REG)	*107.9*	*2.20%*	*3*	*146.12*
Occupation (OCC)	*108.4*	*2.21%*	*3*	*146.79*
Age (AGE)	*57.2*	*1.17%*	*3*	*77.45*
Education (EDUC)	*859.8*	*17.54%*	*3*	*1164.67*
Covariance	*203.9*	*4.16%*		
2-way interactions	*52.2*	*1.07%*	*54*	*3.93*
AGE-EDUC	*9.7*	*0.20%*	*9*	*4.36*
AGE-OCC	*7.1*	*0.14%*	*9*	*3.21*
AGE-REG	*5.9*	*0.12%*	*9*	*2.68*
EDUC-OCC	*6.1*	*0.13%*	*9*	*2.77*
EDUC-REG	*8.2*	*0.17%*	*9*	*3.72*
OCC-REG	*9.6*	*0.19%*	*9*	*4.22*
Covariance	*5.8*	*0.12%*		
"Between-groups"	*1389.3*	*28.35%*	*66*	*85.55*
"Within-groups"	*3512.1*	*71.65%*	*14273*	
TOTAL	*4901.4*	*100.00%*	*14339*	

of whether the factors influencing inequality in the distribution of consumption expenditure are different in urban and rural areas; secondly, to examine whether the factors included in the analysis have equal impact in both areas. Three comments can be made comparing the results of Tables 3.14 and 3.15 with those of Table 3.13. Firstly, since in Tables 3.14 and 3.15 the number of grouping factors is lower than the number of grouping factors in Table 3.13, the reported reduction in the proportional contribution of the "between-groups" disparities could be expected. This reduction is far more serious in the rural than in the urban areas, the relevant percentages being 19.25% and 28.35%. This may be an indication that another important factor (possibly land ownership) is missing from the decomposition of inequality among members of the rural population. Therefore, these results may suggest that the set of factors influencing inequality in urban areas is different from the set of factors influencing inequality in rural areas. Secondly, the relative importance of the main effects' covariance terms has been greatly reduced, particularly in the case of urban areas. Thirdly, all the variables used in the analysis are statistically significant in determining the overall degree of inequality

TABLE 3.15 Multivariate decomposition of inequality

(1974, rural areas only)

Decomposition of the variance of the logarithms of expenditures

Source of variation	*Sum of squares*	*Percentage*	*Degrees of freedom*	*F-ratios*
Main effects	*651.0*	*17.04%*	*12*	*190.64*
Region (REG)	*139.8*	*3.66%*	*3*	*163.77*
Occupation (OCC)	*73.5*	*1.92%*	*3*	*86.04*
Age (AGE)	*23.0*	*0.60%*	*3*	*26.95*
Education (EDUC)	*210.1*	*5.50%*	*3*	*246.10*
Covariance	*204.6*	*5.36%*		
2-way interactions	*84.6*	*2.21%*	*54*	*5.51*
AGE-EDUC	*15.6*	*0.41%*	*9*	*6.07*
AGE-OCC	*14.4*	*0.38%*	*9*	*5.64*
AGE-REG	*7.4*	*0.19%*	*9*	*2.90*
EDUC-OCC	*8.9*	*0.23%*	*9*	*3.48*
EDUC-REG	*16.3*	*0.43%*	*9*	*6.37*
OCC-REG	*15.2*	*0.40%*	*9*	*5.93*
Covariance	*6.8*	*0.17%*		
"Between-groups"	*735.6*	*19.25%*	*66*	*39.17*
"Within-groups"	*3085.6*	*80.75%*	*10844*	
TOTAL	*3821.2*	*100.00%*	*10910*	

both in urban and in rural areas. Among them, the educational level of HH head is the most important. Nevertheless, the importance of this variable in explaining inequality is much greater in the urban than in the rural areas of Greece. Note, also, that the regional variable's main effect accounts for about one fifth of the "between-groups" component in the case of rural areas, while it plays a far less important role in the case of urban areas' "between-groups" component. Hence, it can be argued that the variables used in the analysis do not have an equally important impact in urban and rural areas. The interaction effects, although statistically significant, do not play an important role in explaining the variation in the logarithms of expenditures in either the urban or the rural areas. However, since it is impossible to calculate 3-way and 4-way interaction effects, the results of Tables 3.14 and 3.15 probably underestimate the true "between-groups" component.

As noted earlier, one of the advantages of using L for the multivariate decomposition of inequality is that it allows the estimation of the effect of particular variables on consumption expenditure pea. This can be

TABLE 3.16 Multiple classification analysis (1974)

Grand mean = 8.006 (2999 drachmas)

Variable and Group	Unadjusted effect (percentage)	Adjusted effect (percentage)
LOCATION		
1. Urban	+19.7%	+7.3%
2. Rural	-20.6%	-8.6%
REGION		
1. Eastern Central	+24.6%	+12.8%
2. Northern	-14.8%	-10.4%
3. South and Southwest	-10.4%	-1.2%
4. Western Central	-20.6%	-11.3%
OCCUPATION		
1. Employer	+60.0%	+37.7%
2. Self employed	-13.9%	-3.0%
3. Employee	+13.9%	-1.0%
4. Other	-7.7%	-3.0%
AGE		
1. Less than 41	+13.9%	+7.3%
2. 41-50	+2.0%	+2.0%
3. 51-60	-3.9%	-3.0%
4. More than 60	-17.3%	-10.4%
EDUCATION		
1. University	+105.4%	+80.4%
2. Secondary	+53.7%	+37.7%
3. Primary	-3.0%	-3.9%
4. Primary not completed	-27.4%	-20.6%

done through multiple classification analysis. Using multiple classification analysis we can exploit the formal equivalence between the linear model used in the analysis of variance and the linear model used in multiple regression analysis, in order to estimate the quantitative effects of each group of each explanatory variable on the mean of the logarithms of consumption expenditure pea. The estimates of these effects for the whole country in 1974 are given in Table 3.16 as percentage deviations from the geometric mean expenditure pea.[52] The first column reports the gross effects of membership in a particular group, without adjusting for the other variables used in the analysis. The second column presents the marginal effects which do adjust for the influence of other variables. For example, the geometric mean expenditure pea of persons residing in urban

52. In the 1974 (1982) HES sample the mean of the logarithms of consumption expenditure pea is 8.006 (9.749), which corresponds to a geometric mean expenditure pea of 2999 (17137) drachmas.

areas is 19.7% higher than the national mean (average effect). However, other things being equal, the effect of residing in these areas on consumption expenditure pea is an increase of only 7.3% (marginal effect). Since there exists some correlation between the variables used in the analysis, the adjusted effects for almost all groups are lower, in absolute terms, than the unadjusted ones. For example, in Greece, as in many other countries, young HH heads tend to be better educated than the rest of the population. The unadjusted comparisons do not allow for this fact. Therefore, since the better educated groups ("University", "Secondary") include disproportionately many members of HHs headed by young persons, the unadjusted comparisons overstate the expenditure gain that a representative HH member would realize if his HH head belongs to a younger age group.

Three of the results of Table 3.16 are worth emphasizing. The first is that although the unadjusted urban/rural effects are relatively high, the adjusted ones are not. This implies that rural/urban disparities are mainly due to the high concentration of rural HH heads in older, low education groups residing in poor regions of the country. In addition, there is an under-representation of rural HH heads in the high expenditure occupational group "Employer". The second interesting result is that there are three groups with very high positive unadjusted expenditure differentials. These are the educational groups "University" (+105.4%) and "Secondary" (+53.7%) and the occupational group "Employer"(+60.0%). After allowing for the influence of the other variables, the adjusted effect (although highly positive) is substantially lower for "Secondary" and "Employer" (+37.7%). However, even the adjusted effect for the educational group "University" is extremely high (+80.4%). The third result which merits discussion is that although, on average, members of HHs headed by "Employees" enjoy consumption expenditure 13.9% higher than the national average, the marginal effect of participating in this group is to enjoy an expenditure level 1.0% lower than the national mean.

According to the results of the last section, almost all the one-way percentage contributions of the "between-groups" components to aggregate inequality in 1982 are lower than the corresponding contributions in 1974 (apart from the "between-groups" components of the demographic factors). Hence, it is not surprising that the percentage of the 1982 multivariate "between-groups" component reported in Table 3.17 (29.03%) is lower than the corresponding 1974 percentage (33.74%). The rest of this table's results are very similar to the corresponding results of Table 3.13 for 1974. A large part of the "between-groups" contribution to inequality

TABLE 3.17 Multivariate decomposition of inequality (1982)

Decomposition of the variance of the logarithms of expenditures

Source of variation	Sum of squares	Percentage	Degrees of freedom	F-ratios
Main effects	1529.8	24.27%	13	514.89
Location (LOC)	92.9	1.47%	1	406.36
Region (REG)	66.2	1.05%	3	96.51
Occupation (OCC)	103.0	1.63%	3	150.27
Age (AGE)	34.5	0.55%	3	50.35
Education (EDUC)	530.1	8.41%	3	773.10
Covariance	703.1	11.16%		
2-way interactions	103.5	1.64%	66	6.86
AGE-LOC	0.5	0.01%	3	0.75*
AGE-EDUC	24.9	0.40%	9	12.11
AGE-OCC	13.6	0.22%	9	6.59
AGE-REG	11.4	0.18%	9	5.56
LOC-EDUC	0.9	0.01%	3	1.36*
LOC-OCC	2.4	0.04%	3	3.44*
LOC-REG	13.9	0.22%	3	20.31
EDUC-OCC	13.7	0.22%	9	6.68
EDUC-REG	10.4	0.16%	9	5.04
OCC-REG	7.0	0.11%	9	3.40
Covariance	4.7	0.07%		
3-way interactions	196.1	3.11%	162	5.30
AGE-LOC-EDUC	6.3	0.10%	9	3.06
AGE-LOC-OCC	12.7	0.20%	9	6.18
AGE-LOC-REG	3.2	0.05%	9	1.53*
AGE-EDUC-OCC	34.4	0.55%	27	5.58
AGE-EDUC-REG	37.1	0.59%	27	6.01
AGE-OCC-REG	26.7	0.42%	27	4.33
LOC-EDUC-OCC	7.2	0.11%	9	3.51
LOC-EDUC-REG	20.7	0.33%	9	10.04
LOC-OCC-REG	16.3	0.26%	9	7.90
EDUC-OCC-REG	21.5	0.34%	27	3.48
Covariance	10.2	0.16%		
"Between-groups"	1829.4	29.03%	241	33.21
"Within-groups"	4473.4	70.97%	19573	
TOTAL	6302.8	100.00%	19814	

*Not significant at the 1% level of significance

is due to the main effects' positive covariance term. Among the variables used in the analysis, only HH head's educational level is important from an economic viewpoint. Location, region and HH head's age and occupational status are statistically significant but their proportional contribution is rather low. Similarly, although most of the interaction effects are significant, they do not seem to be really important determining

TABLE 3.18 Multivariate decomposition of inequality

(1982, urban areas only)

Decomposition of the variance of the logarithms of expenditures

Source of variation	Sum of squares	Percentage	Degrees of freedom	F-ratios
Main effects	683.4	20.12%	12	250.58
Region (REG)	56.7	1.67%	3	83.11
Occupation (OCC)	57.8	1.70%	3	84.79
Age (AGE)	24.9	0.73%	3	36.50
Education (EDUC)	410.1	12.07%	3	610.40
Covariance	134.0	3.95%		
2-way interactions	67.4	1.98%	54	5.49
AGE-EDUC	15.7	0.46%	9	7.68
AGE-OCC	5.6	0.17%	9	2.76
AGE-REG	11.0	0.32%	9	5.36
EDUC-OCC	11.4	0.33%	9	5.56
EDUC-REG	14.2	0.42%	9	6.95
OCC-REG	10.7	0.32%	9	5.25
Covariance	-1.3	-0.04%		
"Between-groups"	750.8	22.11%	66	50.05
"Within-groups"	2645.3	77.89%	11639	
TOTAL	3396.1	100.00%	11705	

factors. Note, also, that the percentage of aggregate inequality attributable to interaction effects in 1982 (4.75%) is comparatively higher than the corresponding percentage in 1974 (3.19%).

Tables 3.18 and 3.19 correspond to Tables 3.14 and 3.15; they report the multivariate decomposition analysis results for urban and rural areas in 1982. Even though the percentage contributions of the "between-groups" components are lower in 1982 both for the rural and for the urban areas, the rest of the results are very similar to the 1974 results. "Between-groups" disparities are more important for the determination of aggregate inequality in urban than in rural areas. The educational level of HH head accounts for inequality more than the rest of the variables used in the analysis, particularly in the urban areas. The contributions of the interaction effects are not very high either for the urban or for the rural areas.[53]

53. However, the interaction effects account for almost one quarter of the "between-groups" term in rural areas.

TABLE 3.19 Multivariate decomposition of inequality

(1982, rural areas only)

Decomposition of the variance of the logarithms of expenditures

Source of variation	*Sum of squares*	*Percentage*	*Degrees of freedom*	*F-ratios*
Main effects	*283.9*	*12.23%*	*12*	*97.58*
Region (REG)	*25.7*	*1.11%*	*3*	*35.34*
Occupation (OCC)	*48.6*	*2.09%*	*3*	*66.80*
Age (AGE)	*12.7*	*0.55%*	*3*	*17.50*
Education (EDUC)	*116.2*	*5.01%*	*3*	*159.77*
Covariance	*80.7*	*3.47%*		
2-way interactions	*88.2*	*3.80%*	*54*	*6.74*
AGE-EDUC	*23.3*	*1.00%*	*9*	*10.69*
AGE-OCC	*12.8*	*0.55%*	*9*	*5.88*
AGE-REG	*8.5*	*0.37%*	*9*	*3.90*
EDUC-OCC	*8.7*	*0.38%*	*9*	*4.00*
EDUC-REG	*20.1*	*0.86%*	*9*	*9.20*
OCC-REG	*11.6*	*0.50%*	*9*	*5.31*
Covariance	*3.2*	*0.14%*		
"Between-groups"	*372.0*	*16.03%*	*66*	*23.25*
"Within-groups"	*1949.6*	*83.97%*	*8042*	
TOTAL	*2321.6*	*100.00%*	*8108*	

Finally, the results of multiple classification analysis for 1982 are reported in Table 3.20. They are also similar to the corresponding 1974 results. However, in almost all groups the percentage deviations from the national mean are lower in 1982 than in 1974. In addition, in almost all groups the deviations are in the same direction in 1982 as in 1974 both for the adjusted and for the unadjusted effects. The most notable positive unadjusted (adjusted) deviations from the national mean are observed among members of HHs headed by "University" graduates 64.9% (52.2%), "Employers" 39.1% (31.0%) and persons with "Secondary" education completed 33.6% (23.8%). In contrast, the most notable negative deviations are observed among members of HHs headed by persons with "Primary education not completed or no education" -25.2% (-17.3%), residing in "Rural" areas -18.9% (-9.5%) or in "Western Central Greece" -18.9% (-11.3%). The ranking of the highest positive and negative deviations is exactly the same in both surveys.

The predominant result of this section is that even if the population is classified into many small

TABLE 3.20 Multiple classification analysis (1982)

Grand mean = 9.749 (17137 drachmas)

Variable and Group	*Unadjusted effect (percentage)*	*Adjusted effect (percentage)*
LOCATION		
1. Urban	*+15.0%*	*+7.3%*
2. Rural	*-18.9%*	*-9.5%*
REGION		
1. Eastern Central	*+15.0%*	*+6.2%*
2. Northern	*-8.6%*	*-4.9%*
3. South and Southwest	*-6.8%*	*0.0%*
4. Western Central	*-18.1%*	*-11.3%*
OCCUPATION		
1. Employer	*+39.1%*	*+31.0%*
2. Self employed	*-13.1%*	*-3.0%*
3. Employee	*+12.8%*	*0.0%*
4. Other	*-9.5%*	*-3.9%*
AGE		
1. Less than 41	*+13.9%*	*+5.1%*
2. 41-50	*0.0%*	*+1.0%*
3. 51-60	*-3.0%*	*0.0%*
4. More than 60	*-17.3%*	*-9.5%*
EDUCATION		
1. University	*+64.9%*	*+52.2%*
2. Secondary	*+33.6%*	*+23.4%*
3. Primary	*-6.8%*	*-5.8%*
4. Primary not completed	*-25.2%*	*-17.3%*

homogeneous groups, "between groups" disparities account for only about one third of inequality in 1974 and for even less in 1982. Part of the remaining ("within-groups") variation should be attributed to the use of relatively few groups for each variable used in the analysis. However, as noted earlier, multivariate decomposition analysis involving an increased number of groups for each variable would require vast computer resources. In addition, increasing the number of groups within each variable could create a number of non-empty cells close to the population size and, hence, the analysis would be rather meaningless. Part of the "within-groups" variation should be attributed to the limited number of inequality-determining factors considered in our analysis. Other factors may also affect income and expenditure inequality such as wealth ownership, HH head employer's characteristics and other factors related to the socioeconomic history of the HH. These variables are not available in the information of the HESs. Finally, since we live in a stochastic world, a large part of the observed variation must be attributed to chance factors.

CHAPTER FOUR

THE MEASUREMENT AND DECOMPOSITION OF POVERTY IN GREECE[1]

1. Introduction. The identification of the poor.

The economic literature on poverty measurement has grown considerably during the last decade, following the seminal article of Sen (1976a). According to Sen, the measurement of poverty can be broken down into two stages: an identification stage and an aggregation stage. The identification stage establishes who the poor are, whereas the aggregation stage uses the information related to a particular characteristic of the poor - usually income, total expenditure or expenditure in specific commodities[2] - to construct an aggregate poverty index.[3] In this section we deal with problems related to the identification stage.

For the purposes of the present work an individual is classified as poor if his income falls below a predetermined level. This level corresponds to the minimum income required for the satisfaction of the individual's basic needs and it is defined as the "poverty line". Two general approaches have been suggested for the construction of poverty lines: an "absolutist" (sometimes called "nutritionist") and a "relativist". These correspond to the two main approaches to the measurement of poverty.[4] According to the absolutist approach the basic needs of an individual of given physiological characteristics are, more or less, constant in terms of commodities and do not vary (or vary very little) over time. As a result, the poverty line should be determined almost independently of the society in which the individual lives. Followers of the relativist approach argue that the basic needs of an individual depend on the expenditure patterns and the general level of income of the

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1. Some of this material was presented at the Third Congress of the European Economic Association, in Bologna, Italy, August 1988.

2. As in chapter 3, in the theoretical part of the present chapter we refer to "the distribution of income", but the measurement and decomposition of poverty in the empirical part of the chapter are carried out in terms of consumption expenditure pea.

3. Following Tobin (1970) some authors advocate a "commodity-specific" approach to the measurement of poverty as opposed to the "single-indicator" approach. The survey of literature presented and the poverty analysis performed in this chapter adopt the "single-indicator" approach.

4. Descriptions and arguments for and against these two approaches as well as discussion of conceptual issues related to the definitions of "poverty" and/or "relative deprivation" can be found in Townsend (1962, 1970, 1985), Watts (1968), Tobin (1970), Drewnowski (1977), Sen (1979b, 1981, 1983, 1985), Atkinson (1983, 1985) and Hagenaars (1986).

society in which he lives. Therefore, the poverty line depends on both the average level of income and the entire income distribution, and may vary considerably over time. It should be noted that, at the theoretical level, several attempts have been made to develop a general method incorporating characteristics of both approaches.[5] However, the empirical implications of these methods for the construction of poverty lines are not always straightforward.[6] The absolutist approach for the construction of poverty lines was first rigorously introduced by the pioneering work of Rowntree (1901) and has been applied in several empirical studies on poverty; particularly studies related to LDCs. On the other hand, Adam Smith, Karl Marx and Alfred Marshall were among the first supporters of the view that an individual's basic needs can only be defined in relation to the material conditions of the society in which the individual lives.[7] Most of the empirical studies on poverty in developed countries use some kind of relativist poverty line. Naturally, the advantages of the absolutist approach are the disadvantages of the relativist approach and vice versa. On the one hand, as Sen (1983, p. 159) points out, "there is an irreducible absolutist core in the idea of poverty". If somebody is starving he should be classified as poor irrespective of his relative position in the income distribution. This "absolutist core" cannot be captured if relativist poverty lines are used. On the other hand, poverty has always been associated with the notion of relative deprivation and, additionally, commodities that are considered necessities of life in relatively affluent societies are not considered to be so in relatively poor societies. These aspects of poverty are missed if absolutist poverty lines are used.

At a practical level, four general types of poverty lines have been used. The first type aims at a "nutritionist" (or "objective") definition of the poverty line. Some experts identify a minimum group of commodities necessary for the subsistence of an individual and the minimum amount of money that enables the purchase of these commodities is defined as the poverty line.[8] The poverty lines calculated in this way correspond closely to the absolutist notion of poverty. The second type of poverty lines used in empirical

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5. See, for example, the important attempt of Sen (1981, 1983, 1985) to base the concept of poverty on the notion of 'minimum capabilities'. "Poverty is not just a matter of being relatively *poorer than others* in the society, but of not having some basic opportunities of material well-being; the failure to have certain minimum 'capabilities'. The criteria of minimum capabilities are 'absolute' not in the sense that they must not vary from society to society or over time, but [that] people's deprivations are judged absolutely, and not simply *in comparison* with the others in that society" Sen (1985, pp 669-670, italics in the original).

6. For an (unsuccessful) attempt to construct poverty lines along the arguments of Sen (1981, 1983, 1985) see de Vos and Hagenaars (1988).

7. See the relevant quotations and references in Townsend (1962) and Sen (1979b, 1981).

8. Numerous authors have constructed nutritionist poverty lines. Particular interest present the studies of Rowntree (1901), Orchansky (1965), Sukhatme (1982), Dandekar (1982) and Greer and Thorbecke (1986a, 1986b).

research can be called "official" poverty lines. They are, simply, equal to the amount of some form of transfer payment paid by the government in the framework of income maintenance programmes. In this case the politicians, eventually, decide about the level of the poverty line.[9] The third type of poverty lines aims at a "subjective" evaluation of the poverty line by the members of the population themselves. Using survey questionnaires, individuals are asked what they would consider to be the minimum level of command over resources either for a "representative" individual or for themselves. Then, this information is evaluated and a poverty line is constructed according to the preferences of a "representative respondent".[10] Finally, the fourth type of poverty lines used in the literature adopts an explicit "relativist" approach and defines the poverty line as a fraction of the median or mean income in the society.[11]

Since it is plausible to assume that the members of a population know better than anybody else what they consider to be the minimum socially acceptable level of living, it can be argued that the third method may be better than the others. Unfortunately, the data required for the construction of poverty lines according to this method do not exist in the case of Greece, so it is not applicable. In addition, in Greece there is no "official" poverty line comparable to, say, the U.K. Supplementary Benefit and no study has been conducted to assess the minimal needs of individuals in terms of food, housing, clothing and so on. In view of all this, we are obliged to derive the poverty line using the fourth (relativist) method. As noted earlier, this method does have the advantage that it links the poverty line to the entire income distribution and gives a "full-blooded" notion of relative deprivation. Nevertheless, it misses important aspects of absolute deprivation. For example, if the real income of every population member is halved, intuitively one would expect that the number of the poor should increase. However, this type of poverty line would identify as poor only the same population members as before. For this reason, although in this chapter only relativist poverty lines are used, in the next chapter, where intertemporal changes in poverty are examined, absolutist poverty lines are also adopted.[12]

Following OECD (1976), the poverty line is, here, defined as two thirds of the median consumption

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9. Most of the empirical studies on poverty in the United Kingdom use official poverty lines. See, for example, Fiegehen et al (1977), Townsend (1979), Beckerman and Clark (1982) and Morris and Preston (1986).

10. For subjective poverty lines see Kilpatrick (1973), Goedhart et al (1977), van Praag et al (1980, 1982a, 1982b), Hagenaars (1986).

11. Relativist poverty lines have been used by some international organizations, for example OECD (1976), and they seem to be supported by Atkinson (1983, 1985).

12. That is, in order to measure changes in poverty between 1974 and 1982, poverty in 1982 is measured using both the 1982 poverty line and the 1974 poverty line evaluated in 1982 prices.

TABLE 4.1 Sensitivity of the proportion of population in poverty to changes in the poverty line

Poverty line as percentage of the median consumption expenditure pea	Percentage of population with consumption expenditure pea below the poverty line	
	1974	1982
50%	12.6%	10.6%
60%	19.3%	17.9%
66.67%	24.3%	22.7%
70%	26.9%	25.3%
75%	30.8%	30.2%

expenditure pea in the relevant year. This means that the poverty line is set at 1980 drachmas per month in 1974 and 11425 drachmas per month in 1982. Using these lines, 6142 members of the 1974 HES sample (24.3% of the population) are classified as poor, while in 1982 4489 members of the HES sample (22.7% of the population) fall bellow the poverty line. Since the distributions used in this study are approximately lognormally distributed and the poverty lines are close to the bottom of the distributions, it is reasonable to expect the proportion of the population falling bellow the poverty line to be very sensitive to the selection of this line. This is demonstrated in Table 4.1 where the poverty line is set successively at 50%, 60%, 66.67%, 70% and 75% of the median consumption expenditure pea. An increase in the value of the poverty line by 50% (from 50% to 75% of the median expenditure) is associated with a 144% increase in the number of the poor in 1974. The relevant figure for 1982 is even higher (185%). Experimentation with several poverty lines suggested that although the empirical results related to the measurement of poverty depend crucially on the selection of the poverty line, the results of poverty decomposition are rather insensitive to changes in it.

2. The problem of poverty measurement[13]

2i. Traditional poverty indices

Once the poverty line, z, has been determined we enter the aggregation stage. Let $\mathbf{y}$ be the vector of the (positive) incomes of the n population members ranked from the poorest to the richest. If more than one

13. For a good survey of issues related to the aggregation stage of poverty measurement see Foster (1984).

individual has the same income, the ranking is assigned at random. Assume, also, that q individuals have incomes less than or equal to the poverty line, that is $0 < y_1 \leq \ldots y_q \leq z < y_{q+1} \ldots \leq y_n$. The shortfall of a poor individual's income from the the poverty line, $z-y_j$, is defined as "the poverty gap" and the normalized poverty gap, $(z-y_j)/z$, is defined as "the poverty gap ratio".

Until Sen's (1976a) contribution two indices were, principally, used for the measurement of poverty. The first is, simply, the proportion of poor in the population ("Head count ratio")

$$H = q/n \tag{1}$$

The second is the arithmetic mean of the poverty gap ratios of the poor ("Income gap ratio") (j=1 ... q)

$$I = \Sigma_j(z-y_j)/zq = 1-\mu_p/z \tag{2}$$

where μ_p is the arithmetic mean income of the poor.

To a lesser extent, two combinations of H and I have also been used. The first is the ratio of the aggregate poverty gap to the total income of the population[14] (i=1 ... n)

$$I_1 = \Sigma_j(z-y_j)/\Sigma_i y_i = (q/n)[(z-\mu_p)/\mu] = HI(z/\mu) \tag{3}$$

The second is the ratio of the aggregate poverty gap over the total income of the non-poor

$$I_2 = \Sigma_j(z-y_j)/[\Sigma_i y_i - \Sigma_j y_j] = [q/(n-q)][(z-\mu_p)/\mu_r] = HI[n/(n-q)](z/\mu_r) \tag{4}$$

where μ_r is the arithmetic mean income of the non-poor

The above indices have a very strong intuitive appeal, but they also have some obvious disadvantages. H ignores the amounts by which the incomes of the poor fall short of the the poverty line, I ignores the proportion of population in poverty and all of them are completely insensitive to transfers of income from a very poor to a relatively better-off poor person. I_1 and I_2 are, in fact, "indices of the ease of poverty alleviation" since they answer questions such as "What proportion of national income is needed to bring the income of every poor to the level of the poverty line?", and "What proportion of the income of the non-poor is needed to bring the income of every poor to the level of the poverty line?" respectively. In addition, the fact

14. See Kakwani (1977b).

that both I_1 and I_2 are decreasing functions of the incomes of the non-poor, which reduces their appeal as poverty indices. These defects establish the starting point of Sen's analysis.

2ii. The Sen index of poverty

Sen (1976a) adopts an axiomatic approach to the measurement of poverty. He argues that any index of poverty should satisfy the following axioms

Focus axiom: Changes in the incomes of the non-poor which do not affect the number of poor should leave the index unaffected.[15]

Monotonicity axiom: Ceteris paribus, a reduction in the income of a poor person should increase the index.

Transfer axiom: Ceteris paribus, a regressive transfer of income between two poor persons should increase the index.

Implicit in the poverty measurement are three further axioms derived from the measurement of inequality. The *symmetry axiom*, which requires the index to remain unaffected by a permutation of incomes; the *income-unit independence axiom*, which requires the index to remain unaffected if the incomes of all the population members and the poverty line change by the same proportion; and the *population-size independence axiom*, which requires the index to remain unaffected if two or more identical populations are pooled.[16]

Among the indices already considered, H violates the axioms of monotonicity and transfer, while I, I_1 and I_2 fail to satisfy the transfer axiom. Further, I_1 and I_2 violate the focus axiom. Sen (1976a) proposes the following general form for a poverty index

$$P(z; \mathbf{y}) = A(z; \mathbf{y})\Sigma_j(z-y_j)w_j(z; \mathbf{y}) \qquad (5)$$

where $A(z; \mathbf{y})$ is a normalization factor

and $w_j(z; \mathbf{y})$ is a weight assigned to the income gap of individual j

15. This axiom is only implicit in Sen (1976a) but is introduced explicitly in Sen (1981). Since the aggregation stage follows the identification stage, during the aggregation stage the poverty line is assumed to be exogenously determined. Hence, the focus axiom does not rule out the use of the entire income distribution in fixing the poverty line.

16. Kundu and Smith (1983) introduce the *proportion of the poor axiom* which states that "an increase in the relative number of the poor should increase the index" and show that no index can satisfy the axioms of population-size independence, proportion of the poor and transfer simultaneously.

Therefore, the poverty index is a normalized weighted sum of individual poverty gaps. In moving to a specific index, Sen chooses a weighting scheme where w_j is defined as the relative rank of poor individual j amongst the poor. Therefore, the weight assigned to the poverty gap of j is equal to q+1-j. According to Sen (1981), the justification of this weighting scheme is that j's sense of relative deprivation is represented by his relative position in comparison to the rest of the people in his reference group (the poor). Finally, Sen argues that if all the poor have the same income, μ_p, the index should be equal to the product of the head count ratio and the income gap ratio. This is known as "the normalization axiom" and has caused considerable controversy.[17] Sen (1976a) claims that the only index satisfying all the above requirements is given by

$$S = 2\Sigma_j(z-y_j)(q+1-j)/[(q+1)nz] \tag{6}$$

Taking into account that the Gini index for the distribution of income among the poor, G_p, is given by

$$G_p = 1 + 1/q - 2\Sigma_j y_j(q+1-j)/q^2\mu_p \tag{7}$$

it is not difficult to show that

$$S = H[I+(1-I)G_pq/(q+1)] \tag{8}$$

which for large q approaches[18]

$$S = H[I+(1-I)G_p] \tag{9}$$

Although Sen (1976a) asserts that S satisfies the focus, monotonicity and transfer axioms, in Sen (1977) he points out that, under certain circumstances, S can violate the transfer axiom. This can happen if after the transfer one of the poor individuals crosses the poverty line. For this reason Sen (1981) introduces the *weak transfer axiom* which adds the qualification "if both of them remain poor after the transfer" to the transfer axiom.[19] Sen justifies the weak transfer axiom by arguing that, since the poverty line is viewed as the great divider of the population, to cross the poverty line might have some special importance. Therefore, a reduction in the poverty index is permissible although the nature of the transfer remains regressive.

17. See Anand (1977), Thon (1979), Takayama (1979), Kakwani (1980b), Foster (1984). For a decomposition of this axiom to three elementary axioms see Basu (1985).

18. Note that if q is replaced by n, and z and μ_p by the mean income of the entire population, μ, S is simply the Gini index of inequality for the entire population.

19. See also Thon (1979, 1981, 1983).

2iii. Indices closely related to the Sen index of poverty

Several authors have suggested modifications of the Sen index. The first of these modified versions can be found in Anand (1977) who presents two distributionally sensitive versions of the "indices of the ease of poverty alleviation"

$$S_1 = H[I+(1-I)G_p](z/\mu) = S(z/\mu) \qquad (10)$$

$$S_2 = H[I+(1-I)G_p][n/(n-q)](z/\mu_r) = S[n/(n-q)](z/\mu_r) \qquad (11)$$

However, as Anand notes, S_1 and S_2 satisfy the monotonicity and the (weak) transfer axioms but violate the focus axiom, since they depend on the incomes of the non-poor. More specifically, an increase in the incomes of the non-poor increases the denominators in (10) and (11) and, hence, decreases the values of S_1 and S_2.

The second modification of S is that of Thon (1979). Thon's main motivation is the failure of S to satisfy the transfer axiom. As noted earlier, this can happen if, as a result of the transfer, one of the poor individuals crosses the poverty line. This is due to the fact that since the number of the poor has been reduced all the weights of the poverty gaps in (6) are reduced, as well. Thon suggests a modification of S by adding a fixed number n-q to each weight and renormalizing

$$T = 2\Sigma_j(z-y_j)(n+1-i)/[(n+1)nz] \qquad (12)$$

The weight assigned to the poverty gap of individual j in T is given by his rank among all the population members. Since these weights are not functions of q, they do not change by a reduction in the number of the poor. In addition, these weights are decreasing functions of the poor individual's rank. Hence, T registers an increase whenever a regressive transfer of income takes place between two poor individuals, even when one of them crosses the poverty line after the transfer. As a result, T satisfies the transfer axiom. Further, Thon indicates that for large n and q the relationship between T and S is given by

$$T = H[S+2(1-H)I] \qquad (13)$$

and, therefore, T can be justified on the same grounds as S.

Kakwani (1980b) argues that a poverty index should be more sensitive to the transfer of a given

amount of income among the very poor than among the better-off poor and introduces the following axiom

Transfer sensitivity axiom: If a transfer takes place from the jth poor with income y_j to a poor with income $y_j+\delta$, then for given $\delta>0$, the magnitude of increase in the index should decrease as j increases .

Due to the nature of the rank-order weighting scheme used in S, the magnitude of increase is proportional to the number of individuals ranked between the individuals involved in the transfer. As a result, S does not satisfy the transfer sensitivity axiom . Kakwani (1980b) demonstrates that a variant of S obtained by raising the weights of the poverty gaps in (6) to a power $\varepsilon>1$ and renormalizing satisfies the transfer sensitivity axiom

$$K = q\Sigma_j(z-y_j)(q+1-j)^{\varepsilon}/nz\Sigma_j(j)^{\varepsilon} \qquad (14)$$

For $\varepsilon=0$ K is equal to the product of the head count ratio and the income gap ratio and for $\varepsilon=1$ it is equal to S.

Finally, Drewnowski (1977) presents a poverty index which has some similarities to S. As Kakwani (1984) indicates, Drewnowski's index can be written as

$$D = q\mu_p G_p/n\mu \qquad (15)$$

Since the denominator of D contains μ which depends on the incomes of the non-poor, D violates the focus axiom. In addition, if all the poor have the same income, μ_p, both G_p and D are equal to zero and, hence, D violates the monotonicity axiom too.

2iv. Three general methods of constructing poverty indices

Hamada and Takayama (1977) and Takayama (1979) point out that it is more plausible to assume that the poor feel relatively deprived by comparing themselves with all the population members rather than, as Sen assumes, with their fellow poor only. Based on this assumption, they introduce the notion of "censored income distribution" and develop a general method of obtaining poverty indices from inequality indices. The censored income distribution $\mathbf{y}^*$ can be obtained from an income distribution $\mathbf{y}$ by replacing the incomes of all the non-poor individuals by the poverty line. Formally

$$\text{if } y_i < z, \quad y_i^* = y_i$$

$$\text{and} \quad \text{if } y_i \geq z, \quad y_i^* = z$$

Hamada and Takayama (1977) and Takayama (1979) argue that a poverty index can be obtained by applying

an inequality index to the censored income distribution. They claim that, if the inequality index satisfies the axioms of transfer, population-size independence and income-unit independence, the associated poverty index will have the "appropriate properties".

A rationalization for the use of the degree of inequality of the censored income distribution as an index of poverty is offered by Pyatt (1987). Instead of dividing the population into poor and non-poor he suggests dividing the incomes of all the population members into two components: a "basic" component, corresponding to an individual's income up to the poverty line and a "surplus" component corresponding to the individual's residual income above the poverty line.[20] Then, the poverty index can be defined in terms of the level and distribution of the basic incomes among all the population members.[21]

Takayama (1979) presents an application of his methodology using the Gini index of the censored income distribution

$$L = 1 + 1/n - 2\Sigma_i y_i^*(n+1-i)/n^2\mu^* \qquad (16)$$

where μ^* is the arithmetic mean income of the censored income distribution

In the early stages of his article Takayama argues that L satisfies the Sen axioms. However, later, he admits that a decrease in a poor individual's income can reduce the value of L. Hence, L violates the monotonicity axiom. In addition, L can indicate a decrease in poverty if all the non-poor individuals' incomes fall below the poverty line.[22] Kakwani (1981a) points out that L can violate the monotonicity axiom only if the poverty line is strictly greater than the median income of the population. Further, Kakwani demonstrates that, despite the claim of Takayama that L gives a more "full-blooded" idea of the relative deprivation of the poor than S, in the usual case where less than 50% of the population fall below the poverty line, S is more sensitive than L to transfers of income among the poor.

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20. Note the analogy to the "subsistence" and "supernumerary" income of the Linear Expenditure System. See also Vaughan (1987).

21. It should be noted that the analysis of Pyatt (1987) corresponds more to the second index of Clark et al (1981) which is presented below than to the Takayama (1979) index.

22. For example, consider the situation where initially all the poor have the same income, μ_p, and then the incomes of all the non-poor fall to μ_p, as well. The initial value of L is strictly positive but after the reduction in the incomes of the non-poor it takes the value of zero.

A second method of obtaining poverty indices from inequality indices can be found in Blackorby and Donaldson (1980). It was noted earlier - expression (9) - that for large values of q, S is approximately equal to $H[I+(1-I)G_p]$. Blackorby and Donaldson indicate that poverty indices can be obtained by replacing G_p by other indices of inequality in the distribution of income among the poor (R_p), provided that these indices satisfy the axioms of symmetry, transfer, population-size independence and income-unit independence.

$$B = H[I + (1-I)R_p] \tag{17}$$

(17) can be written as

$$B = H[z - \mu_p(1-R_p)]/z \tag{18}$$

which can be interpreted as the product of the head count ratio and the income gap ratio associated with the "representative income of the poor according to R_p". By the latter they mean the level of income which if equally distributed among the poor leads them to the same level of social welfare as the original distribution evaluated by the social welfare function underlying R_p. Nevertheless, as Foster (1984) points out, the fact that the inequality index satisfies the required properties does not guarantee that the corresponding poverty index does not violate the Sen axioms. More specifically, the indices derived using the Blackorby and Donaldson method violate the monotonicity axiom, unless the expression $\mu_p(1-R_p)$ is a strictly increasing function of the incomes of the poor.[23]

A third method of obtaining poverty indices from inequality indices is suggested in Clark et al (1981).[24] They argue that inequality among the poor can be measured using poverty gaps rather than incomes. For example, taking into account that

23. The poverty indices presented in this section are "relative"; that is they do not change if all incomes and the poverty line change by the same proportion. Blackorby and Donaldson (1980) present a method of constructing "absolute poverty indices", as well. These are indices which do not change if the same amount of money is added to the incomes of all population members and to the poverty line. For absolute poverty indices see, also, Chakravarty (1983b).

24. In fact, Clark et al (1981) present two methods of obtaining poverty indices from inequality indices. The second method is presented in the next subsection.

$$(1-I)G_p = IG_g \quad ^{25} \qquad (19)$$

where G_g is the Gini index of the distribution of poverty gaps among the poor

Expression (9) can be modified as

$$S = HI[1+G_g] \qquad (20)$$

Then, using arguments similar to those of Blackorby and Donaldson (1980), Clark et al (1981) indicate that poverty indices can be obtained by measuring the inequality in the distribution of poverty gaps using another index of inequality, R_g, and substituting in (20)

$$J = HI[1+R_g] \qquad (21)$$

Clark et al (1981) specify their index further by using a variant of the Atkinson index as index of inequality in the distribution of poverty gaps among the poor. More specifically, their index has the following form ($\varepsilon>0$)

$$\begin{aligned} J &= HI\{1 + [[\Sigma_j(z-y_j)^{1-\varepsilon}/q]^{1/(1-\varepsilon)}/(z-\mu_p) - 1]\} \\ &= HI\{[\Sigma_j(z-y_j)^{1-\varepsilon}/q]^{1/(1-\varepsilon)}/(z-\mu_p)\} \\ &= H\{[\Sigma_j(z-y_j)^{1-\varepsilon}/q]^{1/(1-\varepsilon)}\}/z \end{aligned} \qquad (22)$$

J satisfies the focus, the monotonicity and the weak transfer axioms. However, as Chakravarty (1983b) and Thon (1983) show, it violates the transfer axiom.

2v. Social welfare function approaches to the measurement of poverty

Clark et al (1981) present a second index of poverty explicitly based on a social welfare function approach. This index combines several characteristics of the methods suggested by Hamada and Takayama (1977) and Blackorby and Donaldson (1980).[26]

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25. $(1-I)G_p = (\mu_p/z)[1 + 1/q - 2\Sigma_j y_j(q+1-j)/q^2\mu_p] = (\mu_p/z)[1 + 1/q - 2 - 2/q + 2\Sigma_j(y_j)j/q^2\mu_p]$
$= -\mu_p(q+1)/zq + 2\Sigma_j(y_j)j/q^2z$
$IG_g = (1-\mu_p/z)[1 + 1/q - 2\Sigma_j(z-y_j)j/q^2(z-\mu_p)] = [(z-\mu_p)/z][1 + 1/q - z(q+1)/q(z-\mu_p) + 2\Sigma_j(y_j)j/q^2(z-\mu_p)]$
$= -\mu_p(q+1)/zq + 2\Sigma_j(y_j)j/q^2z$

26. See also Chakravarty (1983b) and Pyatt (1987).

$$C = [z - \mu^*(1-A(\mathbf{y}^*))]/z \tag{23}$$

$$= 1 - (\mu^*/z)\{1 - [1 - (1/\mu^*)][(1/n)\Sigma_i(y_i^*)^{1-\varepsilon}]^{1/(1-\varepsilon)}\}$$

$$= 1 - (1/z)[(1/n)\Sigma_i(y_i^*)^{1-\varepsilon}]^{1/(1-\varepsilon)} \tag{24}$$

where $A(\mathbf{y}^*)$ is the Atkinson index of inequality of the censored income distribution ($\varepsilon>0$)

Clark et al (1981) show that C satisfies all the Sen axioms (focus, monotonicity, transfer). In addition, it can be shown that it satisfies Kakwani's transfer sensitivity axiom, as well. Clark et al support the idea of Hamada and Takayama (1977) that the relative deprivation of the poor should be expressed in comparison to the entire population. They, therefore, use the censored income distribution instead of the distribution of income among the poor only. However, their approach differs from that of Hamada and Takayama because the poverty gaps in C are calculated as differences from the poverty line, whereas in L - expression (16) - they are calculated as differences from the mean of the censored income distribution. C also contains the expression $\mu^*(1-A(\mathbf{y}^*))$ which can be interpreted as the representative income of the censored income distribution according to Atkinson's index. In this respect, the Clark et al (1981) approach is similar to that of Blackorby and Donaldson (1980). Nevertheless, C uses the representative income of the censored income distribution, whereas B uses the representative income of the poor only.

Hagenaars (1987) indicates that (23) can be written as

$$C = 1 - y^*_{EDE}/z \tag{25}$$

where y^*_{EDE} is the equally distributed equivalent income per capita of the censored income distribution (using Atkinson's Social Welfare Function).

and that other poverty indices can be derived if $A(\mathbf{y}^*)$ is substituted by other indices of inequality of the censored income distribution in (23). Similarly, she indicates that a poverty index corresponding to the Dalton index of inequality can be constructed. This index has the general form

$$N = 1 - W(\mathbf{y}^*)/W(\mathbf{z})$$

$$= \{nU(z) - [(n-q)U(z) + \Sigma_j U(y_j)]\}/nU(z)$$

$$= (q/n)\Sigma_j\{[U(z) - U(y_j)]/qU(z)\} \tag{26}$$

$W(\mathbf{y}^*)$ is the level of social welfare corresponding to the censored income distribution and $W(\mathbf{z})$ is the level of social welfare that would exist if every population member had income equal to the poverty line. [$U(y_j)$ denotes the utility function of individual j]. It can be noted that, like the Dalton index of inequality, N is not invariant with respect to linear transformations of the utility function used in it.

An alternative method of constructing social welfare based poverty indices is suggested in Vaughan (1987). Vaughan argues that a poverty index can be defined as the normalized difference between the level of social welfare that would exist in the society if poverty was eliminated and the actual level of social welfare. Assuming that the social welfare function is an additively separable function of the incomes of the poor and the non-poor, the general form of his index can be written as[27]

$$V = [W(\mathbf{z};\ \mathbf{y}_r) - W(\mathbf{y}_p;\ \mathbf{y}_r)]/W(\mathbf{z};\ \mathbf{y}_r) \qquad (27)$$

$W(\mathbf{z};\ \mathbf{y}_r)$ is the level of social welfare that would exist if the incomes of all the poor were brought to the level of the poverty line and $W(\mathbf{y}_p;\ \mathbf{y}_r)$ is the actual level of social welfare. Using Atkinson's index of inequality, Vaughan specifies his index as

$$V = \frac{\{Hz^{1-\epsilon} + (1-H)[(1-A_r)\mu_r]^{1-\epsilon}\} - \{H[(1-A_p)\mu_p]^{1-\epsilon} + (1-H)[(1-A_r)\mu_r]^{1-\epsilon}\}}{Hz^{1-\epsilon} + (1-H)[(1-A_r)\mu_r]^{1-\epsilon}}$$

$$= \{Hz^{1-\epsilon} - H[(1-A_p)\mu_p]^{1-\epsilon}\}/\{Hz^{1-\epsilon} + (1-H)[(1-A_r)\mu_r]^{1-\epsilon}\} \qquad (28)$$

where A_p is the Atkinson index of inequality in the distribution of income among the poor

and A_r is the Atkinson index of inequality in the distribution of income among the non-poor

The indices constructed using Vaughan's method depend on the incomes of the non-poor and, therefore, violate the focus axiom. As with Anand's modification of the Sen index, the consequence of this violation is that V decreases whenever the incomes of the non-poor increase.[28] In addition, V is open to criticisms similar to those of Sen (1978) for the Atkinson index of inequality: that the measurement of poverty is a different task than the evaluation of the social welfare loss due to the existence of poverty.

27. In fact, Vaughan presents a set of relative and absolute poverty indices derived using this general method.
28. Note that the mean income of the non-poor appears only in the denominator of (28).

In recent years many attempts have been made to measure welfare, inequality and poverty simultaneously. [Atkinson (1987), Pyatt (1987), Vaughan (1987) and, particularly, Lewis and Ulph (1988)]. A tentative conclusion of this literature is that the existence of poverty as a distinct phenomenon from inequality implies a discontinuity of the social welfare function at the poverty line level.[29] It should be noted, however, that the attempt of Lewis and Ulph (1988) to derive simultaneously inequality and poverty indices within a utilitarian Social Welfare Function framework suggests that the only poverty index consistent with this framework is the Head-count ratio, H. (The relevant inequality index is, of course, the Atkinson index A).

2vi. Additively decomposable poverty indices

From a policy point of view, it is useful to have poverty indices indicating the contribution of each particular population group to aggregate poverty.[30] These indices are called "additively decomposable", although the term is not used in exactly the same sense as in the decomposition of inequality.[31] Additively decomposable inequality indices express aggregate inequality as the sum of "between-groups" and "within-groups" inequalities, whereas additively decomposable poverty indices express aggregate poverty as the weighted sum of the group poverty indices only.[32]

Foster et al (1984) present the following index ($\varepsilon>0$)

$$F = (1/n)\Sigma_j[(z-y_j)/z]^{\varepsilon} \qquad (29)$$

F satisfies the focus axiom for all the values of ε, the monotonicity axiom for $\varepsilon>0$, the transfer axiom for $\varepsilon>1$ and the transfer sensitivity axiom for $\varepsilon>2$. For $\varepsilon=0$ F is equal to the head count ratio, and for $\varepsilon=1$ it is equal to the product of the head count ratio and the income gap ratio. Foster et al focus mainly on the index obtained when $\varepsilon=2$. They indicate that in this case the index can be written in the general form (5) suggested by Sen (1976a) with the weights to the poverty gaps being the poverty gaps themselves. It can also be written as

29. "Being poor is discretely different from being non-poor, and ... this is associated with discrete changes in consumer behaviour and, possibly, utility" [Lewis and Ulph (1988, p. 119)].

30. See Kanbur (1987a).

31. Foster and Shorrocks (1987) introduce the *subgroup consistency axiom* which states that "Ceteris paribus, the poverty index should increase when poverty increases within a population subgroup". Hagenaars (1987) calls this axiom *decomposition axiom*. It should be noted that all the additively decomposable poverty indices satisfy the subgroup consistency axiom but not vice versa.

32. The *"between-groups" component of poverty* is always equal to zero in the sense that the benchmark for each group's poverty index is the same (the poverty line).

$$F_2 = H[I^2 + (1-I)^2\Sigma_j(\mu_p - y_j)^2/(q\mu_p^2)] = H[I^2 + (1-I)^2C_p^2] \qquad (30)$$

where C_p^2 is the squared coefficient of variation of the distribution of income among the poor

If z and μ_p are replaced by μ, and q by n, F becomes the squared coefficient of variation of the entire income distribution. In addition, if the population is grouped into k=1 ... K mutually exclusive and exhaustive groups with populations n_1 ... n_K, the general class of indices introduced by Foster et al (1984) can be written as

$$F = \Sigma_k(n_k/n)\{(1/n_k)\Sigma_{j\in P_k}[(z-y_j)/z]^\varepsilon\} = \Sigma_k(n_k/n)F_k \qquad (31)$$

where P_k is the set of poor individuals in group k

and F_k is the value of F in group k

Therefore, F is an additively decomposable poverty index with population share weights,[33] and the quantities $(n_k/n)F_k$ and $100(n_k/n)(F_k/F)$ are, respectively, the absolute and the percentage contributions of group k to aggregate poverty according to F.

2vii. A new additively decomposable poverty index

Foster et al (1984) claim that one of their main motivations for the construction of F is that it is closely related to the notion of relative deprivation. Foster (1984, p.239) notes that "when the poverty line is taken as the reference point of the poor, the poverty gap corresponds very closely to the 'magnitude of relative deprivation'". Two points can be made regarding this statement. Firstly, if the poverty line represents the minimum socially acceptable standard of living, it is more reasonable to argue that the difference between the poverty line and poor individual's income (the poverty gap) represents the absolute deprivation of this poor person, rather than his relative deprivation, as Foster et al claim. Secondly, if a poverty index can be written in the general form (5) suggested by Sen (F can be written in that form) the poverty gap is already part of the index. Therefore, the notion of relative deprivation felt by the poor should be captured by the weighting scheme employed in the index. If the poverty line is taken as the reference point of the poor,[34] the logical

33. The head count ratio is also an additively decomposable poverty index with population share weights.

34. As Foster (1984, footnote 56) points out, the work of Townsend (1979) highlights the fact that - at least in the U.K. - a very large part of the poor consider the poverty line their reference point.

consequence of the argument of Foster cited above would be to use as weight for a poor individual's poverty gap not the poverty gap itself, but the the ratio of the poverty line over the income of that individual. In other words, it seems more plausible to assume that the poor compare their level of income, rather than their poverty gap, to the poverty line. This notion of relative deprivation can be captured by the following index

$$M_1 = (1/nz)\Sigma_j(z-y_j)(z/y_j) \qquad (32)$$

M_1 belongs to a class of poverty indices which can be written according to the general form (5) as

$$M = (1/nz)\Sigma_j(z-y_j)(z/y_j)^\varepsilon \qquad (\varepsilon>0) \qquad (33)$$

Since M does not contain any expression related to the incomes of the non-poor, it satisfies the focus axiom. Taking into account that

$$\partial M/\partial y_j = (1/n)[-\varepsilon z^\varepsilon/y_j^{\varepsilon+1} + (\varepsilon-1)z^{\varepsilon-1}/y_j^\varepsilon]$$
$$= (1/n)(z^{\varepsilon-1}/y_j^\varepsilon)[-\varepsilon(z-y_j) - y_j]/y_j < 0 \qquad (34)$$

M satisfies the monotonicity axiom. The second derivative of M with respect to y_j is given by

$$\partial^2 M/\partial y_j^2 = (1/n)[\varepsilon(\varepsilon+1)z^\varepsilon/y_j^{\varepsilon+2} - \varepsilon(\varepsilon-1)z^{\varepsilon-1}/y_j^{\varepsilon+1}]$$
$$= (1/n)\varepsilon(z^{\varepsilon-1}/y_j^{\varepsilon+1})[\varepsilon(z-y_j) + z + y_j]/y_j > 0 \qquad (35)$$

The same result holds for each $y_j>0$. Therefore, M is strictly convex to the incomes of the poor and, hence, satisfies the transfer axiom. Following Kolm (1976b), a poverty index satisfies the transfer sensitivity axiom if its third derivatives with respect to the vector of incomes have the opposite signs than the second derivatives.

$$\partial^3 M/\partial y_j^3 = (1/n)[-\varepsilon(\varepsilon+1)(\varepsilon+2)z^\varepsilon/y_j^{\varepsilon+3} + (\varepsilon-1)\varepsilon(\varepsilon+1)z^{\varepsilon-1}/y_j^{\varepsilon+2}]$$
$$= (1/n)\varepsilon(\varepsilon+1)(z^\varepsilon/y_j^{\varepsilon+3})[-\varepsilon(z-y_j) - y_j - 2z]/y_j < 0 \qquad (36)$$

Hence, M also satisfies the transfer sensitivity axiom. Expressed in continuous form M can be written as

$$M = \int_0^z [(z-y)/z](z/y)^\varepsilon f(y)dy$$
$$= z^\varepsilon \int_0^z y^{-\varepsilon} f(y)dy - z^{\varepsilon-1}\int_0^z y^{1-\varepsilon} f(y)dy \qquad (37)$$

Then, since

$$\partial M/\partial z = \varepsilon z^{\varepsilon-1}\int_0^z y^{-\varepsilon}f(y)dy + z^{\varepsilon}[z^{-\varepsilon}]f(z) - (\varepsilon-1)z^{\varepsilon-2}\int_0^z y^{1-\varepsilon}f(y)dy - z^{\varepsilon-1}[z^{1-\varepsilon}]f(z)$$
$$= \varepsilon z^{\varepsilon-1}\{\int_0^z y^{-\varepsilon}f(y)dy - \int_0^z [(y^{1-\varepsilon})/z]f(y)dy\} + z^{\varepsilon-2}\int_0^z y^{1-\varepsilon}f(y)dy$$
$$= \varepsilon z^{\varepsilon-1}\int_0^z y^{-\varepsilon}[(z-y)/z]f(y)dy + z^{\varepsilon-2}\int_0^z y^{\varepsilon-1}f(y)dy > 0 \qquad (38)$$

M is a strictly increasing function of the poverty line, z.[35] Although it might sound very reasonable that a poverty index should increase as the level of the poverty line increases, many sophisticated poverty indices do not satisfy this property.[36] In addition, if the population is grouped into k=1 ... K mutually exclusive and exhaustive groups with populations n_1 ... n_K, M can be written as

$$M = \Sigma_k(n_k/n)(1/n_k z)\Sigma_{j\in P_k}(z-y_j)(z/y_j)^{\varepsilon} = \Sigma_k(n_k/n)M_k \qquad (39)$$

where M_k is the level of poverty in group k according to M

Therefore, M is an additively decomposable poverty index with population share weights and the quantities $(n_k/n)M_k$ and $100(n_k/n)(M_k/M)$ can be considered as the absolute and percentage contributions of group k to aggregate poverty, respectively. Note, also, that when $\varepsilon=1$ M becomes a "constant elasticity" poverty index

$$(\partial M_1/\partial y_j)(y_j/M_1) = -z/\Sigma_j(z-y_j) = -z/q(z-\mu_p) \qquad (40)$$

This implies that, when $\varepsilon=1$, equal *proportional* changes in the incomes of any pair of poor persons have exactly the same effect on M.

The parameter ε can be viewed as a "poverty aversion parameter". The larger its value the relatively larger the weight attached to the income-gap of the poorest poor. As ε tends to infinity M approaches a Rawlsian type of poverty index, focusing exclusively on the position of the poorest individual. At the other extreme, when $\varepsilon=0$, M is equal to the product of the head count ratio and the income gap ratio and, hence, violates the transfer axiom.

It has been argued above that the advantage of M over F is that it is more able to capture the sense of

35. If $\partial M/\partial z$ is calculated from (33) the effect of the change in z on the number of poor, q, is ignored.

36. See, for example, Clark et al (1981) who note that at least the indices suggested by Sen (1976a), Takayama (1979) and the first index suggested by Clark et al (1981) might not increase when the value of the poverty line increases.

relative deprivation experienced by the poor.[37] However, it can be argued that the disadvantage of M in comparison with F is that it can become very "Rawlsian" in certain conditions. It can be noted that if the income of a poor individual is close to zero, both the weight assigned to his poverty-gap and M itself can become infinitely large. Therefore, the whole index is dominated by a single individual. Two arguments can be offered in favour of M in this case. The first is that if the income of a poor individual is close to zero, this implies that the individual is close to a situation of absolute destitution and, therefore, a poverty index ought to be allowed to become infinitely large. The second - which is more relevant in our case - is that the very reason we are interested in measuring poverty is in order to evaluate the welfare position of the most deprived members of the society. It is now rather widely accepted[38] that an individual's consumption is likely to be a much better indicator of his level of welfare than his income. Although an individual's income may be zero, or even negative in the short run, his consumption (or consumption expenditure) is rather unlikely to be very close to zero even under conditions of severe deprivation. Therefore, any argument against M in this context is, in fact, an argument against the use of (current) income as an indicator of welfare.

It should be noted that the poverty indices suggested by Clark et al (1981), Chakravarty (1983a, 1983b), Pyatt (1987), Vaughan (1987) and Hagenaars (1987), which are related to the Atkinson index of inequality, exhibit a similar problem for $\varepsilon>1$. In this case the Atkinson index takes its maximum value even if a single individual has zero income. From a different angle, it can be noted that the above problem of M is very similar to the relevant problem of the second Theil index of inequality, N. As noted in the last chapter, N is the only additively decomposable index of inequality with population share weights which satisfies the four fundamental axioms of inequality measurement but it is unbounded from above and can become infinitely large even if a single population member has zero income.

2viii. A selection amongst poverty indices

It should be clear by now that a single, "best" index of poverty does not exist. All indices are related, to some extent, to an index of inequality and, as noted in the last chapter, underlying each index of inequality is a different social welfare function. Social welfare functions, in turn, are based on value judgments and value

37. Note that both M and F belong to a more general class of poverty indices given by $P^*=(1/n)\Sigma_j\phi(x_j)$, where $x_j=(y_j/z)$. In the case of M $\phi(x_j)=(1-x_j)x_j^{-\epsilon}$ whilst in the case of F $\phi(x_j)=(1-x_j)^{\epsilon}$.

38. See, for example, Sen (1976b), Deaton (1980).

judgments may differ between individuals. For this reason it was decided to base the measurement and decomposition of poverty in Greece on more than one index and to use only indices which do not violate the Sen axioms. On this basis it was decided to include the Thon index T, the second Clark et al index C for $\varepsilon=2$,[39] the Foster et al index F for $\varepsilon=2$ and the new index M for $\varepsilon=1$.[40] Despite its popularity, the Sen index is not used because it violates the transfer axiom. Instead of it, the Thon variant of the Sen index is used because it is derived using a method similar to that used by Sen (1976a) and it does satisfy the transfer axiom. In spite of the disadvantage mentioned in the last section, the new index M is also used so that we can avoid basing the whole decomposition analysis on F. Finally, the head count ratio, H, is used together with T, C, F and M because of its very clear descriptive features.

3. Measurement and one-way decomposition of poverty in Greece.

The estimates of H, T, C, F and M for the entire population are reported in bold characters in the central rows of Tables 4.2 for 1974 and 4.3 for 1982. Before proceeding to the measurement and decomposition of poverty for specific population groups, a warning should be given. In the introduction of this chapter it was noted that, firstly, the share of the population in poverty in Greece is very sensitive to changes in the poverty line and, secondly, that it is likely that the value of a poverty index depends crucially on the level of the poverty line selected. Tables 4.2 and 4.3 report the values of H, T, C, F and M as the poverty line is set at 50%, 60%, 66.67%, 70% and 75% of the median consumption pea of the relevant HES. The figures reported in parentheses below the estimates of the indices are the percentage differences in the values of these indices from the values obtained when the poverty line is defined as two thirds (66.67%) of the median consumption expenditure pea (that is, the poverty line used in this study). The results of Tables 4.2 and 4.3 clearly demonstrate that the values of T, C, and, particularly, F and M are even more sensitive to changes in the poverty line than the proportion of population in poverty (H). Therefore, the results of this chapter should be interpreted very cautiously, bearing in mind that they are determined, to a large extent, by the level of the poverty line used in the analysis.

39. In the last chapter, the value of $\varepsilon=2$ was used for the calculation the Atkinson index of inequality, A. Since C uses A for the measurement of inequality in the censored income distribution, it was decided to use the same value of ε for the measurement of poverty, as well.

40. Estimates of M for a range of values of ε can be found in Tsakloglou (1988b).

TABLE 4.2 Sensitivity of poverty indices to changes in the poverty line (1974)

Poverty line as percentage of the median consumption expenditure pea	Head Count Index H	Thon Index T	Clark et al Index (ε=2) C	Foster et al Index (ε=2) F	New Index (ε=1) M
50%	0.126 (-48.1)	0.061 (-52.7)	0.053 (-55.1)	0.012 (-58.6)	0.056 (-58.2)
60%	0.193 (-20.6)	0.099 (-23.5)	0.090 (-23.7)	0.021 (-27.6)	0.099 (-26.1)
66.67%	**0.243**	**0.129**	**0.118**	**0.029**	**0.134**
70%	0.269 (10.7)	0.144 (11.6)	0.133 (11.9)	0.033 (13.8)	0.153 (14.2)
75%	0.308 (26.7)	0.167 (29.5)	0.156 (32.2)	0.040 (37.9)	0.185 (38.1)

The only other comparable empirical studies of poverty in Greece are those of Carantinos (1981) and Kanellopoulos (1986).[41] There are many methodological differences between the present analysis and the analyses of these authors. Carantinos uses the 1974 HES grouped expenditure data on purchases of goods and services, without including imputed rent, consumption of own production and income-in-kind, although the latter categories constitute a very large part of the total consumption of poor HHs. He, then, sets the poverty line at the level of 5000 drachmas per HH per month (1645 drachmas per person per month) and calculates that 30.85% of all the HHs, or 24.68% of all the population members, were in poverty in 1974. He also calculates the value of the Sen index to be 0.1661. When account is taken of both the differences mentioned above and the differences between the analysis of Carantinos and the present analysis (use of equivalence scales, adjustments for inflation, exclusion of specific expenditure items and certain HHs) it is surprising and purely coincidental that the figure of H in Table 4.2 for 1974 (0.243) is so similar to the corresponding figure in Carantinos' results (0.2468).

For the measurement of poverty, Kanellopoulos (1986) uses the 1974 HES primary income data including imputed rent, but excluding consumption of own production and income in kind. His unit of

41. The studies of Babanasis (1981) and Kavouriaris (1983) are not strictly comparable with the present study.

TABLE 4.3 Sensitivity of poverty indices to changes in the poverty line (1982)

Poverty line as percentage of the median consumption expenditure pea	Head Count H	Thon Index T	Clark et al Index (ε=2) C	Foster et al Index (ε=2) F	New Index (ε=1) M
50%	0.106 (-53.3)	0.047 (-57.7)	0.040 (-59.2)	0.009 (-61.9)	0.041 (-62.4)
60%	0.179 (-21.1)	0.083 (-25.2)	0.072 (-26.5)	0.016 (-29.5)	0.078 (-28.4)
66.67%	**0.227**	**0.111**	**0.098**	**0.023**	**0.109**
70%	0.253 (11.5)	0.126 (13.5)	0.112 (14.3)	0.027 (17.4)	0.126 (15.6)
75%	0.302 (33.0)	0.149 (34.2)	0.134 (36.7)	0.033 (43.5)	0.155 (42.2)

analysis can be called the "equivalent HH". He calculates the number of equivalent adults in the HH by assigning a weight of one to the HH head and a weight of 0.7 to each of the remaining HH members, irrespective of their age. Then, he divides the total HH income by the number of equivalent adults in the HH and performs his analysis using as units the HHs ranked by their income pea. The poverty line selected by Kanellopoulos corresponds to one half of the mean national income pea (2100 drachmas per month). Using this poverty line he calculates that 26.4% of the 1974 HES HHs were living in poverty and that the value of the Sen index was 0.183. The first of these figures in not very different from the corresponding figure of Table 4.2 (24.3%). Note, however, that from a welfare (and policy) point of view it is far more important to know the proportion of individuals, rather than the proportion of HHs, that fall below the poverty line. Otherwise, if the poor HHs are smaller (larger) in size than the national average, the measurement of poverty using as unit the HH can overstate (understate) the incidence and the severity of poverty in the population.

3i. Measurement and decomposition of poverty by regional factors

As with the measurement and decomposition of inequality, we start the measurement and decomposition of poverty by grouping the population according to regional factors. The results are given in Table 4.4. For each group, estimates of H, T, C, F and M are reported together with the group population share

TABLE 4.4 Measurement and decomposition of poverty by regional factors (1974)

Characteristic of Household Member or Household Head	Populat. Share n_j	Mean Expend. of the poor μ_{jp}	Head Count H	Thon Index T	Clark et al Index (ε=2) C	Foster et al Index (ε=2) F	New Index (ε=1) M
REGION							
Greater Athens	0.317	1541	0.094 (12.3)	0.041	0.034	0.007 (7.7)	0.035 (8.3)
East Mainland and Islands	0.108	1465	0.206 (9.1)	0.101	0.089	0.022 (8.3)	0.098 (7.9)
Greater Salonica	0.073	1566	0.183 (5.5)	0.073	0.059	0.013 (3.3)	0.062 (3.4)
Central and West Macedonia	0.097	1361	0.338 (13.5)	0.188	0.171	0.045 (15.2)	0.206 (14.9)
Peloponnese and West Mainland	0.131	1451	0.276 (14.9)	0.135	0.119	0.028 (12.8)	0.135 (13.2)
Thessaly	0.098	1376	0.378 (15.2)	0.203	0.189	0.050 (17.1)	0.233 (17.1)
Crete	0.051	1433	0.353 (7.4)	0.174	0.163	0.041 (7.3)	0.195 (7.4)
Epirus	0.048	1321	0.388 (7.7)	0.225	0.215	0.058 (9.7)	0.274 (9.8)
East Macedonia and Thrace	0.078	1314	0.456 (14.6)	0.259	0.237	0.068 (18.5)	0.311 (18.1)
SIZE OF MUNICIPALITY OR COMMUNE							
Greater Athens	0.317	1541	0.094 (12.3)	0.041	0.034	0.007 (7.7)	0.035 (8.3)
Greater Salonica	0.073	1566	0.183 (5.5)	0.073	0.059	0.013 (3.3)	0.062 (3.4)
Other with more than 30000	0.095	1491	0.212 (8.3)	0.098	0.089	0.020 (6.6)	0.098 (7.0)
10000-29999	0.082	1367	0.219 (7.4)	0.122	0.115	0.028 (8.0)	0.130 (8.0)
5000-9999	0.035	1425	0.229 (3.3)	0.119	0.107	0.026 (3.2)	0.119 (3.1)
2000-4999	0.076	1428	0.295 (9.2)	0.150	0.135	0.034 (9.0)	0.157 (8.9)
1000-1999	0.085	1390	0.365 (12.8)	0.192	0.176	0.046 (13.6)	0.213 (13.5)

(continued)

Less than 1000	*0.236*	*1351*	*0.425*	*0.232*	*0.213*	*0.059*	*0.271*
			(41.2)			*(48.5)*	*(47.8)*
Urban (more than 10000)	*0.568*	*1499*	*0.144*	*0.067*	*0.059*	*0.013*	*0.063*
			(33.5)			*(25.7)*	*(26.7)*
Rural (less than 10000)	*0.432*	*1373*	*0.374*	*0.202*	*0.185*	*0.049*	*0.227*
			(66.5)			*(74.3)*	*(73.3)*
GREECE	*1.000*	*1415*	*0.243*	*0.129*	*0.118*	*0.029*	*0.134*

and the mean expenditure of the poor. The figures in parentheses below the estimates of H, F and M are the percentage contributions to aggregate poverty of each group according to the relevant index.

The upper panel of Table 4.4 reports the results of measurement and decomposition of poverty when the 1974 HES sample is grouped according to the region of residence. These results indicate that in 1974 poverty was particularly acute in East Macedonia and Thrace (where as much as 45.6% of the population was classified as poor) and, to a lesser extent, in Epirus and Thessaly. Combining these results with the information of Table 3.5, it can be argued that the high values of the poverty indices in East Macedonia and Thrace and in Epirus are, mainly, due to their very low mean consumption expenditure pea, whereas in Thessaly they are, probably, a consequence of the observed high degree of inequality.

These results are broadly in line with the argument of Kavouriaris (1983) that since the Regional Accounts indicate that per capita income and gross investment in East Macedonia, Thrace and Epirus are much lower than the national average, poverty in these regions should be higher than in the rest of the country. Kavouriaris also identifies the Aegean Islands as a high-poverty region. As noted in chapters 1 and 3, in the 1974 sample some Aegean Islands are grouped with Thessaly and some others with East Mainland and Islands, whilst in the 1982 sample all of them are grouped with East Mainland and Islands. This may be the reason that, as the results of Table 4.5 (which are reported below) indicate, poverty in 1982 appears to be greatly reduced in Thessaly, whereas East Mainland and Islands is the only region where (relative) poverty increased unambiguously between 1974 and 1982. Kanellopoulos' (1986) results also suggest that the high-poverty regions of Greece in 1974 were Epirus, East Macedonia and Thrace, and Thessaly. However, according to his

results the head-count ratio of Epirus was substantially higher than the relevant ratios of the other regions.[42] At the other end of the scale, poverty appears to be relatively low in large cities. Although in 1974 39.0% of total population was living in Greater Athens and Greater Salonica, only 17.8% of the poor were living there and the two areas together accounted for 11.0% (F) or 11.7% (M) of aggregate poverty.

The last conclusion, that poverty is lower in the large cities and, more generally, in the urban areas, is supported by the evidence presented in the second panel of Table 4.4. where the population is grouped according to the size of the locality of residence. A clear inverse relationship can be observed between poverty and size of locality. In particular, in the small villages (population "Less than 1000") 42.5% of the population was living in poverty and almost half of aggregate poverty in 1974 was located there (48.5% by F or 47.8% by M). Carantinos (1981) also reports an inverse relationship between poverty and size of locality for 1974 although, as a result of using grouped data, that relationship is less marked than in Table 4.4. At the bottom of Table 4.4 the population is divided into two large groups only: urban and rural. Not surprisingly, poverty is found to be a predominantly rural phenomenon. The mean consumption expenditure of the urban poor was 9.2% higher than that of the rural poor and, although in 1974 only 43.2% of the population was living in rural areas, 66.5% of the poor could be located there. F and M indicate that rural poverty accounted for almost three quarters of aggregate poverty (74.3% and 73.3%, respectively).

Table 4.5 reports the results of measurement and decomposition of poverty by regional factors for 1982. As the results of the top panel of the table show, all the indices record their highest values in Epirus. Poverty also appears to be relatively high in East Macedonia and Thrace and, to a lesser extent, in Thessaly, and in Central and West Macedonia. Careful examination of the evidence provided in Tables 4.5 and 3.6 might suggest that the high value of the poverty indices in Epirus should be attributed to the combination of very low level and relatively highly unequal distribution of consumption expenditure pea. On the contrary, it seems likely that the high level of poverty in East Macedonia and Thrace was mainly due to the unequal distribution of consumption expenditure in this region. Although Central and West Macedonia, and Thessaly have lower mean consumption expenditures pea than East Macedonia and Thrace they also have lower levels of poverty. In addition, although the incidence of poverty is higher in Central and West Macedonia than in

42. The regional classification of Kanellopoulos (1986) is identical to that of Table 4.4.

TABLE 4.5 Measurement and decomposition of poverty by regional factors (1982)

Characteristic of Household Member or Household Head	Populat. Share n_j	Mean Expend. of the poor μ_{jp}	Head Count H	Thon Index T	Clark et al Index (ε=2) C	Foster et al Index (ε=2) F	New Index (ε=1) M
REGION							
Greater Athens	0.319	9144	0.110 (15.5)	0.043	0.034	0.007 (9.7)	0.035 (10.3)
East Mainland and Islands	0.126	8126	0.268 (14.9)	0.142	0.129	0.032 (17.4)	0.148 (17.2)
Greater Salonica	0.072	8970	0.139 (4.4)	0.057	0.044	0.009 (2.8)	0.046 (3.0)
Central and West Macedonia	0.096	8436	0.322 (13.6)	0.151	0.132	0.032 (13.3)	0.152 (13.4)
Peloponnese and West Mainland	0.136	8459	0.287 (17.2)	0.136	0.115	0.028 (16.5)	0.130 (16.3)
Thessaly	0.081	8116	0.303 (10.8)	0.159	0.140	0.036 (12.6)	0.163 (12.1)
Crete	0.050	8040	0.197 (4.3)	0.110	0.113	0.026 (5.6)	0.127 (5.8)
Epirus	0.042	7768	0.366 (6.8)	0.206	0.191	0.051 (9.3)	0.236 (9.1)
East Macedonia and Thrace	0.078	8231	0.357 (12.3)	0.176	0.151	0.038 (12.8)	0.178 (12.8)
SIZE OF MUNICIPALITY OR COMMUNE							
Greater Athens	0.319	9144	0.110 (15.5)	0.043	0.034	0.007 (9.8)	0.035 (10.3)
Greater Salonica	0.072	8970	0.139 (4.4)	0.057	0.044	0.009 (2.8)	0.046 (3.0)
Other with more than 30000	0.117	8583	0.182 (9.4)	0.086	0.073	0.017 (8.6)	0.079 (8.5)
10000-29999	0.082	8307	0.254 (9.2)	0.128	0.116	0.028 (9.9)	0.132 (10.0)
5000-9999	0.037	8532	0.282 (4.6)	0.131	0.112	0.027 (4.3)	0.127 (4.3)
2000-4999	0.069	8090	0.293 (8.9)	0.154	0.138	0.034 (10.3)	0.161 (10.2)
1000-1999	0.087	8521	0.323 (12.4)	0.147	0.120	0.029 (11.0)	0.136 (10.9)

(continued)

Less than 1000	*0.216*	*8010*	*0.371*	*0.196*	*0.178*	*0.046*	*0.216*
			(35.4)			*(43.1)*	*(42.9)*
Urban (more than 10000)	*0.591*	*8786*	*0.148*	*0.065*	*0.055*	*0.012*	*0.058*
			(38.6)			*(30.8)*	*(31.7)*
Rural (less than 10000)	*0.409*	*8164*	*0.340*	*0.173*	*0.154*	*0.039*	*0.181*
			(61.4)			*(69.2)*	*(68.3)*
GREECE	*1.000*	*8405*	*0.227*	*0.111*	*0.098*	*0.023*	*0.109*

Thessaly, all the indices which satisfy the Sen axioms indicate that poverty is relatively more acute in the latter region. An interesting change that can be observed by comparing the relevant parts of Tables 4.4 and 4.5 is that, although the population share of Greater Athens increased only slightly between 1974 and 1982 and its level of poverty remained relatively low, its percentage contribution to aggregate poverty rose substantially.

The lower panel of Table 4.5 reports the results of measurement and decomposition of poverty by size of municipality or commune for 1982. These are similar to the corresponding 1974 results. In general, an inverse relationship between size of locality and poverty can be observed and the bulk of poverty appears to be located in the rural areas of the country. This finding (poverty higher in rural rather than in urban areas) is in line with the findings of several empirical studies for other countries.[43] However, comparing the lowest sections of Tables 4.4 and 4.5 it can be observed that although the share of the rural population declined by only 2.3% between 1974 and 1982, its contribution to aggregate poverty declined by 5.1% (H and F), or by 5.0% (M), indicating that during this period (relative) poverty declined more rapidly in the rural than in the urban areas. These changes are examined in detail in the next chapter.[44]

3ii. Measurement and decomposition of poverty by occupational factors

In Table 4.6 the 1974 HES sample is grouped according to several occupational characteristics of the HH or the HH head. In the first three panels of the table the population is grouped according to sector of

43. See, for example, the relevant results of Fishlow (1972) and Thomas (1987) for Brazil, Alamgir (1975) for Bangladesh, Anand (1977, 1983) for Malaysia, van Ginneken (1980b) for Iran, de Kruijk and van Leewen (1985) for Pakistan, Kakwani (1986) for Sri Lanka and Altimir (1982) for several Latin American countries.

44. It should be emphasized that the findings of this section could be very different if different poverty lines were used for rural and urban areas, or for each region separately. However, apart from being theoretically controversial, the use of different poverty lines was not possible because of the lack of regional price indices.

TABLE 4.6 Measurement and decomposition of poverty by occupational factors (1974)

Characteristic of Household Member or Household Head	Populat. Share n_j	Mean Expend. of the poor μ_{jp}	Head Count H	Thon Index T	Clark et al Index (ε=2) C	Foster et al Index (ε=2) F	New Index (ε=1) M
SECTOR OF EMPLOYMENT OF HOUSEHOLD HEAD							
Agriculture	0.225	1372	0.438 (40.5)	0.230	0.205	0.056 (43.8)	0.258 (43.4)
Manufacturing/ Handicraft	0.149	1527	0.182 (11.1)	0.079	0.066	0.015 (7.8)	0.070 (7.8)
Mining etc*	0.100	1461	0.177 (7.3)	0.088	0.078	0.018 (6.3)	0.085 (6.3)
Commerce/Hotels/ Restaurants	0.119	1502	0.161 (7.9)	0.074	0.063	0.015 (6.2)	0.067 (6.0)
Transport/ Communications	0.075	1600	0.127 (3.9)	0.047	0.036	0.008 (2.1)	0.038 (2.1)
Banks/Insurances	0.022	1513	0.041 (0.4)	0.019	0.014	0.003 (0.2)	0.014 (0.2)
Services	0.109	1571	0.084 (3.8)	0.034	0.029	0.006 (2.3)	0.030 (2.4)
Retired	0.130	1335	0.327 (17.5)	0.191	0.185	0.049 (22.2)	0.227 (22.0)
Other	0.070	1350	0.265 (7.6)	0.154	0.157	0.038 (9.3)	0.186 (9.7)
TYPE OF PROFESSION OF HOUSEHOLD HEAD							
Professional or Technical	0.048	1635	0.034 (0.7)	0.012	0.008	0.001 (0.2)	0.008 (0.3)
Executive or Manager	0.014	-	0.000 (0.0)	0.000	0.000	0.000 (0.0)	0.000 (0.0)
Clerical worker	0.063	1577	0.059 (1.5)	0.024	0.017	0.003 (0.7)	0.017 (0.8)
Sales worker	0.086	1508	0.164 (5.8)	0.074	0.063	0.015 (4.5)	0.067 (4.3)
Service worker	0.063	1532	0.164 (4.2)	0.071	0.062	0.014 (3.1)	0.066 (3.1)
Farmer	0.224	1372	0.439 (40.4)	0.231	0.205	0.057 (44.2)	0.259 (43.3)
Production or Transport worker	0.294	1513	0.183 (22.1)	0.082	0.069	0.016 (16.2)	0.074 (16.3)

(continued)

Retired	0.130	1335	0.327 (17.5)	0.191	0.185	0.049 (22.2)	0.227 (22.0)
Other	0.078	1350	0.240 (7.7)	0.141	0.144	0.034 (9.1)	0.169 (9.8)
OCCUPATIONAL STATUS OF HOUSEHOLD HEAD							
Employer	0.060	1607	0.069 (1.7)	0.025	0.021	0.004 (0.8)	0.022 (1.0)
Self-employed (agricultural sector)	0.201	1370	0.445 (36.8)	0.234	0.208	0.057 (39.9)	0.263 (39.5)
Self-employed (non-agricultural sector)	0.178	1472	0.184 (13.5)	0.090	0.079	0.019 (11.8)	0.086 (11.4)
Employee	0.359	1523	0.153 (22.6)	0.068	0.057	0.013 (16.3)	0.060 (16.1)
Retired	0.130	1335	0.327 (17.5)	0.191	0.185	0.049 (22.2)	0.227 (22.0)
Other	0.072	1354	0.264 (7.7)	0.153	0.156	0.037 (9.1)	0.184 (9.8)
NUMBER OF ECONOMICALLY ACTIVE HOUSEHOLD MEMBERS							
None	0.106	1329	0.321 (14.0)	0.190	0.194	0.050 (18.8)	0.241 (19.1)
1	0.508	1457	0.191 (40.0)	0.095	0.086	0.020 (35.5)	0.094 (35.7)
2	0.268	1418	0.264 (29.1)	0.137	0.122	0.030 (27.7)	0.139 (27.8)
3 or more	0.118	1382	0.350 (17.0)	0.187	0.165	0.043 (17.6)	0.197 (17.3)
GREECE	1.000	1415	0.243	0.129	0.118	0.029	0.134

* Mining/Electricity/Gas/Water/Construction/Public Utilities

employment, type of profession and occupational status of HH head, respectively. What becomes apparent from the estimates of F and M in these panels is that in 1974 more than three quarters of aggregate poverty was accounted by three groups. Ranked in terms of poverty severity these groups are the members of HHs headed by persons employed in the agricultural sector, by "Retired" persons and by persons of the "Other" group (housewives, students, unemployed, unpaid family workers and so on). In terms of poverty incidence these groups account for about two thirds of all the poor in the sample.

When account is taken of the fact that in 1974 poverty was high in rural areas where a large part of the population is engaged in agricultural activities and that the mean expenditure pea of individuals with HH heads employed in "Agriculture" was only 68.7% of the national mean, it is not surprising that poverty was very severe in this group. Similarly, since the results of Table 3.7 show that the mean expenditure pea of the group of members of HHs headed by "Retired" persons was 11.9% below the national mean and that inequality within the group was high, it is not surprising that poverty was high in this group, as well. At first sight, what does seem surprising is that poverty was relatively high in the "Other" group, since its mean expenditure pea was 8.6% above the national mean. Note that in most cases the estimates of the indices which satisfy the Sen axioms for the groups "Manufacturing and Handicraft", "Mining etc", "Service worker" and "Employee" are less than half of the relevant estimates of the "Other" group, although the mean expenditures pea of the former groups are lower than that of the latter. However, as noted in the last chapter, the "Other" group is very heterogeneous and the distribution of consumption expenditure among its members extremely unequal. This explains the relatively high level of poverty in this group.

The estimates of all the indices reported in the three top panels of Table 4.6 for the rest of the occupational groups are far below the corresponding national estimates. Note, in particular, that none of the 1974 HES HHs headed by "Executives or Managers" was living in poverty. Poverty was also virtually unknown to HHs headed by "Professional or Technical workers" and very low among HHs headed by persons employed in "Banks and Insurances" and "Services", by "Employers", and "Clerical workers". These are exactly the occupational groups with mean expenditure pea more than 25% above the national mean.

Since a large part of the poor is concentrated into two groups where the HH head is not an employed person ("Retired" and "Other"), it may be reasonable to expect that in Greece - as in many European countries[45] - poverty is associated with lack of economically active (employed) persons in the HH. Among the authors cited in the introduction, Carantinos (1981) seems to support this idea. A partial test for this hypothesis is provided at the bottom panel of Table 4.6 where the population is grouped by the number of economically active HH members. The results reported there give only partial support to this hypothesis. Although the values of T, C, F and M for the group of members of HHs with no economically active members

45. See the evidence provided in Hagenaars (1986).

are higher than the corresponding values of any other group, the contribution of this group to aggregate poverty is only 18.8% by F and 19.1% by M. In addition, poverty among members of HHs with only one employed member is considerably lower than among members of HHs with two or more than two employed members. Further, apart from HHs with no economically active members, the only other group with poverty levels substantially higher than the national average is the group of members of HHs with three or more economically active members. Hence, these results may suggest that, in addition to lack of employment, low pay is an important factor associated with poverty. The main reason that these results are somewhat different from those of Carantinos (1981) is that the unit of measurement in Carantinos's analysis is the HH while in our analysis it is the equivalent adult. Many poor HHs with no economically active members are small HHs headed by retired persons (usually one or two member HHs) whereas in most cases large number of economically active members is associated with large HH size. Therefore, if the unit of analysis is the HH, the contribution of HHs with no economically active members to aggregate poverty is overstated.

Table 4.7 is the equivalent of Table 4.6 for 1982. The results of these tables are not very different. The population group most exposed to poverty consists of members of "Agricultural" HHs. It is followed by members of HHs headed by "Retired" persons and by members of the "Other" group. However, even though the population share of these groups taken together declined by only 0.7% between 1974 and 1982, their combined contribution to aggregate poverty declined by 5.3% according to F, or by 6.3% according to M. In addition, the estimates of the poverty indices of the "Other" group were much closer to the relevant national estimates in 1982 than in 1974. Further, the results of the first panel of Table 4.7 indicate that another group whose poverty level in 1982 was very close to the national average was the group of members of HHs headed by persons employed in "Mining etc". This might be a consequence of the decline in the relative mean expenditure of this group between 1974 and 1982.[46]

Another interesting point emerges when we move from the second to the third panel of Table 4.7. Most of the farmers in Greece are self-employed. Relatively few of them are classified either as "Employers" or as "Employees". When the estimates of the poverty indices for all the members of HHs headed by "Farmers" (reported in the second panel of Table 4.7) are compared with the relevant estimates for the

46. Although the mean expenditure pea of the "Mining etc" group in 1974 was slightly above the national mean, in 1982 it was 4.2% below it.

TABLE 4.7 Measurement and decomposition of poverty by occupational factors (1982)

Characteristic of Household Member or Household Head	Populat. Share n_j	Mean Expend. of the poor μ_{jp}	Head Count H	Thon Index T	Clark et al Index (ε=2) C	Foster et al Index (ε=2) F	New Index (ε=1) M
SECTOR OF EMPLOYMENT OF HOUSEHOLD HEAD							
Agriculture	0.185	8147	0.377 (30.8)	0.190	0.169	0.044 (35.3)	0.203 (34.5)
Manufacturing/ Handicraft	0.151	8933	0.147 (9.8)	0.061	0.051	0.011 (7.2)	0.054 (7.5)
Mining etc*	0.106	8404	0.227 (10.6)	0.112	0.098	0.023 (10.6)	0.108 (10.5)
Commerce/Hotels/ Restaurants	0.118	8567	0.163 (8.5)	0.077	0.064	0.014 (7.1)	0.069 (7.5)
Transport/ Communications	0.071	9418	0.141 (4.4)	0.048	0.032	0.006 (1.8)	0.034 (2.2)
Banks/Insurances	0.025	7773	0.014 (0.2)	0.009	0.007	0.002 (0.2)	0.007 (0.2)
Services	0.111	9184	0.104 (5.1)	0.040	0.031	0.006 (2.9)	0.032 (3.3)
Retired	0.156	8219	0.345 (23.8)	0.173	0.154	0.039 (26.3)	0.182 (26.1)
Other	0.077	8032	0.204 (6.9)	0.113	0.104	0.025 (8.4)	0.116 (8.2)
TYPE OF PROFESSION OF HOUSEHOLD HEAD							
Professional or Technical	0.070	8699	0.060 (1.4)	0.028	0.026	0.006 (1.8)	0.027 (1.7)
Executive or Manager	0.018	8716	0.056 (0.4)	0.026	0.027	0.006 (0.5)	0.028 (0.5)
Clerical worker	0.059	9226	0.093 (2.4)	0.035	0.024	0.004 (1.0)	0.024 (1.3)
Sales worker	0.083	8862	0.146 (5.3)	0.062	0.048	0.010 (3.6)	0.051 (3.9)
Service worker	0.053	8716	0.184 (4.3)	0.082	0.067	0.015 (3.4)	0.072 (3.5)
Farmer	0.183	8150	0.378 (30.5)	0.192	0.168	0.044 (34.8)	0.203 (34.2)
Production or Transport worker	0.296	8743	0.187 (24.4)	0.083	0.071	0.016 (20.4)	0.076 (20.7)

(continued)

Retired	*0.156*	*8219*	*0.345*	*0.173*	*0.154*	*0.039*	*0.182*
			(23.8)			*(26.3)*	*(26.1)*
Other	*0.082*	*8032*	*0.189*	*0.106*	*0.098*	*0.024*	*0.108*
			(6.8)			*(8.4)*	*(8.1)*
OCCUPATIONAL STATUS OF HOUSEHOLD HEAD							
Employer	*0.069*	*9132*	*0.071*	*0.028*	*0.022*	*0.005*	*0.023*
			(2.2)			*(1.4)*	*(1.5)*
Self-employed (agricultural sector)	*0.161*	*8175*	*0.396*	*0.197*	*0.172*	*0.045*	*0.208*
			(28.1)			*(31.3)*	*(30.8)*
Self-employed (non-agricultural sector)	*0.151*	*8586*	*0.199*	*0.093*	*0.078*	*0.018*	*0.084*
			(13.3)			*(11.5)*	*(11.7)*
Employee	*0.382*	*8774*	*0.151*	*0.067*	*0.057*	*0.013*	*0.060*
			(25.5)			*(21.0)*	*(21.6)*
Retired	*0.156*	*8219*	*0.345*	*0.173*	*0.154*	*0.039*	*0.182*
			(23.8)			*(26.3)*	*(26.1)*
Other	*0.081*	*8062*	*0.202*	*0.112*	*0.104*	*0.025*	*0.116*
			(7.2)			*(8.7)*	*(8.6)*
NUMBER OF ECONOMICALLY ACTIVE HOUSEHOLD MEMBERS							
None	*0.133*	*8030*	*0.305*	*0.164*	*0.152*	*0.038*	*0.179*
			(17.9)			*(21.6)*	*(21.8)*
1	*0.500*	*8621*	*0.196*	*0.090*	*0.076*	*0.018*	*0.083*
			(43.2)			*(38.5)*	*(38.1)*
2	*0.278*	*8391*	*0.233*	*0.115*	*0.099*	*0.024*	*0.110*
			(28.5)			*(28.2)*	*(28.1)*
3 or more	*0.089*	*8189*	*0.260*	*0.136*	*0.127*	*0.031*	*0.146*
			(10.2)			*(11.8)*	*(11.9)*
GREECE	*1.000*	*8405*	*0.227*	*0.111*	*0.098*	*0.023*	*0.109*

* *Mining/Electricity/Gas/Water/Construction/Public Utilities*

members of HHs headed by "Self-employed farmers" only (reported in the third panel of Table 4.7) it can be observed that the latter are always higher than the former. A similar pattern can be observed in the corresponding estimates of Table 4.6 for 1974. Considering that in 1974 (1982) the members of HHs headed by "Non-self-employed farmers" were 10.3% (12.0%) of all the members of HHs headed by "Farmers", these comparisons may imply that poverty was considerably less acute in the former than in the latter subgroup. This point is elaborated further in section 4i. Further, the results of the third panel of Table 4.7 suggest that although poverty was relatively low among members of HHs headed by "Employees", the contribution of this

group to aggregate poverty was relatively high (21.0% by F or 21.6% by M). Clearly, this is a consequence of the fact that the weights used in the decomposable poverty indices are the population shares of the groups and the population share of the "Employee" group is considerably higher than that of any other group.

The results of Table 4.7 show that all the occupational groups of the 1982 HES sample had some of their members living in poverty. Nevertheless, poverty appears to be rather low among members of HHs headed by "Employers", persons employed in "Banks and Insurances", "Transport and Communications" and "Services", or in the professional groups "Executive and Manager", "Professional and Technical worker", "Clerical worker" and "Sales worker". These were the occupational groups with the highest mean expenditures pea in 1982, with one exception. This exception is the group "Commerce, Hotels and Restaurants" whose mean expenditure pea was 5.7% higher than that of the group "Transport and Communications", but at the same time its level of poverty was also substantially higher. The difference in the poverty levels of these groups can, probably, be attributed to the fact that, according to the results of Table 3.8, in 1982 inequality was considerably higher in the former group. Note also the remarkably high mean expenditure pea of the poor in the "Transport and Communications" group.

Finally, the results of the last section of Table 4.7 where the population is grouped by the number of economically active HH members, point to the same direction as the corresponding results of Table 4.6. Although the bulk of aggregate poverty is located among population members living in HHs with one or two employed members, high levels of poverty are observed among members of HHs with none or with more than two employed members.

3iii. Measurement and decomposition of poverty by demographic factors

The results of measurement and decomposition of poverty by demographic factors in 1974 are presented in Table 4.8. In the last chapter a clear inverse relationship was found between mean expenditure pea and age of HH head. The evidence of the first part of Table 4.8, where the population is grouped by the age of HH head, suggests that a similar relationship can be observed within the group of the poor only. In addition, a marked positive association between poverty and age of HH head can also be observed. Poverty appears to be extremely severe in the small population group of HH members headed by persons aged "More

TABLE 4.8 Measurement and decomposition of poverty by demographic factors (1974)

Characteristic of Household Member or Household Head	Populat. Share n_j	Mean Expend. of the poor μ_{jp}	Head Count H	Thon Index T	Clark et al Index (ε=2) C	Foster et al Index (ε=2) F	New Index (ε=1) M
AGE OF HOUSEHOLD HEAD							
Less than 25	0.013	1649	0.109 (0.6)	0.035	0.025	0.005 (0.2)	0.026 (0.3)
25-34	0.135	1499	0.151 (8.4)	0.070	0.059	0.014 (6.6)	0.063 (6.4)
35-44	0.292	1431	0.202 (24.2)	0.105	0.096	0.023 (23.2)	0.106 (23.1)
45-54	0.248	1450	0.243 (24.8)	0.121	0.106	0.026 (22.2)	0.118 (21.9)
55-64	0.167	1401	0.283 (19.4)	0.150	0.139	0.034 (19.7)	0.161 (20.1)
65-74	0.108	1362	0.344 (15.3)	0.191	0.180	0.047 (17.6)	0.220 (17.7)
More than 74	0.037	1274	0.478 (7.3)	0.287	0.276	0.083 (10.7)	0.381 (10.5)
NUMBER OF HOUSEHOLD MEMBERS							
1	0.025	1380	0.229 (2.4)	0.136	0.145	0.034 (3.0)	0.169 (3.2)
2	0.130	1370	0.265 (14.2)	0.150	0.146	0.036 (16.3)	0.171 (16.6)
3	0.189	1424	0.181 (14.1)	0.096	0.089	0.021 (13.8)	0.098 (13.8)
4	0.317	1463	0.187 (24.3)	0.092	0.080	0.019 (21.0)	0.087 (20.6)
5	0.190	1431	0.266 (20.9)	0.135	0.120	0.029 (19.3)	0.137 (19.5)
6	0.095	1405	0.359 (14.0)	0.184	0.157	0.041 (13.6)	0.187 (13.3)
More than 6	0.054	1348	0.466 (10.3)	0.255	0.247	0.070 (13.2)	0.328 (13.2)
SEX OF HOUSEHOLD HEAD							
Male	0.916	1421	0.241 (90.8)	0.126	0.114	0.028 (88.7)	0.129 (88.2)

(continued)

Female	*0.084*	*1358*	*0.269*	*0.155*	*0.158*	*0.038*	*0.188*
			(9.2)			*(11.3)*	*(11.8)*
GREECE	*1.000*	*1415*	*0.243*	*0.129*	*0.118*	*0.029*	*0.134*

than 74". In 1974 almost half of this group's members (47.8%) were below the poverty line and the indices which satisfy the Sen axioms show that this group's level of poverty was between 2.22 and 2.86 times higher than the national average. High levels of poverty can also be observed among members of HHs headed by persons in the age bracket "65-74". Together, the groups "More than 74" and "65-74" accounted for 28.3% (F) or 28.2% (M) of aggregate poverty, although their combined population share was only 14.5%.

These results are similar to those of Carantinos (1981) and Kanellopoulos (1986). However, Carantinos also reports a high incidence of poverty among members of HHs headed by persons aged less than 25, whereas the evidence of Table 4.8 suggests that in 1974 both the incidence and the burden of poverty in this group were extremely low. This difference is due to the fact that Carantinos' analysis is performed in terms of total HH expenditure while our analysis is in terms of expenditure pea. In 1974 the average size of HHs headed by persons aged "Less than 25" was 1.72 equivalent adults whereas the relevant figure for the entire sample was 2.90. As a result, although expenditure pea of members of HHs headed by persons aged less than 25 was 32.2% above the national mean, the use of total HH expenditure instead of expenditure per capita or pea almost guarantees an over-representation of this group among the poor.

The evidence of several countries regarding the relationship between HH size and poverty is not clear. Beckerman and Clark (1982) report that poverty in the U.K. is more severe in small HHs, whereas Fishlow (1972) and Anand (1977, 1983) found a strong positive association between incidence of poverty and HH size in Brazil and Malaysia, respectively. The evidence of the second panel of Table 4.8 suggests that in Greece the relationship between HH size and poverty is U-shaped. The estimates of the poverty indices for the group of members of HHs with more than six members are between two and two and a half times higher than the national average. High levels of poverty can also be observed in HHs with one, two, and six members.

Several authors point out that in recent years many industrial countries have experienced a

feminization of poverty; that is, poverty affects more HHs headed by women than HHs headed by men.[47] Among the authors mentioned in the introduction, Kavouriaris (1983) and Kanellopoulos (1986) suggest that this is also true for Greece.[48] This hypothesis is tested in the bottom panel of Table 4.8, where the population is grouped by the sex of HH head. Some interesting results are reported there. Although the evidence of Table 3.9 shows that the mean expenditure pea of members of HHs headed by females in 1974 was 8.3% higher than that of members of HHs headed by males, all the poverty indices used in our analysis show that poverty was more severe in the former group. This is, clearly, due to the fact that inequality within the group of members of HHs headed by females was between 25% and 35% higher than inequality within the group of members of HHs headed by males according to all the indices used in chapter 3, apart from G. Nevertheless, since only a relatively small fraction of the population was living in HHs headed by females, the decomposable poverty indices show that the bulk of poverty was located among members of HHs headed by males.

Table 4.9 is the counterpart of Table 4.8 for 1982. Its results suggest that most of the demographic patterns of poverty observed in 1974 could be observed in 1982 too. The results of the top panel of Table 4.9 show a positive association between poverty and age of HH head. Nevertheless, this association is not as clear as in Table 4.8. For example, C indicates that poverty was higher in the group "25-34" than in the group "35-44", whereas the ranking of T and M is the opposite. Similarly, both C and M suggest that the group "45-54" was more deeply in poverty than the group "55-64", but the ranking given by T is the reverse. Poverty was almost unknown to the members of the few HHs headed persons younger than 25. At the other end of the age range, poverty remained extremely high among members of HHs with heads aged "More than 74". Although the estimates of T, C, F and M for this group fell between 1974 and 1982, the ratios of these estimates over the relevant estimates for the entire population in 1982 were even higher than in 1974, indicating that the relative position of this group in comparison to the rest of the population deteriorated between these years.

Comparing the results of the next two panels of Tables 4.8 and 4.9 it can be noted that almost all the indices show that poverty was lower in all the groups in 1982 than in 1974. As in 1974, the lowest levels of

47. See, for example, Bane (1986), Fuchs (1986) and Hagenaars (1986). For similar evidence for LDCs see Fishlow (1972) and Anand (1977, 1983).

48. In fact, Kavouriaris' claim refers to women in general and not explicitly to HHs headed by women. The data used in our analysis do not refer to intra-household allocation of resources and, therefore, the hypothesis that women are more deeply in poverty than men cannot be tested.

TABLE 4.9 Measurement and decomposition of poverty by demographic factors (1982)

Characteristic of Household Member or Household Head	Populat. Share n_j	Mean Expend. of the poor μ_{jp}	Head Count H	Thon Index T	Clark et al Index (ε=2) C	Foster et al Index (ε=2) F	New Index (ε=1) M
AGE OF HOUSEHOLD HEAD							
Less than 25	0.014	9560	0.052 (0.3)	0.017	0.012	0.002 (0.1)	0.012 (0.2)
25-34	0.161	8583	0.151 (10.7)	0.074	0.080	0.015 (10.5)	0.070 (10.4)
35-44	0.262	8770	0.184 (21.3)	0.081	0.068	0.015 (17.0)	0.073 (17.6)
45-54	0.258	8263	0.220 (25.1)	0.113	0.102	0.024 (26.8)	0.113 (26.8)
55-64	0.157	8506	0.261 (18.1)	0.122	0.100	0.024 (16.3)	0.111 (16.0)
65-74	0.104	8293	0.332 (15.2)	0.163	0.140	0.035 (15.8)	0.163 (15.6)
More than 74	0.044	7694	0.479 (9.3)	0.265	0.252	0.072 (13.7)	0.336 (13.6)
NUMBER OF HOUSEHOLD MEMBERS							
1	0.030	7531	0.184 (2.4)	0.118	0.133	0.030 (3.9)	0.154 (4.3)
2	0.147	8219	0.268 (17.4)	0.138	0.124	0.031 (19.6)	0.142 (19.2)
3	0.195	8648	0.189 (16.3)	0.087	0.075	0.017 (14.3)	0.082 (14.7)
4	0.314	8667	0.153 (21.2)	0.070	0.057	0.013 (17.7)	0.060 (17.3)
5	0.179	8518	0.244 (19.3)	0.155	0.096	0.023 (17.8)	0.107 (17.6)
6	0.088	8405	0.375 (14.3)	0.176	0.161	0.039 (14.9)	0.192 (15.5)
More than 6	0.047	7686	0.425 (8.8)	0.238	0.211	0.060 (12.0)	0.267 (11.5)
SEX OF HOUSEHOLD HEAD							
Male	0.918	8451	0.228 (92.2)	0.110	0.096	0.023 (90.7)	0.106 (89.5)

(continued)

Female	*0.082*	*7831*	*0.209*	*0.123*	*0.122*	*0.026*	*0.139*
			(7.7)			*(9.3)*	*(10.5)*
GREECE	*1.000*	*8405*	*0.227*	*0.111*	*0.098*	*0.023*	*0.109*

poverty could be found among members of HHs with three or four members, whereas poverty was particularly high among members of large HHs (HHs with more than five members) and, to a lesser extent, among members of small HHs (one or two member HHs). In 1982, also, poverty was more acute among members of HHs headed by females than among members of HHs headed by males. However, the ratios of the estimates of the poverty indices for members of HHs headed by females over the corresponding estimates for members of HHs headed by males were considerably lower in 1982 than in 1974. As a result of this reduction, F and M indicate that although between 1974 and 1982 the population share of members of HHs headed by females declined by only 0.2%, their contribution to aggregate poverty declined by 2.0% and 1.3%, respectively.

It should be emphasized that the results of this section depend, to some extent, on the particular values of equivalence scales used here. Most of the children live in HHs with 3-5 members and heads in the age bracket 25-54. Hence, if the analysis was performed in per capita rather than in per equivalent adult terms or the values of the equivalence scales for the cost of children were higher (lower), poverty in these low-poverty groups would, probably, appear to be higher (lower) than in Tables 4.8 and 4.9. On the other hand, some authors assign lower values to equivalence scales for females and old males than for working-age adult males.[49] If this method was adopted, it is likely that poverty among members of HHs headed by old persons or women would appear to be lower than in Tables 4.8 and 4.9. Finally, our equivalence scales do not take explicit account of economies of scale in consumption. If a different treatment of these economies of scale was adopted[50] it is likely that the values of the equivalence scales and the estimates of the poverty indices for large HHs would be lower than those of the second panel of Tables 4.8 and 4.9.

3iv. Measurement and decomposition of poverty by educational factors

The findings of chapter 3 demonstrate, firstly, a strong positive link between consumption

49. See Buce and Salathe (1978), Iyengar and Gobalakrishna (1985) and Tedford et al (1986).
50. See, for example, OECD (1976). A relatively similar approach is adopted by Kanellopoulos (1986).

TABLE 4.10 Measurement and decomposition of poverty by educational factors (1974)

Characteristic of Household Member or Household Head	Populat. Share n_j	Mean Expend. of the poor μ_{jp}	Head Count H	Thon Index T	Clark et al Index (ε=2) C	Foster et al Index (ε=2) F	New Index (ε=1) M
University graduate	0.064	1715	0.016 (0.4)	0.004	0.003	0.0004 (0.1)	0.003 (0.1)
Some years of tertiary educ.	0.006	-	0.000 (0.0)	0.000	0.000	0.000 (0.0)	0.000 (0.0)
Secondary educ. completed	0.122	1576	0.050 (2.5)	0.020	0.016	0.003 (1.3)	0.016 (1.5)
At least three years of secondary educ.	0.059	1597	0.095 (2.3)	0.036	0.028	0.006 (1.2)	0.029 (1.3)
Primary educ. completed	0.488	1475	0.252 (50.6)	0.119	0.101	0.024 (40.8)	0.112 (40.8)
Some years of primary educ.	0.164	1362	0.364 (24.6)	0.200	0.184	0.049 (28.0)	0.226 (27.7)
No educ. but not illiterate	0.039	1303	0.466 (7.5)	0.272	0.272	0.078 (10.7)	0.373 (10.9)
Illiterate	0.058	1267	0.509 (12.1)	0.304	0.288	0.087 (17.7)	0.405 (17.5)
.....							
University graduate	0.064	1715	0.016 (0.4)	0.004	0.003	0.0004 (0.1)	0.003 (0.1)
Secondary educ. completed	0.128	1576	0.048 (2.5)	0.019	0.015	0.003 (1.3)	0.015 (1.4)
Primary educ. completed	0.547	1480	0.235 (52.8)	0.110	0.094	0.022 (41.9)	0.103 (42.1)
Primary educ. not completed or no educ.	0.262	1326	0.411 (44.3)	0.235	0.224	0.062 (56.6)	0.288 (56.4)
GREECE	1.000	1415	0.243	0.129	0.118	0.029	0.134

expenditure pea and educational level of HH head and, secondly, an inverse relationship between inequality and educational level of HH head. Taking into account this evidence, one could reasonably anticipate a clear negative association between poverty and educational level of HH head. For 1974, this association is captured by all the indices in Table 4.10. The only exception is the tiny group of members of HHs headed by persons with "Some years of tertiary education". None of this group's members had expenditure lower than the

poverty line while some members of HHs headed by "University graduates" had, although the mean expenditure pea of the latter group was 20.1% higher than that of the former. Nevertheless, since the population share of members of HHs headed by persons with "Some years of tertiary education" was only 0.6%, this can be attributed to statistical discrepancies.

Poverty was extremely high among members of HHs headed by "Illiterate" persons. More than half of this group's members (50.9%) were living in poverty in 1974 and even though its population share was only 5.8%, 12.1% of all the poor were members of this group and its contribution to aggregate poverty was 17.7% (F) or 17.5% (M). In addition, T, C, F and M show that poverty in this group was between 2.36 and 3.02 times higher than the national average. High poverty levels could also be observed among members of HHs headed by persons with "No (formal) education, but not illiterate" or with "Some years of primary education". F and M show that the combined contribution of these three groups to aggregate poverty was 56.6% and 56.4%, respectively. At the other end, poverty was almost unknown to members of HHs headed by "University graduates", very low among members of HHs headed by persons with "Secondary education completed" and relatively low among members of HHs headed by persons with "At least three years of secondary education". Since the 1982 HES allows the grouping of the population according to the educational level of HH head in four groups only, the second part of Table 4.10 provides the results of measurement and decomposition of poverty according to this grouping, in order to facilitate comparisons with the relevant results for 1982.

One of the most important differences in the structure of the samples of the two HESs used in this study is, probably, the improvement in the educational level of HH heads between 1974 and 1982. In spite of this improvement, the evidence of chapter 3 suggests that the structure of inequality did not change substantially between these years. As in 1974, in 1982 the educational level of HH head was positively associated with expenditure pea and negatively associated with "within-group" inequality. As a result of these factors, the structure of poverty in 1982 was not substantially different than in 1974. All the indices reported in Table 4.11 show that poverty was inversely related to the educational level of HH head. In addition, the mean expenditure of the poor was positively related to the educational level of HH head. Although poverty among members of HHs headed by persons with "Primary education not completed or no education" declined considerably between 1974 and 1982, it remained high. Nevertheless, the decline in this group's level of

TABLE 4.11 Measurement and decomposition of poverty by educational factors (1982)

Characteristic of Household Member or Household Head	Populat. Share n_j	Mean Expend. of the poor μ_{jp}	Head Count H	Thon Index T	Clark et al Index (ε=2) C	Foster et al Index (ε=2) F	New Index (ε=1) M
University graduate	0.091	9573	0.036 (1.4)	0.012	0.008	0.001 (0.4)	0.008 (0.7)
Secondary educ. completed	0.165	9227	0.085 (6.2)	0.032	0.024	0.005 (3.7)	0.024 (3.6)
Primary educ. completed	0.556	8584	0.244 (59.9)	0.112	0.096	0.022 (53.2)	0.106 (54.2)
Primary educ. not completed or no educ.	0.187	7862	0.392 (32.4)	0.213	0.194	0.052 (42.4)	0.241 (41.5)
GREECE	1.000	8405	0.227	0.111	0.098	0.023	0.109

poverty combined with the reduction of its population share resulted in a dramatic drop of its contribution to aggregate poverty (42.4% and 41.5% instead of 56.6% and 56.4% by F and M, respectively). Exactly the opposite is the case of members of HHs headed by "University graduates" or persons with "Secondary education completed". The estimates of all the poverty indices for these groups and their contribution to aggregate poverty remained low, despite the fact that they increased substantially between 1974 and 1982. Unlike 1974, the bulk of poverty in 1982 was located among members of HHs headed by persons with "Primary education completed". Both the population share and the estimates of all the poverty indices (apart from C) for this group rose slightly between 1974 and 1982. It should be noted that a strong negative link between poverty and educational level of HH head, similar to that reported in Tables 4.10 and 4.11, has been reported in several empirical studies for different countries.[51]

4. Subgroups in poverty

For a better diagnosis of the problem of poverty it is desirable to identify small and more homogeneous poverty groups than those identified in the one-way measurement and decomposition of poverty.

51. See, for example, Fishlow (1972), Anand (1977, 1983) and van Ginneken (1980b).

The identification of these groups can help in the design of more efficient anti-poverty policies; that is policies which reduce the leakages to the non-poor. For example, the analysis of section 3.2 highlights that poverty is disproportionately high among members of HHs headed by "Farmers". Therefore, anti-poverty policies should focus on these HHs. However, different policies (pricing of agricultural products and inputs, investment in infrastructure and so on) may be required if, for instance, poverty is more acute in region A than in region B and vice versa. The above identification can be achieved by cross-classifying the variables used in the one-way measurement and decomposition of poverty, in order to obtain a multi-dimensional profile of the poor and their poverty burden.[52] The analysis of section 3ii demonstrates that the great majority of the poor and the bulk of aggregate poverty are concentrated in three occupational groups: members of HHs headed by "Farmers", "Retired" and "Other". It was also noted that the "Other" group is rather heterogeneous, relatively small in size and, although in most cases its poverty estimates are above the national average, they are not substantially so. Therefore, it was decided to restrict our two-way measurement and decomposition of poverty to the members of HHs headed by "Farmers" and "Retired" persons. The population share of these groups taken together was 35.4% (33.9%) in 1974 (1982), but they included 57.9% (54.3%) of all the poor and their combined contribution to aggregate poverty was 66.4% (61.1%) by F and 65.3% (60.3%) by M.

Using criteria other than the sector of employment, the type of profession and the occupational status of HH head, five groups can be identified as being deeply in poverty both in 1974 and in 1982. These groups consist of individuals living in: (i) communes with population "Less than 2000", (ii) HHs with heads aged "Over 65", (iii) HHs headed by persons with "Primary education not completed or no education", (iv) HHs with "No economically active" members, and (v) HHs with "More than 5" members. Both in 1974 and in 1982 there was a considerable overlap between these groups and the group of members of HHs headed by "Farmers" and "Retired". In 1974 (1982) the latter groups included 66.6% (63.5%) of the population living in communes with population "Less than 2000", 79.9% (81.6%) of the members of HHs with heads aged "Over 65", 53.9% (58.8%) of the members of HHs headed by persons with "Primary education not completed or no education", 65.8% (67.9%) of the members of HHs with "No economically active" members and 46.1% (45.8%) of the members of HHs with "More than 5" members. As a result, the two-way measurement and decomposition of

52. Another method of achieving identification of small homogeneous poverty groups is to increase the selected level of detail of certain variables. For example, instead of using one-digit information about the sector of employment of HH head one can disaggregate further using two- or three-digit information. Since neither the 1974 nor the 1982 HES provide two-digit information for any of the recorded variables, this method is not applicable.

poverty that follows overlaps, to a considerable extent, with the two-way measurement and decomposition of poverty for these groups.

Poverty decomposition can, of course, be performed when the population is disaggregated further using more than two cross-classification variables. However, we decided to avoid this (higher than two-way) decomposition analysis for three reasons. Firstly, because the analysis would become very tedious. Secondly, because most population subgroups would be very small in size and, hence, the results would be subject to large margins of error. Thirdly, because it seems unlikely that the results of that kind of analysis could have interesting policy implications.

4i. Members of households headed by farmers

Although both the population share and the contribution to aggregate poverty of the group of members of HHs headed by farmers were reduced between 1974 and 1982, this group was the single most important group in poverty in both years. Therefore, the structure of poverty within this group deserves a closer examination. The broad characteristics of poverty among members of HHs headed by farmers in 1974 are reported in Table 4.12. The findings of this table show that this group's structure of poverty was broadly similar to the structure of poverty in the entire population. This similarity could be anticipated since the above group alone accounted for 44.2%-43.3% of aggregate poverty.

In three regions (East Macedonia and Thrace, Epirus, and Thessaly) more than half of the members of HHs headed by farmers were living in poverty. T, C, F and M indicate that poverty was particularly acute in the first two of them. In addition, a negative relationship could be observed between poverty and size of locality among the members of the group; poverty being most severe in communes with population "Less than 1000", where the majority of the group was living.

As noted in section 3ii, Greek farmers are mainly self-employed. In 1974 over 90% of the members of HHs headed by farmers were living in HHs with heads classified as "Self-employed". The relevant percentages for "Employers" and "Employees" were 3.4% and 6.5%, respectively. All the indices show that poverty among the few members of the second of the three subgroups was below the national average. On the

TABLE 4.12 Measurement and decomposition of poverty among population members living in households headed by farmers (1974)

Additional Characteristic of Household Member or Household Head	Subgroup Populat. Share n_j	Mean Expend. of the poor μ_{jp}	Head Count H	Thon Index T	Clark et al Index (ε=2) C	Foster et al Index (ε=2) F	New Index (ε=1) M
REGION							
Greater Athens and Greater Salonica	0.009	1589	0.302 (0.6)	0.105	0.075	0.015 (0.2)	0.081 (0.3)
East Mainland and Islands	0.090	1480	0.249 (5.1)	0.117	0.107	0.027 (4.3)	0.120 (4.2)
Central and West Macedonia	0.171	1323	0.451 (17.6)	0.254	0.228	0.066 (20.0)	0.296 (19.6)
Peloponnese and West Mainland	0.244	1461	0.373 (20.7)	0.172	0.143	0.035 (15.1)	0.167 (15.8)
Thessaly	0.167	1363	0.516 (19.6)	0.267	0.237	0.068 (20.1)	0.311 (20.1)
Crete	0.085	1443	0.407 (7.9)	0.193	0.173	0.045 (6.8)	0.210 (6.9)
Epirus	0.081	1307	0.529 (9.8)	0.294	0.274	0.080 (11.5)	0.377 (11.8)
East Macedonia and Thrace	0.154	1299	0.535 (18.8)	0.300	0.266	0.082 (22.3)	0.363 (21.6)
SIZE OF MUNICIPALITY OR COMMUNE							
More than 5000	0.099	1478	0.303 (6.8)	0.140	0.118	0.029 (5.1)	0.134 (5.1)
2000-4999	0.101	1409	0.303 (11.3)	0.140	0.118	0.029 (10.2)	0.134 (10.0)
1000-1999	0.191	1386	0.410 (17.8)	0.213	0.186	0.051 (17.0)	0.228 (16.8)
Less than 1000	0.610	1351	0.461 (64.1)	0.248	0.224	0.063 (67.9)	0.288 (68.0)
OCCUPATIONAL STATUS OF HOUSEHOLD HEAD							
Employer	0.034	1459	0.211 (1.6)	0.103	0.088	0.021 (1.3)	0.096 (1.3)
Self-employed	0.901	1370	0.445 (91.3)	0.234	0.208	0.057 (91.1)	0.262 (91.2)
Employee	0.065	1379	0.473 (7.0)	0.245	0.223	0.064 (7.5)	0.288 (7.3)

(continued)

NUMBER OF ECONOMICALLY ACTIVE HOUSEHOLD MEMBERS							
1	*0.396*	*1397*	*0.381*	*0.198*	*0.181*	*0.048*	*0.220*
			(34.4)			*(33.5)*	*(33.7)*
2	*0.387*	*1389*	*0.446*	*0.227*	*0.198*	*0.054*	*0.246*
			(39.3)			*(36.9)*	*(36.8)*
3 or more	*0.217*	*1317*	*0.532*	*0.290*	*0.259*	*0.077*	*0.350*
			(26.3)			*(29.4)*	*(29.3)*
AGE OF HOUSEHOLD HEAD							
Less than 35	*0.077*	*1407*	*0.470*	*0.228*	*0.229*	*0.051*	*0.229*
			(8.2)			*(6.9)*	*(6.8)*
35-44	*0.299*	*1378*	*0.418*	*0.220*	*0.203*	*0.055*	*0.254*
			(28.5)			*(29.1)*	*(29.4)*
45-54	*0.275*	*1385*	*0.440*	*0.227*	*0.197*	*0.055*	*0.246*
			(27.6)			*(26.7)*	*(26.2)*
55-64	*0.231*	*1347*	*0.433*	*0.237*	*0.279*	*0.060*	*0.279*
			(22.8)			*(24.5)*	*(24.9)*
More than 64	*0.119*	*1359*	*0.481*	*0.251*	*0.279*	*0.061*	*0.279*
			(13.0)			*(12.8)*	*(12.8)*
NUMBER OF HOUSEHOLD MEMBERS							
1 or 2	*0.121*	*1399*	*0.383*	*0.197*	*0.178*	*0.046*	*0.216*
			(10.6)			*(9.8)*	*(10.1)*
3	*0.148*	*1404*	*0.336*	*0.175*	*0.160*	*0.042*	*0.190*
			(11.3)			*(11.0)*	*(10.9)*
4	*0.271*	*1381*	*0.371*	*0.197*	*0.177*	*0.047*	*0.215*
			(22.9)			*(22.5)*	*(22.5)*
5	*0.229*	*1393*	*0.463*	*0.232*	*0.197*	*0.054*	*0.245*
			(24.2)			*(21.9)*	*(21.7)*
6	*0.144*	*1358*	*0.588*	*0.296*	*0.257*	*0.077*	*0.346*
			(19.3)			*(19.6)*	*(19.3)*
More than 6	*0.088*	*1285*	*0.590*	*0.334*	*0.315*	*0.099*	*0.459*
			(11.8)			*(15.4)*	*(15.6)*
SEX OF HOUSEHOLD HEAD							
Male	*0.956*	*1373*	*0.443*	*0.232*	*0.207*	*0.057*	*0.261*
			(96.5)			*(96.2)*	*(96.4)*
Female	*0.044*	*1358*	*0.351*	*0.193*	*0.173*	*0.045*	*0.210*
			(3.5)			*(3.8)*	*(3.6)*

(continued)

EDUCATIONAL LEVEL OF HOUSEHOLD HEAD							
At least three years of secondary educ.	*0.039*	*1586*	*0.251 (2.2)*	*0.092*	*0.068*	*0.015 (1.0)*	*0.074 (1.1)*
Primary educ. completed	*0.548*	*1424*	*0.402 (50.2)*	*0.197*	*0.167*	*0.044 (42.6)*	*0.200 (42.4)*
Some years of primary educ.	*0.268*	*1318*	*0.449 (27.5)*	*0.254*	*0.225*	*0.065 (30.8)*	*0.290 (30.1)*
No educ. but not illiterate	*0.059*	*1289*	*0.669 (8.9)*	*0.370*	*0.370*	*0.118 (12.3)*	*0.587 (13.4)*
Illiterate	*0.087*	*1301*	*0.565 (11.2)*	*0.312*	*0.281*	*0.086 (13.2)*	*0.391 (13.2)*
All	*1.000*	*1372*	*0.439*	*0.231*	*0.205*	*0.057*	*0.259*
GREECE		*1415*	*0.243*	*0.129*	*0.118*	*0.029*	*0.134*

contrary, poverty in the third subgroup was higher than in the other two. In addition, poverty seems to be positively related to the number of economically active members in the group under examination. Nevertheless, this might be a slightly distorted picture of the reality due to the particular definition of "economically active persons" used by the NSSG. According to this definition, all HH members aged over 13 who helped the HH head for more than 12 hours during the week preceding the HES interview are classified as "economically active". In many poor agricultural HHs the head cannot afford to employ casual workers and receives considerable help from other HH members for short periods of the year (particularly during the cropping season). In reality, though, he remains the only breadwinner of the HH. However, using the definition of the NSSG some of the rest of the HH members are also classified as economically active. Hence, there is an "artificial" increase in the reported number of employed members in these HHs.[53]

Although poverty in the group under consideration was slightly higher among members of HHs headed by persons aged "More than 54" than in the rest of the group, the results of Table 4.12 do not establish the firm positive relationship between poverty and age of HH head observed in the entire sample. On the contrary, the evidence of this table indicates that the U-shaped relationship between HH size and poverty detected in the whole population could also be detected in the group under examination. It is interesting to

53. In the 1974 HES sample the mean number of economically active members for HHs headed by farmers was 1.78, whereas for the rest of the HHs it was only 1.10.

note that the incidence of poverty was only slightly below 60% among farmer-headed HHs with both "Six" and "More than six" members. In spite of this similarity T, C, F and M indicate, respectively, that the level of poverty was 12.8%, 22.6%, 28.6% and 32.7% higher in the latter subgroup. Regarding the relation between poverty and sex of HH head, in contrast to the rest of the population, poverty in HHs headed by farmers was more severe among members of HHs headed by men than among members of HHs headed by women.

The inverse relationship between poverty and educational level of HH head observed in the entire sample can also be traced in the group of members of HHs headed by farmers, with one important exception. Although poverty in both subgroups "No education, but not illiterate" and "Illiterate" was very high, all the indices show that it was considerably higher in the former subgroup. The Head-count ratio of this subgroup was as high as 0.669 and even its mean consumption expenditure pea (not reported in Table 4.12) was 9.6% below the poverty line. As a result, although this subgroup constituted only 5.9% of the group, its contribution to the group poverty was 12.3% (F) or 13.4% (M). At the other end of the educational scale, although the incidence of poverty among members of HHs headed by farmers with "At least three years of secondary education" was slightly higher than the national average, T, C, F and M show that poverty in this subgroup was substantially less acute than in the whole population.[54]

Table 4.13 is the equivalent of Table 4.12 for 1982. The evidence of these tables suggests that the structure of poverty within the group of members of HHs headed by farmers was rather different in the two years. All the indices show that in 1982 poverty was particularly severe among members of HHs headed by farmers living in Epirus. 52.1% of this subgroup's members had consumption expenditure pea below the poverty line and its estimates of T, C, F and M were, respectively, 2.99, 3.15, 4.39 and 4.10 times the relevant estimates for the entire population. The incidence of poverty was also high among members of HHs headed by farmers living in East Macedonia and Thrace, and in Thessaly (the two other high-poverty regions in 1974). However, T, C, F and M show that in 1982 poverty was more acute among members of this group living in East Mainland and Islands, and in Central and West Macedonia than in East Macedonia and Thrace and in Thessaly. In addition, unlike 1974, the evidence of Table 4.13 does not reveal a clear inverse relationship between poverty and size of locality, although poverty was very high within the subgroup of members of HHs

54. None of the farmers heads of HHs in the 1974 HES sample was a university graduate.

TABLE 4.13 Measurement and decomposition of poverty among population members living in households headed by farmers (1982)

Additional Characteristic of Household Member or Household Head	Subgroup Populat. Share n_j	Mean Expend. of the poor μ_{jp}	Head Count H	Thon Index T	Clark et al Index (ε=2) C	Foster et al Index (ε=2) F	New Index (ε=1) M
REGION							
Greater Athens and Greater Salonica	0.012	8600	0.182 (0.6)	0.084	0.077	0.018 (0.5)	0.083 (0.5)
East Mainland and Islands	0.109	7423	0.342 (9.9)	0.209	0.181	0.051 (12.6)	0.221 (11.9)
Central and West Macedonia	0.190	8631	0.421 (21.2)	0.216	0.195	0.051 (22.2)	0.241 (22.6)
Peloponnese and West Mainland	0.223	8452	0.354 (20.9)	0.155	0.133	0.033 (16.9)	0.153 (16.8)
Thessaly	0.136	8452	0.420 (15.1)	0.189	0.157	0.040 (12.5)	0.184 (12.4)
Crete	0.118	7509	0.192 (6.0)	0.124	0.141	0.033 (8.9)	0.164 (9.6)
Epirus	0.046	6964	0.521 (6.3)	0.332	0.309	0.101 (10.6)	0.447 (10.2)
East Macedonia and Thrace	0.167	8465	0.459 (20.3)	0.202	0.164	0.042 (16.1)	0.197 (16.2)
SIZE OF MUNICIPALITY OR COMMUNE							
More than 5000	0.126	8052	0.325 (10.8)	0.171	0.158	0.039 (11.3)	0.187 (11.6)
2000-4999	0.088	8094	0.306 (7.1)	0.160	0.138	0.035 (7.1)	0.160 (7.0)
1000-1999	0.211	8371	0.429 (23.9)	0.191	0.161	0.043 (20.8)	0.192 (20.0)
Less than 1000	0.574	8084	0.382 (58.0)	0.196	0.178	0.046 (60.5)	0.216 (61.2)
OCCUPATIONAL STATUS OF HOUSEHOLD HEAD							
Employer	0.067	9337	0.137 (2.4)	0.048	0.032	0.006 (1.0)	0.033 (1.1)
Self-employed	0.887	8178	0.396 (93.9)	0.197	0.172	0.045 (90.9)	0.208 (91.0)
Employee	0.046	6971	0.375 (4.6)	0.254	0.253	0.075 (7.9)	0.338 (7.7)

(continued)

NUMBER OF ECONOMICALLY ACTIVE HOUSEHOLD MEMBERS							
1	*0.374*	*8022*	*0.333* (39.2)	*0.178*	*0.159*	*0.042* (35.8)	*0.189* (34.8)
2	*0.410*	*8307*	*0.429* (46.5)	*0.202*	*0.171*	*0.045* (42.1)	*0.207* (41.8)
3 or more	*0.216*	*8002*	*0.359* (20.5)	*0.190*	*0.179*	*0.045* (22.1)	*0.219* (23.3)
AGE OF HOUSEHOLD HEAD							
Less than 35	*0.081*	*7765*	*0.332* (7.1)	*0.191*	*0.192*	*0.051* (9.5)	*0.237* (9.5)
35-44	*0.238*	*8483*	*0.385* (24.2)	*0.175*	*0.147*	*0.038* (20.7)	*0.173* (20.3)
45-54	*0.365*	*8096*	*0.352* (34.0)	*0.182*	*0.168*	*0.042* (35.1)	*0.201* (36.2)
55-64	*0.233*	*8045*	*0.415* (25.6)	*0.212*	*0.178*	*0.049* (26.1)	*0.217* (25.0)
More than 64	*0.082*	*8067*	*0.419* (9.1)	*0.208*	*0.179*	*0.047* (8.8)	*0.218* (8.8)
NUMBER OF HOUSEHOLD MEMBERS							
1 or 2	*0.121*	*8060*	*0.341* (10.9)	*0.180*	*0.163*	*0.043* (11.9)	*0.195* (11.6)
3	*0.156*	*8355*	*0.335* (13.8)	*0.160*	*0.133*	*0.033* (11.8)	*0.153* (11.8)
4	*0.245*	*7993*	*0.279* (18.1)	*0.152*	*0.133*	*0.034* (19.1)	*0.154* (18.6)
5	*0.222*	*8321*	*0.391* (23.0)	*0.186*	*0.157*	*0.041* (20.8)	*0.186* (20.4)
6	*0.156*	*8239*	*0.468* (19.3)	*0.222*	*0.209*	*0.053* (18.9)	*0.264* (20.3)
More than 6	*0.099*	*7839*	*0.564* (14.8)	*0.290*	*0.260*	*0.077* (17.5)	*0.351* (17.2)
SEX OF HOUSEHOLD HEAD							
Male	*0.982*	*8167*	*0.381* (99.0)	*0.191*	*0.168*	*0.044* (98.1)	*0.202* (97.9)
Female	*0.018*	*6569*	*0.215* (1.0)	*0.197*	*0.179*	*0.047* (1.9)	*0.218* (2.1)

(continued)

EDUCATIONAL LEVEL OF HOUSEHOLD HEAD							
Secondary educ. completed	*0.033*	*9664*	*0.118 (1.0)*	*0.035*	*0.032*	*0.007 (0.5)*	*0.033 (0.5)*
Primary educ. completed	*0.644*	*8328*	*0.355 (60.5)*	*0.171*	*0.153*	*0.038 (56.4)*	*0.181 (57.6)*
Primary educ. not completed or no educ.	*0.323*	*7830*	*0.451 (38.5)*	*0.240*	*0.208*	*0.058 (42.9)*	*0.262 (41.8)*
All	*1.000*	*8150*	*0.378*	*0.192*	*0.168*	*0.044*	*0.203*
GREECE		*8405*	*0.227*	*0.111*	*0.098*	*0.023*	*0.109*

living in communes with population "Less than 1000". Note also that, unlike 1974, in 1982 the incidence of poverty for the members of the group living in communes with population "Less than 1000" was lower than that of the members of the group living in communes with population "1000-1999".

Between 1974 and 1982 the population share of the subgroup of members of HHs headed by farmers classified as "Employers" almost doubled, but its poverty level remained low. At the other end, although the estimate of H for the small subgroup of persons living in HHs headed by "Employees" was slightly below the relevant estimate for the whole group, the estimates of the rest of the indices for this subgroup were between 32.3% and 62.5% higher than the relevant group estimates. Also, unlike 1974, the evidence of Table 4.13 does not reveal any clear link between poverty and number of economically active HH members.

The next panel of Table 4.13 suggests that poverty was high among persons living in HHs headed by farmers aged "More than 54". However, in 1974 poverty was relatively low in the subgroup of members of HHs headed by farmers aged "Less than 35", while the evidence of Table 4.13 points to the opposite direction. Even though the head count ratio of this subgroup was lower than the corresponding ratios for the other subgroups in this panel of Table 4.13, C, M, and F show that its poverty level was higher than that of any other subgroup. The U-shaped relationship between poverty and HH size observed in Tables 4.8, 4.9, and 4.12 can also be observed in Table 4.13. The results of this table show that poverty was very high in HHs headed by farmers with "Six" and, particularly, "More than six" members, where 56.4% of the population was living in poverty. Unlike 1974, poverty was more severe among members of HHs headed by female farmers than

among HHs headed by male farmers. However, great weight should not be attached to this result because it may be due to the very small size of the sample of members of HHs headed by female farmers. Finally, the results of the last panel of Table 4.13 confirm that, as in the whole population, a strong negative relationship could be observed between poverty and educational level of HH head in the group under examination.

4ii. Members of households headed by retired persons

During the last decades the population share of retired persons increased rapidly in most industrialized countries. This can be attributed to the combined effect of longer life and earlier age of retirement. As a result, the share of the population living in HHs headed by retired persons has also increased. A similar increase can be observed in Greece. The evidence of the two HESs shows that in only eight years the population share of persons living in HHs headed by retired persons rose from 13.0% to 15.6%. In the case of Greece, an additional factor that has, probably, contributed to this increase is the decline in the importance of extended family in recent years. An increasing number of retired persons or couples prefer to live alone, instead of living in the same HH with other family members.[55] During the above period the contribution of this group to aggregate poverty rose from around 22% to around 26%. If this tendency continues, in parallel with the reduction in the population share and the contribution to aggregate poverty of persons living in HHs headed by farmers, it is likely that in the near future the group of members of HHs headed by retired persons will be the group with the highest contribution to aggregate poverty. Therefore, a careful examination of the structure of poverty within this group could be important for the design of appropriate anti-poverty policies.

The results of measurement and decomposition of poverty for the group of members of HHs headed by retired persons in 1974 are reported in Table 4.14. When the group is subdivided using as grouping criterion the region of residence, poverty appears to be relatively low among the members of the group living in Greater Athens and in Greater Salonica. At the other extreme, 58.9% of the group's members living in Crete and 59.3% of them living in East Macedonia and Thrace had expenditures pea below the poverty line. T, C, F and M suggest that poverty was also severe among members of the group living in Thessaly, in Central and West Macedonia and in Epirus. Excluding Greater Athens and Greater Salonica, it is difficult to discern a

55. Between 1974 and 1982 the population share of persons living in one or two-member HHs headed by retired persons rose from 4.6% to 6.6%.

TABLE 4.14 Measurement and decomposition of poverty among population members living in households headed by retired persons (1974)

Additional Characteristic of Household Member or Household Head	Subgroup Populat. Share n_j	Mean Expend. of the poor μ_{jp}	Head Count H	Thon Index T	Clark et al Index (ε=2) C	Foster et al Index (ε=2) F	New Index (ε=1) M
REGION							
Greater Athens	0.387	1487	0.157 (18.6)	0.075	0.071	0.016 (12.7)	0.076 (13.0)
East Mainland and Islands	0.103	1325	0.383 (12.1)	0.221	0.197	0.056 (11.8)	0.245 (11.1)
Greater Salonica	0.070	1406	0.247 (5.3)	0.131	0.110	0.027 (3.9)	0.124 (3.8)
Central and West Macedonia	0.076	1208	0.448 (10.4)	0.294	0.278	0.087 (13.5)	0.385 (12.9)
Peloponnese and West Mainland	0.107	1321	0.396 (12.9)	0.226	0.193	0.054 (11.8)	0.239 (11.3)
Thessaly	0.087	1282	0.458 (12.2)	0.277	0.296	0.083 (14.8)	0.421 (16.2)
Crete	0.050	1338	0.589 (9.0)	0.314	0.313	0.093 (9.5)	0.458 (10.1)
Epirus	0.035	1217	0.397 (4.2)	0.265	0.280	0.082 (5.9)	0.389 (6.0)
East Macedonia and Thrace	0.085	1309	0.593 (15.4)	0.323	0.293	0.092 (16.0)	0.415 (15.6)
SIZE OF MUNICIPALITY OR COMMUNE							
Greater Athens	0.387	1487	0.157 (18.6)	0.075	0.071	0.016 (12.7)	0.076 (13.0)
Greater Salonica	0.070	1406	0.247 (5.3)	0.131	0.110	0.027 (3.9)	0.124 (3.8)
Other with more than 30000	0.110	1410	0.349 (11.7)	0.180	0.171	0.044 (9.9)	0.206 (10.0)
10000-29999	0.070	1262	0.359 (7.7)	0.228	0.205	0.060 (8.6)	0.258 (8.0)
5000-9999	0.037	1437	0.369 (4.2)	0.176	0.140	0.036 (2.7)	0.162 (2.6)
2000-4999	0.063	1381	0.354 (6.8)	0.190	0.182	0.047 (6.1)	0.223 (6.2)
1000-1999	0.067	1270	0.493 (10.1)	0.295	0.285	0.084 (11.5)	0.398 (11.8)

(continued)

Less than 1000	0.195	1235	0.598 (35.6)	0.359	0.341	0.112 (44.7)	0.517 (44.5)
NUMBER OF ECONOMICALLY ACTIVE HOUSEHOLD MEMBERS							
None	0.534	1328	0.366 (59.8)	0.214	0.213	0.058 (63.2)	0.270 (63.6)
1	0.284	1366	0.278 (24.1)	0.156	0.139	0.035 (20.3)	0.161 (20.1)
2	0.138	1308	0.295 (12.4)	0.180	0.174	0.046 (13.0)	0.210 (12.8)
3 or more	0.044	1354	0.278 (3.7)	0.159	0.144	0.041 (3.4)	0.169 (3.3)
AGE OF HOUSEHOLD HEAD							
Less than 55	0.082	1325	0.270 (6.8)	0.162	0.143	0.039 (6.5)	0.166 (6.0)
55-64	0.232	1457	0.204 (14.5)	0.101	0.090	0.021 (10.0)	0.098 (10.0)
65-74	0.474	1353	0.327 (47.3)	0.185	0.178	0.046 (44.9)	0.217 (45.4)
More than 74	0.211	1255	0.486 (31.3)	0.299	0.292	0.089 (38.4)	0.413 (38.5)
NUMBER OF HOUSEHOLD MEMBERS							
1	0.045	1283	0.358 (4.9)	0.222	0.225	0.061 (5.6)	0.290 (5.8)
2	0.309	1308	0.372 (35.1)	0.222	0.221	0.059 (37.3)	0.281 (38.3)
3	0.233	1394	0.290 (20.6)	0.157	0.152	0.038 (18.1)	0.179 (18.4)
4	0.179	1352	0.299 (16.3)	0.171	0.150	0.040 (14.7)	0.176 (13.9)
5	0.108	1325	0.324 (10.7)	0.193	0.194	0.052 (11.5)	0.240 (11.4)
6	0.086	1359	0.234 (6.1)	0.134	0.108	0.028 (4.9)	0.121 (4.6)
More than 6	0.041	1287	0.496 (6.2)	0.296	0.300	0.095 (8.0)	0.429 (7.8)
SEX OF HOUSEHOLD HEAD							
Male	0.907	1356	0.317 (87.9)	0.181	0.172	0.045 (83.5)	0.208 (83.1)

(continued)

Female	*0.093*	*1200*	*0.423* (12.1)	*0.284*	*0.292*	*0.084* (16.4)	*0.412* (16.9)
EDUCATIONAL LEVEL OF HOUSEHOLD HEAD							
University graduate	*0.073*	*1776*	*0.033* (0.7)	*0.007*	*0.004*	*0.001* (0.1)	*0.004* (0.1)
Secondary educ. completed	*0.129*	*1431*	*0.066* (2.6)	*0.036*	*0.034*	*0.008* (2.1)	*0.035* (2.0)
At least three years of secondary educ.	*0.048*	*1678*	*0.177* (2.6)	*0.052*	*0.040*	*0.009* (0.9)	*0.042* (0.9)
Primary educ. completed	*0.380*	*1419*	*0.342* (39.7)	*0.173*	*0.157*	*0.040* (31.1)	*0.189* (31.7)
Some years of primary educ.	*0.191*	*1283*	*0.437* (25.5)	*0.262*	*0.248*	*0.072* (28.1)	*0.330* (27.8)
No educ. but not illiterate	*0.069*	*1292*	*0.527* (11.1)	*0.303*	*0.287*	*0.088* (12.4)	*0.403* (12.3)
Illiterate	*0.110*	*1168*	*0.528* (17.7)	*0.352*	*0.342*	*0.112* (25.2)	*0.520* (25.2)
All	*1.000*	*1335*	*0.327*	*0.191*	*0.185*	*0.049*	*0.227*
GREECE		*1415*	*0.243*	*0.129*	*0.118*	*0.029*	*0.134*

clear negative relationship between poverty and size of locality. However, poverty was very high among members of the group living in communes with population "1000-1999" and, particularly, "Less than 1000". 59.8% of the latter subgroup's population was living in poverty and, although its population share among the group members was only 19.5%, its contribution to the group's poverty burden was 44.7% by F and 44.5% by M. Taking into account that in 1974 65.0% of the population members living in communes with "Less than 1000" residents and in HHs not headed by retired persons were living in HHs headed by farmers, it may be plausible to suggest that most of the poor retired heads of HHs in small communes were retired farmers.

The evidence of Table 4.14 does not reveal any clear relationship between poverty and number of economically active HH members, although poverty was higher in the subgroup of members of HHs with no employed members. The next panel of Table 4.14 demonstrates a strong positive relationship between poverty and age of HH head. The only exception is the small subgroup of members of HHs headed by retired persons aged "Less than 55". Possibly, some of this subgroup's HH heads retired before the normal retirement age.

Hence, they were receiving reduced pensions and the expenditures of their families were relatively low. Poverty was markedly higher than the national average in the subgroup of members of HHs with heads aged "More than 74". 48.6% of this subgroup's members were living in poverty and their contribution to the group poverty was 38.4% (F) or 38.5% (M), compared with a population share of only 21.1%. In general, the U-shaped relationship between poverty and HH size observed in the entire sample can also be traced in the group under consideration, with one important exception. All the indices show that the lowest level of poverty could be observed in the subgroup of six-member HHs. No obvious reason can be found for this discrepancy. Almost half (49.6%) of the few group members living in HHs with "More than six" members had expenditure pea below the poverty line and the estimates of all the indices for this subgroup were far above the corresponding estimates for the rest of the subgroups in the relevant panel. When the group is split according to the sex of HH head, poverty is found to be substantially higher in the subgroup of HHs headed by retired women than in the subgroup of HHs headed by retired men. However, since the population share of the latter subgroup was almost ten times larger than that of the former, the decomposable indices show that the bulk of the group poverty was contributed by HHs headed by men.

The last panel of Table 4.14 reveals a strong inverse relationship between poverty and educational level of HH head in the group under examination. Poverty was not a serious problem for members of HHs headed by retired persons with three years of secondary education or more. On the contrary, poverty was extremely high among members of HHs headed by retired persons who were either illiterate or did not have any formal education. Even the mean expenditure pea of the "Illiterate" subgroup (not reported in Table 4.14) was lower than the poverty line and its estimates of T, C, F and M were, respectively, 2.73, 2.90, 3.86 and 3.88 times higher than the corresponding estimates for the entire sample. In addition, the decomposable indices show that the combined contribution of the subgroups "Illiterate" and "No education but not illiterate" to the group poverty was about 37.5%, compared with a population share of 17.9%.

Table 4.15 reports the results of measurement and decomposition of poverty within the group of members of HHs headed by retired persons in 1982. In general, this group's structure of poverty was similar in both surveys. Like 1974, in 1982 poverty was lower among members of the group living in Greater Athens and in Greater Salonica although, unlike 1974, in 1982 poverty was higher in the Greater Salonica than in the

TABLE 4.15 Measurement and decomposition of poverty among population members living in households headed by retired persons (1982)

Additional Characteristic of Household Member or Household Head	Subgroup Populat. Share n_j	Mean Expend. of the poor μ_{jp}	Head Count H	Thon Index T	Clark et al Index (ε=2) C	Foster et al Index (ε=2) F	New Index (ε=1) M
REGION							
Greater Athens	0.355	8665	0.211 (21.7)	0.095	0.080	0.018 (16.5)	0.087 (17.0)
East Mainland and Islands	0.152	7906	0.437 (19.3)	0.233	0.229	0.062 (24.3)	0.297 (24.8)
Greater Salonica	0.067	9000	0.199 (3.9)	0.079	0.058	0.012 (2.1)	0.062 (2.3)
Central and West Macedonia	0.070	8582	0.491 (10.0)	0.204	0.168	0.042 (7.6)	0.202 (7.8)
Peloponnese and West Mainland	0.139	8469	0.434 (17.5)	0.196	0.169	0.045 (16.0)	0.204 (15.6)
Thessaly	0.068	7529	0.457 (9.0)	0.260	0.220	0.066 (11.6)	0.281 (10.5)
Crete	0.042	8351	0.385 (4.7)	0.182	0.165	0.042 (4.5)	0.198 (4.6)
Epirus	0.054	7386	0.476 (7.5)	0.278	0.264	0.074 (10.3)	0.358 (10.6)
East Macedonia and Thrace	0.055	7784	0.421 (6.7)	0.226	0.188	0.052 (7.4)	0.231 (7.0)
SIZE OF MUNICIPALITY OR COMMUNE							
Greater Athens	0.355	8665	0.211 (21.7)	0.095	0.080	0.018 (16.5)	0.087 (17.0)
Greater Salonica	0.067	9000	0.199 (3.9)	0.079	0.058	0.012 (2.1)	0.062 (2.3)
Other with more than 30000	0.095	8700	0.389 (10.7)	0.164	0.135	0.034 (8.3)	0.157 (8.2)
10000-29999	0.077	8191	0.399 (8.9)	0.199	0.185	0.049 (9.7)	0.227 (9.6)
5000-9999	0.032	9000	0.459 (4.3)	0.169	0.137	0.034 (2.8)	0.159 (2.8)
2000-4999	0.061	8317	0.413 (7.3)	0.193	0.156	0.040 (6.3)	0.180 (6.2)
1000-1999	0.077	7552	0.353 (7.9)	0.208	0.175	0.049 (9.7)	0.212 (9.0)

(continued)

Less than 1000	0.238	7756	0.514 (35.5)	0.275	0.256	0.073 (44.8)	0.344 (45.1)
NUMBER OF ECONOMICALLY ACTIVE HOUSEHOLD MEMBERS							
None	0.581	8076	0.374 (63.0)	0.193	0.177	0.046 (68.6)	0.214 (68.4)
1	0.297	8313	0.331 (28.5)	0.161	0.138	0.034 (26.0)	0.160 (26.1)
2	0.100	8936	0.207 (6.0)	0.084	0.062	0.013 (3.4)	0.066 (3.6)
3 or more	0.023	9006	0.386 (2.6)	0.145	0.116	0.029 (1.8)	0.131 (1.7)
AGE OF HOUSEHOLD HEAD							
Less than 55	0.116	8860	0.267 (9.0)	0.110	0.082	0.019 (5.7)	0.090 (5.7)
55-64	0.207	8735	0.231 (13.9)	0.101	0.080	0.018 (9.6)	0.087 (9.9)
65-74	0.443	8272	0.342 (43.9)	0.168	0.144	0.036 (41.1)	0.168 (41.0)
More than 74	0.234	7759	0.490 (33.2)	0.267	0.252	0.072 (43.4)	0.337 (43.4)
NUMBER OF HOUSEHOLD MEMBERS							
1	0.061	7448	0.323 (5.7)	0.201	0.216	0.055 (8.6)	0.276 (9.3)
2	0.361	8135	0.420 (44.0)	0.210	0.187	0.050 (46.4)	0.230 (45.7)
3	0.229	8653	0.280 (18.6)	0.125	0.114	0.026 (15.3)	0.129 (16.3)
4	0.171	8060	0.235 (11.7)	0.128	0.110	0.028 (12.3)	0.124 (11.7)
5	0.081	8239	0.320 (7.5)	0.159	0.133	0.034 (7.1)	0.154 (6.9)
6	0.050	8503	0.423 (6.1)	0.182	0.140	0.034 (4.4)	0.162 (4.5)
More than 6	0.047	8212	0.469 (6.4)	0.222	0.183	0.051 (6.2)	0.224 (5.8)
SEX OF HOUSEHOLD HEAD							
Male	0.892	8332	0.343 (88.7)	0.166	0.145	0.036 (82.8)	0.169 (82.9)

(continued)

Female	*0.108*	*7322*	*0.359* (11.3)	*0.226*	*0.221*	*0.061* (17.2)	*0.284* (17.1)
EDUCATIONAL LEVEL OF HOUSEHOLD HEAD							
University graduate	*0.072*	*9644*	*0.094* (2.0)	*0.028*	*0.020*	*0.004* (0.7)	*0.021* (0.8)
Secondary educ. completed	*0.142*	*9205*	*0.145* (6.0)	*0.054*	*0.043*	*0.009* (3.3)	*0.044* (3.4)
Primary educ. completed	*0.458*	*8400*	*0.345* (45.8)	*0.163*	*0.143*	*0.035* (41.3)	*0.167* (42.1)
Primary educ. not completed or no educ.	*0.328*	*7850*	*0.486* (46.2)	*0.255*	*0.229*	*0.065* (54.9)	*0.297* (53.6)
All	*1.000*	*8219*	*0.345*	*0.173*	*0.154*	*0.039*	*0.182*
GREECE		*8405*	*0.227*	*0.111*	*0.098*	*0.023*	*0.109*

Greater Athens subgroup. The high-poverty regional subgroups were relatively different in the two surveys. T, C, F and M point out that in 1982 the subgroup most exposed to poverty consisted of members of HHs headed by retired persons living in Epirus. F and M show that although this subgroup constituted only 5.4% of the group, its contribution to the group poverty was 10.3% and 10.6%, respectively. Poverty was also high in the subgroups of members of HHs headed by retired persons living in East Mainland and Islands and in Thessaly. Like 1974, when Greater Athens and Greater Salonica are excluded, the relationship between size of locality and poverty is not clear, although the highest levels of poverty can be found in the subgroup of persons living in communes with "Less than 1000" residents. The percentage contribution of this subgroup to the group poverty according to F and M was rather similar in 1974 and 1982 (between 44% and 45%) although its population share among all the group members rose substantially (from 19.5% to 23.8%).

As in 1974, in 1982 poverty was more acute among the members of the group living in HHs with no economically active members. Similarly, as in 1974, a strong negative association can be observed between poverty and age of HH head (with the exception of the subgroup "Less than 55"). Between 1974 and 1982 both the population share and the contribution to the aggregate poverty of the subgroup of members of HHs headed by retired persons aged "More than 74" rose substantially. 49.0% of this subgroup's members were living in poverty in 1982 and the subgroup estimates of the indices which satisfy the Sen axioms were between

2.41 and 3.13 times the relevant national estimates. The panel of Table 4.15 which differs most from the relevant panel of Table 4.14 is that in which the sample is grouped by HH size. As in 1974, a U-shaped relationship could be observed between poverty and HH size. However, the highest poverty estimates are recorded in one- and two-member HHs instead of the subgroup of very large HHs (six or more members).[56] Between 1974 and 1982 the combined population share of one- and two-member HHs headed by retired persons among all the group members rose from 35.4% to 42.2% and their contribution to the group poverty rose from 42.9% by F, and 44.1% by M to 55.0%. Poverty was also high among group members living in HHs with "More than six" members. Regarding the sex of HH head, the structure of the group poverty was very similar in both survey years. The poverty estimates were higher for the subgroup of members of HHs headed by retired women; however, because of the huge differences in the population shares, the bulk of the group's poverty was contributed by HHs headed by retired men.

In line with most of the results reported in this chapter, poverty in the group under examination was inversely related to the educational level of HH head. Poverty was low in the subgroup of members of HHs headed by retired persons with secondary or tertiary education completed but very high among members of the group headed by persons with primary education not completed or no education at all. 48.6% of the latter subgroup's members were living in poverty in 1982 and, although its population share was 32.8%, its contribution to the group poverty burden was 46.2%, 54.9% and 53.6% by H, F and M, respectively.

56. Similar results are reported in Morris and Preston (1986) for the U.K. Their analysis shows that the subgroup of single pensioners is the demographic subgroup most exposed to poverty and that poverty is also very high in two-member HHs headed by retired persons.

APPENDIX I. A profile of the high-expenditure members of the population

For comparative purposes, it may be interesting to look briefly at the top end of the distribution. For these purposes, the top 5% of the distribution is defined as the "high-expenditure group". This implies a "high-expenditure line" of 8378 (43205) drachmas in 1974 (1982). Although an analysis similar that of poverty could be performed regarding the high-expenditure group, it was decided to present only a profile of the group. Table 4.16 reports the population shares of the various socioeconomic groups in the total population and among the members of the high-expenditure group only, along with the "relative incidence of high-expenditure" for each particular group (ratio of the latter over the former share).

Four general comments can be made regarding these results. Firstly, although some socioeconomic groups are over-represented and some others under-represented, all of them have some of their members in the high-expenditure group. Secondly, as could be anticipated, a comparison of these results with the mean expenditures reported in chapter 3 shows that, in general, the higher the mean expenditure of a group the higher its relative incidence of high-expenditure. Thirdly, the overwhelming majority of the high-expenditure group is living in urban areas (82.7% in 1974 and 86.2% in 1982). Fourthly, although the differences in the relative incidences of high-expenditure between groups are important in both years, they are more so in 1974.

The population groups which are relatively over-represented in the high-expenditure group (relative incidence of high expenditure higher than or very close to 1.5) both in 1974 and in 1982 are:

a) The regional group of members of HHs living in Greater Athens.

b) The occupational groups of members of HHs with heads "Employers", or employed in "Banks and Insurances" and in "Services", or classified as "Executives and Managers", "Professional and Technical workers", "Clerical workers" and "Sales workers".

c) The demographic groups of members of HHs with only one member, or with heads either females or aged "Less than 35".

d) The educational groups of members of HHs headed by "University" and "Secondary education" graduates.

At the other end of the spectrum, the population groups with extremely low representation in the high-

expenditure group (relative incidence of high expenditure less than or close to 0.5) are:

a) The regional groups of members of HHs living in Central and West Macedonia, in Epirus, in East Macedonia and Thrace or in communes with "Less than 2000" residents.

b) The occupational group of members of HHs with heads employed in "Agriculture".

c) The demographic group of members of HHs with "More than five" members.

d) The educational group of members of HHs headed by persons who either were illiterate or had not completed primary education.

Finally, note that there are some groups with head count ratios and/or values of the poverty indices above the national average and, at the same time, with relative incidences of high-expenditure above unity. Note, for example, the groups of members of one-member HHs, the members of HHs with no economically active members, the members of HHs headed by members of the "Other" occupational group and the members of HHs headed by females. Naturally, most of these groups are relatively heterogeneous and inequality within them is high.

TABLE 4.16 The profile of the high expenditure population members

Characteristic of Household Member or Household Head	Population share among the total population (A)		Population share among the top 5% of the population (B)		Relative incidence of high expenditure (B)/(A) (C)	
	1974	1982	1974	1982	1974	1982
REGION						
Greater Athens	0.317	0.319	0.603	0.598	1.902	1.875
East Mainland and Islands	0.108	0.126	0.089	0.104	0.824	0.825
Greater Salonica	0.073	0.072	0.067	0.065	0.918	0.903
Central and West Macedonia	0.097	0.096	0.032	0.026	0.330	0.271
Peloponnese and West Mainland	0.131	0.136	0.077	0.069	0.588	0.507
Thessaly	0.098	0.081	0.058	0.036	0.592	0.444
Crete	0.051	0.050	0.039	0.043	0.765	0.860
Epirus	0.048	0.042	0.017	0.017	0.354	0.405

(continued)

East Macedonia and Thrace	0.078	0.078	0.018	0.042	0.231	0.538
SIZE OF MUNICIPALITY OR COMMUNE						
Greater Athens	0.317	0.319	0.603	0.598	1.902	1.875
Greater Salonica	0.073	0.072	0.067	0.065	0.918	0.903
Other with more than 30000	0.095	0.117	0.076	0.118	0.800	1.009
10000-29999	0.082	0.082	0.081	0.081	0.988	0.988
5000-9999	0.035	0.037	0.030	0.014	0.857	0.378
2000-4999	0.076	0.069	0.051	0.039	0.671	0.565
1000-1999	0.085	0.087	0.036	0.031	0.424	0.356
Less than 1000	0.236	0.216	0.055	0.054	0.233	0.250
SECTOR OF EMPLOYMENT OF HOUSEHOLD HEAD						
Agriculture	0.225	0.185	0.027	0.056	0.120	0.303
Manufacturing/ Handicraft	0.149	0.151	0.125	0.156	0.839	1.033
Mining etc*	0.100	0.106	0.068	0.087	0.680	0.821
Commerce/Hotels/ Restaurants	0.119	0.118	0.170	0.170	1.429	1.441
Transport/ Communications	0.075	0.071	0.084	0.079	1.120	1.113
Banks/Insurances	0.022	0.025	0.094	0.088	4.273	3.520
Services	0.109	0.111	0.232	0.203	2.128	1.829
Retired	0.130	0.156	0.089	0.066	0.685	0.423
Other	0.070	0.077	0.112	0.096	1.600	1.247
TYPE OF PROFESSION OF HOUSEHOLD HEAD						
Professional or Technical	0.048	0.070	0.214	0.254	4.458	3.629
Executive or Manager	0.014	0.018	0.070	0.082	5.000	4.556
Clerical worker	0.063	0.059	0.110	0.087	1.746	1.475
Sales worker	0.086	0.083	0.141	0.135	1.640	1.627
Service worker	0.063	0.053	0.054	0.035	0.857	0.660
Farmer	0.224	0.183	0.027	0.053	0.121	0.290

(continued)

Production or Transport worker	0.294	0.296	0.153	0.178	0.520	0.601
Retired	0.130	0.156	0.089	0.066	0.685	0.423
Other	0.078	0.082	0.142	0.110	1.821	1.341
OCCUPATIONAL STATUS OF HOUSEHOLD HEAD						
Employer	0.060	0.069	0.172	0.191	2.867	2.768
Self-employed (agricultural sector)	0.201	0.161	0.021	0.035	0.104	0.217
Self-employed (non-agricultural sector)	0.178	0.151	0.206	0.146	1.157	0.967
Employee	0.359	0.382	0.398	0.462	1.109	1.209
Retired	0.130	0.156	0.089	0.066	0.685	0.423
Other	0.072	0.081	0.115	0.101	1.597	1.247
NUMBER OF ECONOMICALLY ACTIVE HOUSEHOLD MEMBERS						
None	0.106	0.133	0.137	0.131	1.292	0.985
1	0.508	0.500	0.564	0.533	1.110	1.066
2	0.268	0.278	0.225	0.313	0.840	1.126
3 or more	0.118	0.089	0.075	0.023	0.636	0.258
AGE OF HOUSEHOLD HEAD						
Less than 25	0.013	0.014	0.022	0.022	1.692	1.571
25-34	0.135	0.161	0.217	0.239	1.607	1.484
35-44	0.292	0.262	0.326	0.336	1.116	1.282
45-54	0.248	0.258	0.228	0.247	0.919	0.957
55-64	0.167	0.157	0.100	0.093	0.599	0.592
65-74	0.108	0.104	0.085	0.051	0.787	0.490
More than 74	0.037	0.044	0.023	0.012	0.622	0.273
NUMBER OF HOUSEHOLD MEMBERS						
1	0.025	0.030	0.080	0.091	3.200	3.033
2	0.130	0.147	0.209	0.198	1.608	1.347
3	0.189	0.195	0.275	0.260	1.455	1.333

(continued)

4	0.317	0.314	0.278	0.351	0.877	1.118
5	0.191	0.179	0.115	0.076	0.602	0.425
6	0.095	0.088	0.038	0.018	0.400	0.205
More than 6	0.054	0.047	0.006	0.007	0.111	0.150
SEX OF HOUSEHOLD HEAD						
Male	0.916	0.918	0.876	0.873	0.956	0.951
Female	0.084	0.082	0.124	0.127	1.476	1.549
EDUCATIONAL LEVEL OF HOUSEHOLD HEAD						
University graduate	0.064	0.091	0.323	0.343	5.047	3.769
Secondary educ. completed	0.128	0.165	0.331	0.342	2.586	2.073
Primary educ. completed	0.547	0.556	0.307	0.297	0.561	0.534
Primary educ. not completed or no education	0.262	0.187	0.040	0.018	0.153	0.096

* Mining/Electricity/Gas/Water/Construction/Public Utilities

CHAPTER FIVE

INTERTEMPORAL CHANGES IN INEQUALITY AND POVERTY IN GREECE AND CROSS-COUNTRY COMPARISONS

1. Introduction

Like many index numbers, indices of inequality and poverty are useful, firstly, for comparisons between population groups at a given point in time, secondly, for comparisons over time and, thirdly, for comparisons across countries. Comparisons of inequality and poverty between groups of the Greek population in 1974 and 1982 have been presented in chapters 3 and 4. The present chapter is devoted to the measurement (and decomposition) of changes in the levels of inequality and poverty in Greece between 1974 and 1982 and to comparisons of inequality in the distribution of consumption expenditure across countries. The intertemporal changes in the level of inequality in the distribution of consumption expenditure pea in Greece are presented in the next section, while in the third section the impact of demographic changes on inequality is assessed. A similar analysis regarding intertemporal changes in the level of poverty (absolute and relative) is presented in the following two sections. In the last section, some results of international inequality comparisons are reported and some cross-country welfare comparisons (static and dynamic) are attempted.

2. Intertemporal changes in inequality

In chapter 3 estimates of the Gini index G, the Atkinson index A (for $\varepsilon=2$), the Theil indices T and N and the variance of logarithms L for the distribution of consumption expenditure pea were reported both for 1974 and for 1982. Table 5.1 reports the changes in these estimates during the above period both for the whole country and for particular socioeconomic groups. The figures in parentheses are the corresponding percentage changes. Three observations can be made. The first is that when the population is grouped according to any of the ten factors used in chapters 3 and 4, all the indices show that inequality declined within the majority of the socioeconomic groups. In most cases this reduction was substantial. The most spectacular reductions in inequality were recorded in communes with population "1000-1999", in the occupational groups "Banks and

TABLE 5.1 Changes in the level of inequality of specific socioeconomic groups between 1974 and 1982

Characteristic of Household Member or Household Head	Absolute and relative changes in inequality measured by the Gini index G	Atkinson index (ε=2) A	Theil index T	Theil index N	Variance of of logs L
REGION					
Greater Athens	-0.028 (-8.8)	-0.038 (-13.7)	-0.034 (-19.7)	-0.028 (-16.9)	-0.048 (-15.0)
East Mainland and Islands	-0.004 (-1.3)	-0.006 (-2.1)	-0.004 (-2.4)	-0.005 (-3.0)	-0.012 (-3.6)
Greater Salonica	-0.033 (-10.6)	-0.053 (-20.1)	-0.038 (-22.2)	-0.035 (-21.9)	-0.065 (-21.5)
Central and West Macedonia	-0.029 (-9.3)	-0.042 (-15.0)	-0.031 (-19.4)	-0.030 (-18.5)	-0.058 (-17.6)
Peloponnese and West Mainland	-0.014 (-4.4)	-0.027 - (9.5)	-0.027 (-15.0)	-0.014 (-8.5)	-0.035 (-10.5)
Thessaly	-0.053 (-15.1)	-0.074 (-22.5)	-0.069 (-31.4)	-0.059 (-28.5)	-0.103 (-26.1)
Crete	-0.050 (-15.2)	-0.033 (-11.2)	-0.064 (-33.7)	-0.044 (-24.6)	-0.049 (-14.4)
Epirus	-0.027 (-7.9)	-0.041 (-12.6)	-0.043 (-20.9)	-0.032 (-16.1)	-0.047 (-12.1)
East Macedonia and Thrace	-0.004 (-1.3)	-0.008 (-2.8)	-0.001 (-0.6)	-0.005 (-2.9)	-0.014 (-4.1)
"Within-groups" component			-0.032 (-18.1)	-0.027 (-15.7)	-0.047 (-14.0)
Contribution to inequality reduction			78.0%	73.0%	68.1%
"Between-groups" component			-0.009 (-39.1)	-0.010 (-41.7)	-0.022 (-44.0)
Contribution to inequality reduction			22.0%	27.0%	31.9%
SIZE OF MUNICIPALITY OR COMMUNE					
Greater Athens	-0.028 (-8.8)	-0.038 (-13.7)	-0.034 (-19.7)	-0.028 (-16.9)	-0.048 (-15.0)
Greater Salonica	-0.033 (-10.6)	-0.053 (-20.1)	-0.038 (-22.2)	-0.035 (-21.9)	-0.065 (-21.5)
Other with more than 30000	-0.032 (-10.0)	-0.036 (-12.5)	-0.041 (-23.3)	-0.032 (-18.6)	-0.048 (-14.2)
10000-29999	-0.008 (-2.5)	-0.025 (-8.1)	-0.007 (-4.1)	-0.012 (-6.8)	-0.033 (-8.9)
5000-9999	-0.031 (-9.7)	-0.051 (-17.1)	-0.028 (-16.8)	-0.032 (-18.5)	-0.068 (-19.2)

(continued)

2000-4999	-0.029	-0.032	-0.032	-0.028	-0.043
	(-8.8)	(-10.8)	(-17.5)	(-15.6)	(-12.3)
1000-1999	-0.051	-0.079	-0.066	-0.055	-0.097
	(-15.6)	(-27.2)	(-33.9)	(-30.7)	(-29.0)
Less than 1000	-0.025	-0.031	-0.027	-0.024	-0.043
	(-7.8)	(-10.8)	(-15.8)	(-14.2)	(-12.8)
"Within-groups" component			-0.034	-0.029	-0.052
			(-19.4)	(-17.1)	(-15.6)
Contribution to inequality reduction			82.9%	78.4%	75.4%
"Between-groups" component			-0.007	-0.008	-0.017
			(-28.0)	(-30.8)	(-31.5)
Contribution to inequality reduction			17.1%	21.6%	24.6%
SECTOR OF EMPLOYMENT OF HOUSEHOLD HEAD					
Agriculture	-0.015	-0.017	-0.015	-0.013	-0.024
	(-4.9)	(-6.5)	(-9.6)	(-8.5)	(-8.0)
Manufacturing/ Handicraft	-0.035	-0.051	-0.040	-0.035	-0.063
	(-11.4)	(-19.3)	(-24.4)	(-22.3)	(-20.7)
Mining etc*	+0.009	0.000	+0.008	+0.005	+0.004
	(+3.1)	(0.0)	(+5.5)	(+3.4)	(+1.4)
Commerce/Hotels/ Restaurants	-0.022	-0.027	-0.021	-0.021	-0.038
	(-6.7)	(-9.2)	(-11.8)	(-11.9)	(-11.0)
Transport/ Communications	-0.029	-0.036	-0.039	-0.030	-0.047
	(-9.7)	(-14.9)	(-24.2)	(-20.4)	(-17.2)
Banks/Insurances	-0.074	-0.093	-0.072	-0.071	-0.132
	(-22.6)	(-32.0)	(-41.1)	(-40.6)	(-38.4)
Services	-0.033	-0.034	-0.037	-0.029	-0.045
	(-10.5)	(-12.6)	(-22.2)	(-18.0)	(-14.4)
Retired	-0.050	-0.082	-0.062	-0.059	-0.116
	(-14.0)	(-23.4)	(-28.6)	(-27.4)	(-27.0)
Other	-0.061	-0.106	-0.075	-0.077	-0.157
	(-16.0)	(-26.4)	(-30.6)	(-30.8)	(-30.8)
"Within-groups" component			-0.034	-0.030	-0.056
			(-19.3)	(-17.4)	(-16.6)
Contribution to inequality reduction			82.9%	81.1%	81.2%
"Between-groups" component			-0.007	-0.007	-0.013
			(-29.2)	(-29.2)	(-26.5)
Contribution to inequality reduction			17.1%	18.9%	18.8%
TYPE OF PROFESSION OF HOUSEHOLD HEAD					
Professional or Technical	-0.022	-0.008	-0.027	-0.016	-0.011
	(-7.2)	(-3.1)	(-17.1)	(-10.4)	(-3.7)
Executive or Manager	+0.013	+0.041	+0.011	+0.026	+0.085
	(+4.7)	(+13.6)	(+8.7)	(+21.5)	(+37.3)

(continued)

Clerical worker	-0.025	-0.022	-0.026	-0.021	-0.030
	(-8.6)	(-9.6)	(-18.2)	(-15.3)	(-11.5)
Sales worker	-0.037	-0.054	-0.039	-0.038	-0.070
	(-11.1)	(-17.8)	(-21.0)	(-20.7)	(-19.3)
Service worker	+0.001	+0.005	+0.008	+0.003	-0.002
	(+0.4)	(+2.1)	(+5.8)	(+2.2)	(-0.8)
Farmer	-0.018	-0.022	-0.021	-0.017	-0.028
	(-5.9)	(-8.5)	(-13.5)	(-11.2)	(-9.3)
Production or	-0.016	-0.022	-0.019	-0.016	-0.029
Transport worker	(-5.7)	(-9.3)	(-14.0)	(-11.9)	(-10.9)
Retired	-0.050	-0.082	-0.062	-0.059	-0.116
	(-14.0)	(-23.4)	(-28.6)	(-27.4)	(-27.0)
Other	-0.060	-0.100	-0.071	-0.075	-0.160
	(-15.8)	(-24.8)	(-29.6)	(-30.2)	(-31.1)
"Within-groups" component			-0.030	-0.026	-0.049
			(-18.2)	(-16.0)	(-15.1)
Contribution to inequality reduction			73.2%	70.3%	71.0%
"Between-groups" component			-0.011	-0.011	-0.020
			(-31.4)	(-33.3)	(-32.3)
Contribution to inequality reduction			26.8%	29.7%	29.0%
OCCUPATIONAL STATUS OF HOUSEHOLD HEAD					
Employer	-0.012	-0.031	-0.018	-0.017	-0.038
	(-3.8)	(-10.8)	(-10.7)	(-10.2)	(-11.4)
Self-employed	-0.018	-0.023	-0.021	-0.017	-0.029
(agric. sector)	(-6.1)	(-9.2)	(-14.2)	(-11.7)	(-10.1)
Self-employed	-0.035	-0.047	-0.048	-0.038	-0.061
(non-agric. sect.)	(-10.6)	(-15.9)	(-25.3)	(-21.0)	(-17.6)
Employee	-0.017	-0.020	-0.020	-0.017	-0.027
	(-5.6)	(-7.7)	(-12.7)	(-11.1)	(-9.0)
Retired	-0.050	-0.082	-0.062	-0.059	-0.116
	(-14.0)	(-23.4)	(-28.6)	(-27.4)	(-27.0)
Other	-0.058	-0.117	-0.069	-0.074	-0.153
	(-15.3)	(-27.9)	(-28.3)	(-29.7)	(-30.2)
"Within-groups" component			-0.033	-0.029	-0.053
			(-18.6)	(-16.9)	(-15.6)
Contribution to inequality reduction			80.5%	78.4%	76.8%
"Between-groups" component			-0.008	-0.008	-0.016
			(-34.8)	(-33.3)	(-34.0)
Contribution to inequality reduction			19.5%	21.6%	23.2%
NUMBER OF ECONOMICALLY ACTIVE HOUSEHOLD MEMBERS					
None	-0.053	-0.100	-0.067	-0.074	-0.161
	(-13.5)	(-23.9)	(-25.5)	(-27.7)	(-29.7)

(continued)

1	-0.030	-0.047	-0.034	-0.033	-0.064
	(-9.1)	(-15.5)	(-18.5)	(-18.2)	(-17.9)
2	-0.020	-0.023	-0.029	-0.022	-0.033
	(-6.0)	(-7.5)	(-15.1)	(-11.8)	(-9.0)
More than 2	-0.063	-0.057	-0.080	-0.060	-0.079
	(-18.8)	(-19.1)	(-39.8)	(-32.1)	(-22.6)
"Within-groups" component			-0.039	-0.035	-0.063
			(-19.9)	(-18.2)	(-16.7)
Contribution to inequality reduction			95.1%	94.6%	91.3%
"Between-groups" component			-0.002	-0.002	-0.006
			(-50.0)	(-50.0)	(-66.7)
Contribution to inequality reduction			4.9%	5.4%	8.7%
AGE OF HOUSEHOLD HEAD					
Less than 25	-0.042	-0.047	-0.058	-0.046	-0.076
	(-14.2)	(-18.9)	(-36.3)	(-31.1)	(-27.2)
25-34	-0.032	-0.021	-0.017	-0.017	-0.031
	(-10.1)	(-7.3)	(-10.2)	(-10.1)	(-9.2)
35-44	-0.030	-0.054	-0.039	-0.037	-0.072
	(-9.0)	(-17.4)	(-20.6)	(-19.9)	(-19.5)
45-54	-0.032	-0.033	-0.044	-0.033	-0.047
	(-9.4)	(-10.8)	(-21.9)	(-17.4)	(-13.0)
55-64	-0.040	-0.068	-0.043	-0.044	-0.091
	(-11.9)	(-21.7)	(-22.8)	(-23.4)	(-24.3)
65-74	-0.053	-0.080	-0.068	-0.062	-0.113
	(-14.7)	(-23.3)	(-29.6)	(-28.4)	(-27.2)
More than 74	-0.064	-0.073	-0.100	-0.076	-0.109
	(-16.7)	(-19.7)	(-37.5)	(-30.9)	(-23.9)
"Within-groups" component			-0.042	-0.038	-0.069
			(-21.7)	(-20.0)	(-18.6)
Contribution to inequality reduction			102.4%	102.7%	100.0%
"Between-groups" component			+0.001	+0.001	0.000
			(+16.7)	(+16.7)	(0.0)
Contribution to inequality reduction			-2.4%	-2.7%	0.0%
NUMBER OF HOUSEHOLD MEMBERS					
1	-0.044	-0.063	-0.055	-0.062	-0.123
	(-10.2)	(-13.0)	(-17.5)	(-19.0)	(-18.5)
2	-0.043	-0.067	-0.060	-0.056	-0.103
	(-11.2)	(-17.1)	(-24.1)	(-22.5)	(-20.8)
3	-0.034	-0.057	-0.042	-0.040	-0.081
	(-10.1)	(-17.5)	(-21.9)	(-20.7)	(-20.7)
4	-0.021	-0.042	-0.028	-0.027	-0.053
	(-6.8)	(-15.3)	(-17.4)	(-16.9)	(-16.6)

(continued)

5	-0.049	-0.069	-0.052	-0.048	-0.090
	(-15.1)	(-23.6)	(-29.2)	(-27.6)	(-26.2)
6	-0.028	-0.023	-0.031	-0.024	-0.031
	(-8.9)	(-8.6)	(-18.3)	(-14.9)	(-10.1)
More than 6	-0.006	-0.030	-0.017	-0.014	-0.030
	(-2.1)	(-11.6)	(-11.9)	(-9.8)	(-10.2)
"Within-groups" component			-0.039	-0.034	-0.067
			(-20.7)	(-18.6)	(-18.3)
Contribution to inequality reduction			95.1%	91.9%	97.1%
"Between-groups" component			-0.002	-0.003	-0.002
			(-16.7)	(-23.1)	(-10.0)
Contribution to inequality reduction			4.9%	8.1%	2.9%
SEX OF HOUSEHOLD HEAD					
Male	-0.032	-0.048	-0.039	-0.036	-0.066
	(-9.5)	(-15.2)	(-20.0)	(-18.8)	(-17.6)
Female	-0.047	-0.064	-0.062	-0.057	-0.102
	(-12.3)	(-16.0)	(-25.2)	(-22.9)	(-21.2)
"Within-groups" component			-0.0413	-0.0379	-0.0689
			(-20.6)	(-19.4)	(-15.4)
Contribution to inequality reduction			100.7%	102.4%	99.9%
"Between-groups" component			+0.0003	+0.0009	-0.0001
			(+250.0)	(+550.0)	(-25.0)
Contribution to inequality reduction			-0.7%	-2.4%	0.1%
EDUCATIONAL LEVEL OF HOUSEHOLD HEAD					
University graduate	-0.025	-0.026	-0.027	-0.021	-0.030
	(-8.6)	(-11.0)	(-19.0)	(-15.1)	(-11.0)
Secondary educ. completed	-0.015	-0.019	-0.018	-0.015	-0.024
	(-5.0)	(-7.7)	(-11.9)	(-10.3)	(-8.5)
Primary educ. completed	-0.021	-0.027	-0.023	-0.020	-0.037
	(-7.0)	(-10.6)	(-15.1)	(-13.4)	(-12.5)
Primary educ. not completed or no education	-0.023	-0.037	-0.026	-0.025	-0.050
	(-7.4)	(-12.9)	(-16.3)	(-15.2)	(-14.8)
"Within-groups" component			-0.023	-0.022	-0.041
			(-15.1)	(-14.5)	(-13.5)
Contribution to inequality reduction			56.1%	59.5%	59.4%
"Between-groups" component			-0.018	-0.015	-0.028
			(-37.5)	(-34.1)	(-33.7)
Contribution to inequality reduction			43.9%	40.5%	40.6%
GREECE	-0.033	-0.050	-0.041	-0.037	-0.069
	(-9.6)	(-15.5)	(-20.5)	(-18.9)	(-17.8)

* Mining/Electricity/Gas/Water/Construction/Public Utilities

Insurances", "Retired" and "Other", among members of HHs with "None" or "More than 2" economically active members, among members of HHs headed by "Females" and among members of HHs with heads aged either "Less than 25" or "More than 55".[1] At the other end of the spectrum, inequality rose within three groups. These are the occupational groups of members of HHs headed by "Executives or Managers", "Service workers" and persons employed in "Mining etc" (although in the last two groups the increase was relatively small). Several other groups experienced relatively low inequality reductions. See, for example, the changes in the groups of members of HHs headed by persons employed in "Agriculture", by "Professional or Technical workers", by "Employers", by persons in the age bracket "25-34", by persons with "Secondary education completed" and the groups of members of HHs living in municipalities with population "10000-29999", in HHs with two economically active members and in HHs with "More than 6" members. Careful examination of the evidence of Table 5.1 and comparison with the relevant tables of chapter 3 reveals a particular pattern of change in the level of inequality. Inequality declined proportionally more within those population groups where it was relatively high in 1974 and proportionally less where it was relatively low. As a result, the differences in the degrees of inequality between most pairs of groups in 1982 were not as large as in 1974. This pattern is notably clear in those parts of Table 5.1 where the population is grouped by occupational factors. Nevertheless, there are some exceptions to this pattern. The most striking of them is, probably, the small high-expenditure group of members of HHs headed by persons employed in "Banks and Insurances". This group experienced the highest proportional decline in inequality according to all indices used in our analysis, even though its 1974 level of inequality was not particularly high.

A second feature of the results of Table 5.1 is that, in general, between 1974 and 1982 inequality declined both "within-groups" and "between-groups". In fact, in most cases the proportional reduction in the values of the "between-groups" components of inequality was higher than the proportional reduction in the corresponding "within-groups" components.[2] However, since the contribution of most "between-groups" components to aggregate inequality is rather low, in most cases over 70% of the overall inequality reduction is attributable to changes in the "within-groups" components. There is only one important exception to this

1. The results of Table 5.1 indicate that between 1974 and 1982 inequality declined dramatically within some regions of Greece, as well (especially in Thessaly). However, the fact that the regional grouping of the population is not exactly the same in 1974 and in 1982, precludes a discussion of intertemporal changes in regional inequality and poverty.

2. Although in absolute terms the changes in the values of the "between-groups" components of inequality when the population is grouped by number of economically active HH members, age and sex of HH head are negligible, in relative terms they appear to be huge. This is due to the fact that the values of these components were very low in 1974.

pattern. The evidence of Table 5.1 shows that between 40% and 45% of the overall reduction in inequality can be attributed to the decrease in the "between-groups" component of inequality when the population is grouped according to the educational level of HH head. This finding is in line with the arguments of Psacharopoulos (1982) that the expansion of the educational system in Greece had a strong equalizing effect on income distribution. In addition, when the population is cross-classified by the five grouping factors used in the multivariate decomposition of inequality in chapter 3 (location, region, occupational status, age and educational level of HH head) L indicates that 43.5% of the overall decline in inequality was due to changes in the level of inequality "within-subgroups" and 56.5% to changes in inequality "between-subgroups". This result is not surprising since the change in the "between-educational groups" component of inequality alone accounts for 40.6% of the overall reduction in inequality according to L.

The third, and most important, conclusion emerging from Table 5.1 is that inequality declined substantially in Greece between 1974 and 1982. All the indices used in our analysis point to this direction. However, the recorded reductions vary considerably across indices. Inequality in the distribution of consumption expenditure pea declined by 9.6%, 15.5%, 20.5%, 18.9% and 17.8% according to G, A, T, N and L, respectively. As noted in chapter 3, Champernowne (1974) demonstrates that N, L and A (for ε=2) are relatively more sensitive to changes at the bottom end, T is more sensitive to changes at the top and G is more sensitive to changes in the middle of a distribution. Taking into account these findings, the results of Table 5.1 may suggest that between 1974 and 1982 the proportional changes in the expenditure shares of the top and the bottom population deciles were relatively higher than the proportional changes in the shares of the middle deciles. The evidence provided in Table 5.2 confirms this speculation. The first two columns of this table report the percentage expenditure shares of deciles of population ranked from the lowest to the highest expenditure person for 1974 and 1982 respectively. The third column reports the absolute and (in parentheses) the relative changes in the expenditure shares of the relevant population deciles. The picture that emerges clearly from this table is that between 1974 and 1982 a redistribution of consumption expenditure took place from the top two towards the bottom eight deciles of the population.[3] In absolute terms, the main beneficiaries of this transfer were the five bottom deciles and the main loser the top decile. In relative terms, there was a

3. Perhaps the term "redistribution" is not appropriate in this case, because between 1974 and 1982 the mean consumption expenditure pea of all the population deciles was increased. However, the rate of increase was much higher for the bottom than for the top deciles.

TABLE 5.2 Decile shares of consumption expenditure (1974 and 1982)

Population Decile	1974	1982	Change
1 (bottom)	2.8	3.2	+0.4 (14.2)
2	4.3	4.8	+0.5 (11.6)
3	5.5	5.9	+0.4 (7.2)
4	6.5	6.9	+0.4 (6.2)
5	7.6	8.0	+0.4 (5.3)
6	8.8	9.1	+0.3 (3.4)
7	10.3	10.6	+0.3 (2.9)
8	12.3	12.4	+0.1 (0.8)
9	15.6	15.4	-0.2 (-1.3)
10 (top)	26.3	23.7	-2.6 (-9.9)

substantial increase in the expenditure share of the two bottom deciles (14.2% and 11.6% respectively) and an important decrease in the share of the top decile (-9.9%).

3. The effect of changes in the structure of the population on inequality

Between 1974 and 1982 there were several changes in the structure of the population in Greece. In our samples these changes are reflected in the changes in the size of the population shares of the various socioeconomic groups. It is interesting, then, to examine to what extent the observed changes in aggregate inequality can be attributed to these changes, rather than to changes in the level of inequality within specific socioeconomic groups and to changes in group mean expenditures. This can be done using the decomposable inequality indices, in the following way.

In chapter 3 it was shown that, if the population is grouped into j mutually exclusive and exhaustive

groups, the three decomposable indices used in this study can be written as

$$T = \Sigma_j(Y_j/Y)T_j + \Sigma_j(Y_j/Y)\ln[(Y_j/Y)/(n_j/n)] \quad (1)$$

$$N = \Sigma_j(n_j/n)N_j + \Sigma_j(n_j/n)\ln[(n_j/n)/(Y_j/Y)] \quad (2)$$

$$L = \Sigma_j(n_j/n)L_j + \Sigma_j(n_j/n)(\ln\mu_j^* - \ln\mu^*)^2 \quad (3)$$

Defining $v_j=n_j/n$, $k_j=\mu_j/\mu$, $k_j^*=\mu_j^*/\mu^*$ and taking into account that $Y_j=n_j\mu_j$, and $Y=n\mu$, (1), (2) and (3) can be written as

$$T = \Sigma_j v_j k_j T_j + \Sigma_j v_j k_j \ln k_j \quad (4)$$

$$N = \Sigma_j v_j N_j - \Sigma_j v_j \ln k_j \quad (5)$$

$$L = \Sigma_j v_j L_j + \Sigma v_j(\ln k_j^*)^2 \quad (6)$$

Applying the difference operator to both sides of (4), (5) and (6) gives

$$\Delta T = \Sigma_j v_j k_j \Delta T_j + \Sigma_j k_j(T_j + \ln k_j)\Delta v_j + \Sigma_j v_j(T_j + \ln k_j + 1)\Delta k_j \quad (7)$$

$$\Delta N = \Sigma_j v_j \Delta N_j + \Sigma_j N_j \Delta v_j - \Sigma_j \ln k_j \Delta v_j - \Sigma_j v_j \Delta \ln k_j \quad (8)$$

$$\Delta L = \Sigma_j v_j \Delta L_j + \Sigma_j L_j \Delta v_j + \Sigma_j(\ln k_j^*)^2 \Delta v_j + \Sigma_j 2 v_j \ln k_j^* \Delta \ln k_j^* \quad (9)$$

where Δ represents the change in the index from period t (1974) to period t+1 (1982)

Equations (7), (8) and (9) are exact decompositions of the changes in T, N and L, respectively. Further, equations (8) and (9) decompose the change in inequality into four terms that can be interpreted as: the effect of intertemporal changes in "within-groups" inequality ($\Sigma_j v_j \Delta N_j$, $\Sigma_j v_j \Delta L_j$), the effect of changes in population shares on the "within-groups" component of inequality ($\Sigma_j N_j \Delta v_j$, $\Sigma_j L_j \Delta v_j$), the effect of changes in population shares on the relative mean expenditures of the population groups ($-\Sigma_j \ln k_j \Delta v_j$, $\Sigma_j(\ln k_j^*)^2 \Delta v_j$),[4] and the effect of changes in the relative mean expenditures of the population groups ($-\Sigma_j v_j \Delta \ln k_j$, $\Sigma_j 2 v_j \ln k_j^* \Delta \ln k_j^*$). Obviously, the overall effect of demographic changes is given by the sum of the second and the third term. The decomposition of ΔT cannot be interpreted in a similar way because the effect of changes in population shares on the "within-groups" component cannot be distinguished from the effect of

4. Mookherjee and Shorrocks (1982, p.896) interpret this term as 'the effect of changes in population shares on the "between-groups" component of inequality'. This interpretation does not seem to be correct because the "between-groups" components of inequality in N and L are calculated using both relative mean expenditures and population shares, whereas the weights of the third terms in (8) and (9) contain relative mean expenditures only.

changes in population shares on the relative mean expenditures. This is a consequence of the fact that (unlike N and L) T is only weakly additively decomposable. As a result, changes in the population shares affecting the relative mean expenditures (and, therefore, the "between-groups" component of inequality) have an impact on the "within-groups" component and vice versa.[5]

The aggregation weights in equations (7), (8) and (9) can be either base or final period values for v_j, k_j, k_j^*, T_j, N_j, and L_j. Although it is unlikely that the particular choice can markedly affect the results, following Mookherjee and Shorrocks (1982), a compromise between the base and the final period weights was adopted. Hence, all the weights used in this section are the arithmetic mean values of the base and final period weights. The application of (7) and (8) to our data produces the results reported in brackets in Table 5.3 (third line of the relevant rows). The application of (9) to the same data produces the results reported in the first line of the relevant row. The main comment that can be made comparing the results of the decompositions of ΔT and ΔN, is that although the effects of changes in inequality "within-groups" appear to be broadly similar, the effects of changes in population shares and in relative mean expenditures seem to be strikingly different. In most cases in which T indicates a negative effect of changes in population shares, N indicates a positive effect and vice versa. This is due to the fact that although the first terms of the weights of each Δv_j in (7), k_jT_j, and in (8), N_j, are always positive, whenever the second term in the weight of Δv_j in (7), $k_j\ln k_j$,is positive the relevant term in the weight of Δv_j in (8), $-\ln k_j$, is negative. Similarly, in most cases in which T indicates a negative effect of changes in the relative mean expenditures, N indicates a positive effect and vice versa. This, in turn, is due to the fact that the weight of Δk_j in (7), $v_j(T_j+\ln k_j+1)$, is always positive in our data, whilst the weight of $\Delta \ln k_j$ in (8), $-v_j$, is always negative. Therefore, whenever k_j increases ΔT registers an increase in inequality whereas ΔN registers a decrease. It can be noted that although the absolute effect of changes in "within-groups" inequality is in line with the results of Table 5.1, the effects of changes in population shares and in relative mean expenditures seem to be enormous in absolute terms, at least in some cases (most notably when the population is grouped according to educational level and type of profession of HH head).

Mookherjee and Shorrocks (1982) argue convincingly that these strange results can be attributed to the fact that the relative mean expenditures, $k_j=\mu_j/\mu$, depend on both the group mean expenditures and the

5. See section 2 of chapter 3.

TABLE 5.3 Decomposition of the change in aggregate inequality (1974-1982)

Characteristic of Household Member or Household Head	Index of Inequality	Contribution to changes in inequality due to changes in* Within groups inequality	Population shares		Mean Group Expenditures
Region of Residence	Theil's T	-32.1	-0.8		-8.8
		(76.9)	(1.9)		(21.2)
		[-32.1	+3.4		-13.1]
	Theil's N	-26.1	-0.4	-0.4	-10.5
		(69.8)	(1.0)	(1.0)	(28.2)
		[-26.1	-0.4	-3.9	-7.2]
	Variance of Logarithms L	-46.5	-0.5	-0.8	-21.1
		(67.5)	(0.7)	(1.2)	(30.6)
Size of Municipality or Commune	Theil's T	-33.6	-0.9		-7.4
		(80.1)	(2.2)		(17.7)
		[-33.6	+6.8		-15.1]
	Theil's N	-29.2	-0.1	-0.8	-7.6
		(77.5)	(0.2)	(2.1)	(20.2)
		[-29.2	-0.1	-7.4	-1.0]
	Variance of Logarithms L	-51.5	-0.1	-1.5	-16.2
		(74.3)	(0.2)	(2.1)	(23.4)
Sector of Employment of Household Head	Theil's T	-35.1	+0.01		-6.4
		(84.7)	(-0.03)		(15.3)
		[-35.1	+11.4		-17.8]
	Theil's N	-31.1	+1.4	-1.2	-6.6
		(83.0)	(-3.8)	(3.1)	(17.7)
		[-31.1	+1.4	-10.8	+3.1]
	Variance of Logarithms L	-58.1	+3.1	-1.9	-12.1
		(84.2)	(-4.5)	(2.8)	(17.6)
Type of Profession of Household Head	Theil's T	-30.1	+3.8		-14.9
		(73.9)	(-9.2)		(36.1)
		[-30.1	+32.6		-43.6]
	Theil's N	-27.5	+1.4	+2.4	-13.5
		(74.0)	(-3.9)	(-6.5)	(36.3)
		[-27.5	+1.4	-22.0	+10.7]
	Variance of Logarithms L	-50.8	+3.2	+4.6	-25.7
		(73.9)	(-4.6)	(-6.8)	(37.5)
Occupational Status of Household Head	Theil's T	-33.9	+0.1		-7.8
		(81.6)	(-0.3)		(18.8)
		[-33.9	+17.3		-24.8]
	Theil's N	-30.8	+1.7	-1.2	-7.3
		(81.8)	(-4.4)	(3.1)	(19.4)
		[-30.8	+1.7	-15.7	+7.2]
	Variance of Logarithms L	-56.0	+3.6	-1.7	-15.1
		(80.8)	(-5.1)	(2.4)	(21.8)

(continued)

Number of Economically Active Household Members	Theil's T	-40.5 (97.8) [-40.5		+1.8 (-4.3) -5.4	-2.7 (6.5) +6.2]
	Theil's N	-37.2 (102.2) [-37.7	+2.1 (-5.7) +2.1	-0.4 (1.1) -3.6	-0.9 (2.4) +1.8]
	Variance of Logarithms L	-68.7 (99.0)	+4.5 (-6.5)	-0.6 (0.9)	-4.6 (6.6)
Age of Household Head	Theil's T	-41.8 (100.8) [-41.8		+0.4 (-1.1) +2.4	-0.1 (0.2) -2.1]
	Theil's N	-38.5 (102.4) [-38.5	+0.05 (-0.1) +0.05	+0.6 (-1.5) -1.1	+0.3 (-0.7) +2.0]
	Variance of Logarithms L	-68.6 (99.0)	+0.1 (-0.2)	+1.5 (-2.2)	-2.4 (3.4)
Number of Household Members	Theil's T	-40.6 (98.1) [-40.6		+2.1 (-5.1) +11.6	-2.9 (7.0) -12.5]
	Theil's N	-37.4 (101.1) [-37.4	+2.2 (-5.9) +2.2	-0.5 (1.4) -8.7	-1.3 (3.4) +6.3]
	Variance of Logarithms L	-70.9 (102.8)	+4.6 (-6.7)	-1.2 (1.7)	-1.5 (2.2)
Sex of Household Head	Theil's T	-40.9 (98.9) [-40.9		-0.9 (1.7) -0.5	+0.2 (-0.5) +0.5]
	Theil's N	-37.6 (100.5) [-37.6	-0.1 (0.3) -0.1	-0.01 (0.02) +0.3	+0.3 (0.8) -0.002]
	Variance of Logarithms L	-69.0 (100.0)	-0.3 (0.4)	-0.005 (0.0)	+0.3 (-0.4)
Educational Level of Household Head	Theil's T	-23.0 (56.3) [-23.0		+3.1 (-7.5) +68.4	-20.9 (51.2) -86.0]
	Theil's N	-20.5 (55.6) [-20.5	-1.2 (3.4) -1.2	+4.1 (-11.2) -51.3	-19.2 (52.2) +35.6]
	Variance of Logarithms L	-37.5 (55.0)	-3.5 (5.2)	+8.7 (-12.7)	-35.8 (52.6)

* Absolute changes in inequality indices multiplied by 1000

population shares, v_j (because $\mu=\Sigma_j\mu_j v_j$).[6] Hence, changes in population shares affect not only the middle terms in (7) and (8) but the last term too. This is also true for (9). Therefore, it might be reasonable to try to identify the impact of changes in μ_j (or μ_j^*) on the inequality indices, rather than the impact of changes in k_j (or k_j^*). This can be done for ΔT by defining $\theta_j=v_jk_j(T_j+\ln k_j+1)$ and rewriting the last term in (7) as

$$\begin{aligned}\Sigma_j v_j(T_j+\ln k_j+1)\Delta k &= \Sigma_j v_j(T_j+\ln k_j+1)k_j\Delta\ln(\mu_j/\mu)\\ &= \Sigma_j\theta_j\Delta\ln\mu_j - \Sigma_j\theta_j\Delta\ln(\Sigma_j\mu_j v_j)\\ &= \Sigma_j\theta_j\Delta\ln\mu_j - \Sigma_j\theta_j[\Sigma_j(\mu_j/\mu)\Delta v_j + \Sigma_j(v_j/\mu)\Delta\mu_j]\\ &= \Sigma_j\theta_j\Delta\ln\mu_j - \Sigma_j\theta_j(\Sigma_j k_j\Delta v_j) - \Sigma_j\theta_j(\Sigma_j v_j k_j\Delta\ln\mu_j) \qquad (10)\end{aligned}$$

Similarly, the last term in (8) can be rewritten as

$$\begin{aligned}-\Sigma_j v_j\Delta\ln k_j &= \Sigma_j v_j\Delta\ln(\mu/\mu_j) = \Sigma_j v_j\Delta\ln(\Sigma_j\mu_j v_j) - \Sigma_j v_j\Delta\ln\mu_j\\ &= \Sigma_j v_j[\Sigma_j(\mu_j/\Sigma_j\mu_j v_j)\Delta v_j + \Sigma_j(v_j/\Sigma_j\mu_j v_j)\Delta\mu_j] - \Sigma_j v_j\Delta\ln\mu_j\\ &= \Sigma_j v_j\Sigma_j(\mu_j/\mu)\Delta v_j + \Sigma_j v_j\Sigma_j(v_j/\mu)\mu_j\Delta\ln\mu_j - \Sigma_j v_j\Delta\ln\mu_j\\ &= \Sigma_j v_j\Sigma_j k_j\Delta v_j + \Sigma_j v_j\Sigma_j v_j k_j\Delta\ln\mu_j - \Sigma_j v_j\Delta\ln\mu_j\\ &= \Sigma_j k_j\Delta v_j\Sigma v_j + \Sigma_j v_j k_j\Delta\ln\mu_j\Sigma_j v_j - \Sigma_j v_j\Delta\ln\mu_j\\ &= \Sigma_j k_j\Delta v_j + \Sigma_j v_j k_j\Delta\ln\mu_j - \Sigma_j v_j\Delta\ln\mu_j \qquad (11)\end{aligned}$$

Defining $\Phi_j=2v_j\ln k_j^*$ and taking into account that $\Sigma_j\Phi_j=0$,[7] the last term in (9) becomes

$$\begin{aligned}\Sigma_j\Phi_j\Delta\ln k_j^* &= \Sigma_j\Phi_j\Delta(\ln\mu_j^* - \ln\mu^*)\\ &= \Sigma_j\Phi_j\Delta\ln\mu_j^* - \Delta\ln\mu^*\Sigma_j\Phi_j\\ &= \Sigma_j\Phi_j\Delta\ln\mu_j^* \qquad (12)\end{aligned}$$

Substitution of (10), (11) and (12) into (7), (8) and (9) respectively, produces the following exact decompositions which are employed in our analysis.

$$\begin{aligned}\Delta T = {} & \Sigma_j v_j k_j\Delta T + \Sigma_j k_j(T_j+\ln k_j)\Delta v_j - \Sigma_j v_j k_j(T_j+\ln k_j+1)(\Sigma_j k_j\Delta v_j)\\ & + \Sigma_j v_j k_j(T_j+\ln k_j+1)(\Delta\ln\mu_j - \Sigma_j v_j k_j\Delta\ln\mu_j) \qquad (13)\end{aligned}$$

$$\Delta N = \Sigma_j v_j\Delta N_j + \Sigma_j N_j\Delta v_j + \Sigma_j(k_j-\ln k_j)\Delta v_j + \Sigma_j v_j(k_j-1)\Delta\ln\mu_j \qquad (14)$$

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6. It should be noted that the analysis of Mookherjee and Shorrocks (1982) is confined to Theil's N index only. However, the same analysis applies equally well to T and L, as it is shown in this section.

7. Since $\Sigma_j v_j\ln\mu_j^* = \ln\mu^*$, $\Sigma_j\Phi_j = 2\Sigma_j v_j\ln k_j^* = 2\Sigma_j v_j(\ln\mu_j^* - \ln\mu^*) = 2(\Sigma_j v_j\ln\mu_j^* - \ln\mu^*\Sigma_j v_j) = 2(\ln\mu^* - \ln\mu^*) = 0$

$$\Delta L = \Sigma_j v_j \Delta L_j + \Sigma_j L_j \Delta v_j + \Sigma_j (\ln k_j^*)^2 \Delta v_j + \Sigma_j 2 v_j \ln k_j^* \Delta \ln \mu_j^* \qquad (15)$$

The interpretation of the first three terms in (13), (14) and (15) is exactly the same as that of the corresponding terms in (7), (8) and (9). The final terms of (13), (14) and (15) should be interpreted as the contributions to T, N and L attributable to relative changes in the group mean expenditures. They reflect the effect of relative, rather than absolute changes in μ_j (or μ_j^*), since they are equal to zero if all the group mean expenditures change by the same proportion. Note also that last terms in (9) and (15) are both equal to $\Delta L - [\Sigma_j v_j \Delta L_j + \Sigma_j L_j \Delta v_j + \Sigma_j (\ln k_j^*)^2 \Delta v_j]$. Hence, (9) and (15) produce exactly the same decomposition of ΔL. It is for this reason that in Table 5.3, where the results of the decomposition of the changes in aggregate inequality are presented, there is no third line [in brackets] for the decompositions of the change in L.

The results of the decomposition of the change in aggregate inequality according to (13), (14) and (15) are presented in the first line of each row of Table 5.3. The original values of some components are very small and, for expositional purposes, the true figures have been multiplied by 1000.[8] The second line of each row reports the percentage contribution of each component to the observed decline in aggregate inequality. If a particular component contributes an increase in inequality its sign is positive and the sign of its percentage contribution to inequality reduction is, of course, negative.

Two comments can be made regarding the results of Table 5.3. Firstly, in most cases the contribution of changes in the structure of the population to changes in aggregate inequality is not very high. This is hardly surprising since, in most cases, the population shares did not change dramatically between 1974 and 1982. In absolute terms, the total effect of changes in population shares is less than 5.5% of the change in T, N and L when the population is grouped by size of municipality or commune, HH size and number of economically active HH members and also by sector of employment, occupational status, age and sex of HH head. The only cases where the contribution of demographic changes is (in absolute terms) more than 5.5% of the overall change in inequality are when the population is grouped according to type of profession (-9.2%, -10.1%, -11.2% by T, N and L, respectively) and educational level of HH head (-7.5%, -7.8%, -7.5% by T, N and L).

8. The figures of the third line (in brackets) have been multiplied by 1000, as well.

Secondly, in most cases the changes in population shares tended to increase aggregate inequality. This is true for the impact of changes in population shares when the population is grouped by HH size, number of economically active HH members and also by sector of employment, occupational status, age and, particularly, type of profession and educational level of HH head. On the contrary, changes in the population shares when the population is grouped according to sex of HH head and size of municipality or commune had a slightly positive effect on inequality reduction. In other words, either the general pattern of population shifts between 1974 and 1982 was from low to high inequality groups (effect of changes in population shares on the "within-groups" component of inequality), or the disparities in the relative mean expenditures of the population groups would have been reduced further if there were no changes in the population shares between 1974 and 1982 (effect of changes in population shares on the relative mean expenditures).

The first column of Table 5.3 represents the "ceteris paribus" impact of changes in inequality "within-groups". It can be noted that, in all cases, the contribution of this component is the most important contribution to the observed changes in inequality. This is consistent with the evidence of Table 5.1. The last column indicates the "ceteris paribus" contribution of relative changes in the group mean expenditures. In most cases this contribution is quite important; particularly when the population is grouped by educational level and type of profession of HH head.[9] The same kind of decomposition analysis can be applied when the population is divided into finer groups, using more than one classification criterion. However, experimentation in this direction revealed exactly the same pattern as that reported in Table 5.3. In almost all cases, the effect of changes in population shares was a small increase in inequality.

An application of the kind of decomposition analysis employed in this section is known as "shift-share analysis of inequality".[10] In a broad sense, *shift-share analysis of inequality tries to answer the question* "What would be the level of inequality in a country in period t+1 if the structure of the population had remained the same as in period t?". The answer to this question is simply the value of a decomposable inequality index in period t+1 minus the value of the contribution of changes in population shares to changes in

9. Adding the absolute figures and percentages of the first and the second column or the third and the fourth column of Table 5.3 in the case of N and L might not produce the relevant figures and percentages of Table 5.1. This should be attributed to rounding errors and to the fact that the weights used in Table 5.1 are base period weights whilst the weights used in Table 5.3 are averages of base and final period weights.

10. See Semple (1975) and Love and Wolfson (1976).

aggregate inequality. For example, if the structure of the population grouped according to the type of profession of HH head in 1982 was exactly the same as in 1974, the results of Table 5.3 suggest that the values of T, N and L would have been 0.1552, 0.1552 and 0.3112, respectively (instead of 0.159, 0.159 and 0.318).

Thus, on the basis of the evidence of Table 5.3, changes in the composition of the population in Greece between 1974 and 1982 did not have a very important effect on the level of aggregate inequality. The observed reduction in inequality should be attributed to changes in inequality "within-groups" and to relative changes in the mean group expenditures. In the few cases in which changes in population shares had a relatively important effect on inequality, this effect was found to operate in the opposite direction to the observed change in aggregate inequality.

4. Intertemporal changes in poverty

After examining the intertemporal changes in inequality, we turn to examine the changes in the level of poverty in Greece between 1974 and 1982. In the last chapter it was noted that there are two general approaches to the selection of a poverty line: an "absolutist" and a "relativist". The approach adopted in the empirical part of that chapter was explicitly relativist. Nevertheless, it was also noted that a serious disadvantage of the relativist approach is that it can register an increase in the level of poverty even when the incomes/consumption expenditures of all the population members are increased. For this reason we start the present section by comparing the intertemporal changes in the values of the poverty indices used in our analysis using both relativist and absolutist poverty lines.

The relativist poverty lines used for the calculation of the poverty indices in the last chapter were chosen to be equal to two thirds of the median consumption expenditure pea of the entire population in the year under examination. As a result, differences in the values of the indices reported in that chapter for 1974 and 1982 reflect changes in relative poverty. However, it is also interesting to consider the question "What would be the change in the level of poverty if the same poverty line was used in both years?". This question implicitly assumes an absolutist approach to the measurement of poverty. In order to answer it, the 1974 poverty line was revalued at 1982 prices and the poverty indices used in our analysis were recalculated.[11]

11. Alternatively, we could evaluate the 1982 poverty line in 1974 prices or we could consider a combination of

Between 1974 and 1982 the general Retail Price Index in Greece rose by a factor of 3.629. Hence, the purchasing power of 1980 drachmas in 1974 (1974 poverty line) was equivalent to 7185 drachmas in 1982. However, it could be argued that the 1974 poverty line should be inflated not by the change in the general Retail Price Index, but by the change in the prices of the basket of commodities consumed by the poor.[12] Using the information of NSSG (1984, p. 417) it is calculated that between 1974 and 1982 the Retail Price Index for the basket of goods and services consumed by the poor in 1982 rose by a factor of 3.720. Therefore, according to this approach the absolutist poverty line in 1982 should be equal to 7366 drachmas. The values of the various poverty indices for 1982 using the above relativist and absolutist poverty lines are reported in the last three columns of Table 5.4. The figures reported in the first column of the table are the values of these indices for 1974. The figures in parentheses are the percentage changes in the level of poverty for the entire population between 1974 and 1982 according to the relevant index and poverty line.

The main conclusion that can be drawn from the results of Table 5.4 is that between 1974 and 1982 there appeared to be an unambiguous reduction in the level of poverty in Greece, irrespective of whether relativist or absolutist poverty lines are used. However, it does make a great difference to the percentage of poverty reduction if absolutist poverty lines are used instead of the relativist poverty line of the last chapter. Using the latter, the head count ratio H declined by 6.6% while the poverty indices which satisfy the the Sen axioms (T, C, F and M) indicate a poverty decline between 14% and 20%. Using either of the two absolutist poverty lines suggested above, the reduction in H is 73%-76%[13] and the reduction in the rest of the indices is between 78% and 85% depending on the index and the poverty line in use. These results are hardly surprising since between 1974 and 1982 the mean consumption expenditure pea in Greece increased by 51.7% in real terms (5.35% per annum) accompanied by a decline in inequality.[14] Therefore, if the absolutist approach is adopted and we assume that the 1974 poverty line represents the purchasing power which allows an adult to buy all the "necessities of life" but no "luxuries" at all, then we must conclude that by 1982 poverty was dramatically reduced. In addition, detailed results which are not reported here suggest that if this approach is

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the two poverty lines. The results would remain largely unchanged.

12. This argument implicitly assumes that the commodities consumed by the poor are necessities with limited substitution possibilities. Otherwise it can be argued that the poor can substitute commodities whose prices rise relatively slowly for commodities with rapidly rising prices and, therefore, the effect of changes in the Retail Price Index for them would be more or less the same as for the rest of the population.

13. Only 26.2% (28.3%) of the members of the 1982 HES sample who are classified as poor using the relativist poverty line remain in the group of the poor if the first (second) absolutist poverty line is used instead.

14. As a result of these changes, the median consumption expenditure pea rose by 59.0% (6.0% per annum).

TABLE 5.4 Changes in the level of aggregate poverty between 1974 and 1982 using different poverty lines

Year Type of poverty line		1974[a]	1982[b] "Relativist"	1982[c] "Absolutist"	1982[d] "Absolutist"
Poverty Index					
Head Count ratio	H	0.243	0.227 (-6.6)	0.059 (-75.7)	0.064 (-73.7)
Thon index	T	0.129	0.111 (-14.0)	0.026 (-79.8)	0.028 (-78.3)
Clark et al index	C	0.118	0.098 (-16.9)	0.021 (-82.2)	0.023 (-80.5)
Foster et al index	F	0.029	0.023 (-19.5)	0.0045 (-84.5)	0.0049 (-83.1)
New index	M	0.134	0.109 (-18.7)	0.022 (-83.6)	0.024 (-82.1)

(figures in parentheses are the percentage changes in poverty between 1974 and 1982 according to the relevant index and poverty line)

[a] The 1974 poverty line is defined as 2/3 of the 1974 median consumption expenditure pea.

[b] The 1982 "relativist" poverty line is defined as 2/3 of the 1982 median consumption expenditure pea.

[c] The first 1982 "absolutist" poverty line is equal to the 1974 poverty line evaluated in 1982 prices using the general Retail Price Index.

[d] The second 1982 "absolutist" poverty line is equal to the 1974 poverty line evaluated in 1982 prices using the expenditure shares of the poor as weights for the Retail Price Index.

adopted, then by 1982 poverty was apparently eliminated completely among the members of many socioeconomic groups. Therefore, an analysis of changes in the level of absolute poverty for particular socioeconomic groups would not be especially interesting and, for this reason, the rest of this chapter is confined to changes in the level of relative poverty. A minor point that can be made regarding the findings of Table 5.4 is that the results of poverty measurement are affected very little if the Retail Price Index of the basket of commodities consumed by the poor is used instead of the general Retail Price Index. Although during the period under examination the former index increased slightly faster than the latter, the difference was not large enough to produce qualitatively different results.

Table 5.5 reports the changes in relative poverty for specific socioeconomic groups. The figures in

TABLE 5.5 Changes in the level of (relative) poverty of specific socioeconomic groups between 1974 and 1982

Characteristic of Household Member or Household Head	Changes in the degree of poverty measured by the Head count ratio H	Thon index T	Clark et al index C	Foster et al index F	New index M
REGION					
Greater Athens	0.016	0.002	0.000	0.000	0.000
	(17.0)	(4.9)	(0.0)	(0.0)	(0.0)
East Mainland and Islands	0.062	0.041	0.040	0.010	0.050
	(30.1)	(40.6)	(44.9)	(45.5)	(51.0)
Greater Salonica	-0.044	-0.016	-0.015	-0.004	-0.016
	(-24.0)	(-21.9)	(-25.4)	(-30.8)	(-25.8)
Central and West Macedonia	-0.016	-0.037	-0.039	-0.013	-0.054
	(-4.7)	(-19.7)	(-22.8)	(-28.9)	(-26.2)
Peloponnese and West Mainland	0.011	0.001	-0.004	0.000	-0.005
	(4.0)	(0.7)	(-3.4)	(0.0)	(-3.7)
Thessaly	-0.075	-0.044	-0.049	-0.014	-0.070
	(-19.8)	(-21.7)	(-25.9)	(-28.0)	(-30.0)
Crete	-0.156	-0.064	-0.050	-0.015	-0.068
	(-44.2)	(-36.8)	(-30.7)	(-36.6)	(-34.9)
Epirus	-0.022	-0.019	-0.024	-0.007	-0.038
	(-5.7)	(-8.4)	(-11.2)	(-12.1)	(-13.9)
East Macedonia and Thrace	-0.099	-0.083	-0.086	-0.030	-0.133
	(-21.7)	(-32.0)	(-36.3)	(-44.1)	(-42.8)
SIZE OF MUNICIPALITY OR COMMUNE					
Greater Athens	0.016	0.002	0.000	0.000	0.000
	(17.0)	(4.9)	(0.0)	(0.0)	(0.0)
Greater Salonica	-0.044	-0.016	-0.015	-0.004	-0.016
	(-24.0)	(-21.9)	(-25.4)	(-30.8)	(-25.8)
Other with more than 30000	-0.030	-0.012	-0.016	-0.003	-0.019
	(-14.2)	(-12.2)	(-18.0)	(-15.0)	(-19.4)
10000-29999	0.035	0.006	0.001	0.000	0.002
	(16.0)	(4.9)	(0.9)	(0.0)	(1.5)
5000-9999	0.053	0.012	0.005	0.001	0.008
	(23.1)	(10.1)	(4.7)	(3.8)	(6.7)
2000-4999	-0.002	0.004	0.003	0.000	0.004
	(-0.7)	(2.7)	(2.2)	(0.0)	(2.5)
1000-1999	-0.042	-0.045	-0.056	-0.017	-0.077
	(-11.5)	(-23.4)	(-31.8)	(-37.0)	(-36.2)

(continued)

Less than 1000	*-0.054*	*-0.036*	*-0.035*	*-0.013*	*-0.055*
	(-12.7)	*(-15.5)*	*(-16.4)*	*(-22.0)*	*(-20.3)*
SECTOR OF EMPLOYMENT OF HOUSEHOLD HEAD					
Agriculture	*-0.061*	*-0.040*	*-0.036*	*-0.012*	*-0.055*
	(-13.9)	*(-17.4)*	*(-17.6)*	*(-21.4)*	*(-21.3)*
Manufacturing/ Handicraft	*-0.035*	*-0.018*	*-0.015*	*-0.004*	*-0.016*
	(-19.2)	*(-22.8)*	*(-22.7)*	*(-26.7)*	*(-22.9)*
*Mining etc**	*0.050*	*0.024*	*0.020*	*0.005*	*0.023*
	(28.2)	*(27.3)*	*(25.6)*	*(27.8)*	*(27.1)*
Commerce/Hotels/ Restaurants	*0.002*	*0.003*	*0.001*	*-0.001*	*0.002*
	(1.2)	*(4.1)*	*(1.6)*	*(-6.7)*	*(3.0)*
Transport/ Communications	*0.014*	*0.001*	*-0.004*	*-0.002*	*-0.004*
	(11.0)	*(2.1)*	*(-11.1)*	*(-25.0)*	*(-10.5)*
Banks/Insurances	*-0.027*	*-0.010*	*-0.007*	*-0.001*	*-0.007*
	(-65.9)	*(-52.6)*	*(-50.0)*	*(-33.3)*	*(-50.0)*
Services	*0.020*	*0.006*	*0.002*	*0.000*	*0.002*
	(23.8)	*(17.6)*	*(6.9)*	*(0.0)*	*(6.7)*
Retired	*0.018*	*-0.018*	*-0.031*	*-0.010*	*-0.045*
	(5.5)	*(-9.4)*	*(-16.8)*	*(-20.4)*	*(-19.8)*
Other	*-0.061*	*-0.041*	*-0.053*	*-0.013*	*-0.070*
	(-23.0)	*(-26.6)*	*(-33.8)*	*(-34.2)*	*(-37.6)*
TYPE OF PROFESSION OF HOUSEHOLD HEAD					
Professional or Technical	*0.026*	*0.016*	*0.018*	*0.005*	*0.019*
	(76.5)	*(133.3)*	*(225.0)*	*(500.0)*	*(237.5)*
Executive or Manager	*0.056*	*0.026*	*0.027*	*0.006*	*0.028*
Clerical worker	*0.034*	*0.011*	*0.007*	*0.001*	*0.007*
	(57.6)	*(45.8)*	*(41.2)*	*(33.3)*	*(41.2)*
Sales worker	*-0.018*	*-0.012*	*-0.015*	*-0.005*	*-0.016*
	(-11.0)	*(-16.2)*	*(-23.8)*	*(-33.3)*	*(-23.9)*
Service worker	*0.020*	*0.011*	*0.005*	*0.001*	*0.006*
	(12.2)	*(15.5)*	*(8.1)*	*(7.1)*	*(9.1)*
Farmer	*-0.061*	*-0.039*	*-0.037*	*-0.013*	*-0.056*
	(-13.9)	*(-16.9)*	*(-18.0)*	*(-22.8)*	*(-21.6)*
Production or Transport worker	*0.004*	*0.001*	*0.002*	*0.000*	*0.002*
	(2.2)	*(1.2)*	*(2.9)*	*(0.0)*	*(2.7)*
Retired	*0.018*	*-0.018*	*-0.031*	*-0.010*	*-0.045*
	(5.5)	*(-9.4)*	*(-16.8)*	*(-20.4)*	*(-19.8)*
Other	*-0.051*	*-0.035*	*-0.046*	*-0.010*	*-0.061*
	(-21.3)	*(-24.8)*	*(-31.9)*	*(-29.4)*	*(-36.1)*

(continued)

OCCUPATIONAL STATUS OF HOUSEHOLD HEAD					
Employer	*0.002*	*0.003*	*0.001*	*0.001*	*0.001*
	(2.9)	*(12.0)*	*(4.8)*	*(25.0)*	*(4.5)*
Self-employed (agric. sector)	*-0.049*	*-0.037*	*-0.036*	*-0.012*	*-0.055*
	(-11.0)	*(-15.8)*	*(-17.3)*	*(-21.1)*	*(-20.9)*
Self-employed (non-agric. sector)	*0.015*	*0.003*	*-0.001*	*-0.001*	*-0.002*
	(8.2)	*(3.3)*	*(-1.3)*	*(-5.3)*	*(-2.3)*
Employee	*-0.002*	*-0.001*	*0.000*	*0.000*	*0.000*
	(-1.3)	*(-1.5)*	*(0.0)*	*(0.0)*	*(0.0)*
Retired	*0.018*	*-0.018*	*-0.031*	*-0.010*	*-0.045*
	(5.5)	*(-9.4)*	*(-16.8)*	*(-20.4)*	*(-19.8)*
Other	*-0.062*	*-0.041*	*-0.052*	*-0.012*	*-0.068*
	(-23.5)	*(-26.8)*	*(-33.3)*	*(-32.4)*	*(-37.0)*
NUMBER OF ECONOMICALLY ACTIVE HOUSEHOLD MEMBERS					
None	*-0.016*	*-0.026*	*-0.042*	*-0.012*	*-0.062*
	(-5.0)	*(-13.7)*	*(-21.6)*	*(-24.0)*	*(-25.7)*
1	*0.005*	*-0.005*	*-0.010*	*-0.002*	*-0.011*
	(2.6)	*(-5.3)*	*(-11.6)*	*(-10.0)*	*(-11.7)*
2	*-0.031*	*-0.022*	*-0.023*	*-0.006*	*-0.029*
	(-11.7)	*(-16.1)*	*(-18.9)*	*(-20.0)*	*(-20.9)*
More than 2	*-0.090*	*-0.051*	*-0.038*	*-0.012*	*-0.051*
	(-25.7)	*(-27.3)*	*(-23.0)*	*(-27.9)*	*(-25.9)*
AGE OF HOUSEHOLD HEAD					
Less than 25	*-0.057*	*-0.018*	*-0.013*	*-0.003*	*-0.014*
	(-52.3)	*(-51.4)*	*(-52.0)*	*(-60.0)*	*(-53.8)*
25-34	*0.000*	*0.004*	*0.006*	*0.001*	*0.007*
	(0.0)	*(5.7)*	*(10.2)*	*(7.1)*	*(11.1)*
35-44	*-0.018*	*-0.024*	*-0.028*	*-0.008*	*-0.033*
	(-8.9)	*(-22.9)*	*(-29.2)*	*(-34.8)*	*(-31.1)*
45-54	*-0.023*	*-0.008*	*-0.004*	*-0.002*	*-0.005*
	(-9.5)	*(-6.6)*	*(-3.8)*	*(-7.7)*	*(-4.2)*
55-64	*-0.022*	*-0.028*	*-0.039*	*-0.010*	*-0.050*
	(-7.8)	*(-18.7)*	*(-28.1)*	*(-29.4)*	*(-31.1)*
65-74	*-0.012*	*-0.028*	*-0.040*	*-0.012*	*-0.057*
	(-3.5)	*(-14.7)*	*(-22.2)*	*(-25.5)*	*(-25.9)*
More than 74	*0.001*	*-0.022*	*-0.024*	*-0.011*	*-0.045*
	(0.2)	*(-7.7)*	*(-8.7)*	*(-13.3)*	*(-11.8)*
NUMBER OF HOUSEHOLD MEMBERS					
1	*-0.045*	*-0.018*	*-0.012*	*-0.004*	*-0.015*
	(-19.7)	*(-13.2)*	*(-8.3)*	*(-11.8)*	*(-8.9)*

(continued)

2	0.003	-0.012	-0.022	-0.005	-0.029
	(1.1)	(-8.0)	(-15.1)	(-13.9)	(-17.0)
3	0.008	-0.009	-0.014	-0.004	-0.016
	(4.4)	(-9.4)	(-15.7)	(-19.0)	(-16.3)
4	-0.034	-0.022	-0.023	-0.006	-0.027
	(-18.2)	(-23.9)	(-28.7)	(-31.6)	(-31.0)
5	-0.022	-0.020	-0.024	-0.006	-0.030
	(-8.3)	(-14.8)	(-20.0)	(-20.7)	(-21.9)
6	0.016	-0.008	0.004	-0.002	0.005
	(4.5)	(-4.3)	(2.5)	(-4.9)	(2.7)
More than 6	-0.041	-0.017	-0.036	-0.010	-0.061
	(-8.8)	(-6.7)	(-14.6)	(-14.3)	(-18.6)
SEX OF HOUSEHOLD HEAD					
Male	-0.013	-0.016	-0.018	-0.005	-0.023
	(-5.4)	(-12.7)	(-15.8)	(-17.9)	(-17.8)
Female	-0.060	-0.032	-0.036	-0.012	-0.049
	(-22.3)	(-20.6)	(-22.8)	(-31.6)	(-26.1)
EDUCATIONAL LEVEL OF HOUSEHOLD HEAD					
University graduate	0.020	0.008	0.005	0.001	0.005
	(125.0)	(200.0)	(166.7)	(220.0)	(166.7)
Secondary educ. completed	0.037	0.013	0.009	0.002	0.009
	(77.1)	(68.4)	(60.0)	(66.7)	(60.0)
Primary educ. completed	0.009	0.002	0.002	0.000	0.003
	(3.8)	(1.8)	(2.1)	(0.0)	(2.9)
Primary educ. not completed or no education	-0.019	-0.022	-0.030	-0.010	-0.047
	(-4.6)	(-9.4)	(-13.4)	(-16.1)	(-16.3)
GREECE	-0.016	-0.018	-0.020	-0.0056	-0.025
	(-6.6)	(-14.0)	(-16.9)	(-19.5)	(-18.7)

* Mining/Electricity/Gas/Water/Construction/Public Utilities

parentheses are the percentage changes in the level of poverty according to the relevant indices.[15] The conclusion that emerges clearly from the empirical findings of this table is that between 1974 and 1982 poverty declined more in the high-poverty groups. The highest absolute poverty reductions were recorded among members of HHs living in communes with population "Less than 2000", with "None" or "More than 2"

15. Nevertheless, these percentage changes could be slightly misleading since in some cases the value of a poverty index in the base year was extremely low and, hence, even a modest change in the value of the index in absolute terms produces an enormous proportional change. Note also that in the case of members of HHs headed by "Executives and Managers" no proportional change is reported because no member of this group was living in poverty in 1974.

economically active HH members, with "More than 6" members and with heads aged "Over 54", "Females", with "Primary education not completed or no education" or belonging to one of the occupational groups "Farmer", "Retired" or "Other". The results of chapter 4 suggest that these were the high-poverty groups in Greece in 1974 and, to a lesser extent, in 1982 too. At the other end, relative poverty rose mainly among members of low-poverty groups; see, for example, the increases in poverty among members of HHs headed by "Professional and Technical workers", "Executives and Managers", "University graduates" and persons with "Secondary education completed". Relative poverty also increased modestly in the medium-poverty groups of members of HHs living in communes with population "2000-4999", with HH heads in the age bracket "25-34" or in one of the occupational groups "Mining etc", "Clerical worker", and "Service worker". Marginal increases in relative poverty were experienced by a few other socioeconomic groups, as well.

This particular pattern of poverty changes can be attributed to two principal factors. Firstly, the evidence of chapter 3 suggests that between 1974 and 1982 there was a substantial reduction in the differences between the mean consumption expenditures pea of the socioeconomic groups. In other words, the mean consumption expenditure pea of the poorer groups grew faster than that of the relatively better-off groups.[16] Hence, ceteris paribus, one could expect a larger reduction in the relative poverty of the poorer groups and a lower reduction (or even an increase) in that of the better-off groups. Secondly, most of the 1974 high-poverty groups were among the high-inequality groups. Hence, taking into account that during the period under examination inequality declined proportionally more in high-inequality than in low-inequality groups, it is not unreasonable to expect that the former groups would experience a relatively higher decline in relative poverty.

A more general conclusion drawn from the results of Table 5.5 is that the Head count ratio H, which is the most widely used index of poverty, is a rather poor index. In many of those instances where all the indices which satisfy the Sen axioms indicate a poverty reduction, H indicates a poverty increase and vice versa. Consider, for example, the group of members of HHs headed by "Retired" persons. T, C, F and M suggest that the relative poverty in this group declined by 9.4%, 16.8%, 20.4% and 19.8% respectively,

16. For example, during the period under consideration, the mean consumption expenditure pea of members of HHs headed by "Farmers" grew by 6.6% per annum whereas the relevant growth rates for the members of HHs headed by "Executives and Managers" and by "Professional and Technical workers" were only 2.3% and 3.4%, respectively. However, the growth rate of the other large high-poverty group, that is the members of HHs headed by "Retired" persons (4.7% per annum) was higher than that of the low-poverty groups, but lower than the national average (5.35%).

whereas H suggests that it rose by 5.5%. This discrepancy can be attributed to the fact that between 1974 and 1982 this group's mean consumption expenditure pea grew slower than the national mean, but at the same time there was a spectacular decline in inequality within the group. As a result of using a relativist poverty line, in 1982 a larger proportion of the group's members were classified as poor. However, the distribution of consumption expenditure among them was more equal than in 1974. H is completely insensitive to the extent of poverty among the poor and, hence, registers an increase in poverty. On the contrary, in T, C, F and M the positive effect of the increase in the proportion of the poor is counter-balanced by the negative effect due to improved intra-poor distribution of consumption expenditure. Hence, they register a reduction in poverty.[17]

5. The effect of changes in the structure of the population on poverty

The analysis of section 3 suggests that changes in population shares between 1974 and 1982 had a minor negative impact on inequality. Therefore, it might be interesting to examine whether these changes had a negligible effect on poverty, as well. Assuming that the poverty line, z, is exogenously determined, this can be achieved using the decomposable poverty indices which satisfy the Sen axioms (F and M).[18] In chapter 4 it was noted that these indices can be written as functions of the group poverty indices (F_j, M_j) and the group population shares (n_j/n) in the following way

$$F = \Sigma_j(n_j/n)F_j \qquad (16)$$

$$M = \Sigma_j(n_j/n)M_j \qquad (17)$$

Defining $v_j=n_j/n$ and applying the difference operator on both sides of (16) and (17) gives

$$\Delta F = \Sigma_j v_j \Delta F_j + \Sigma_j F_j \Delta v_j \qquad (18)$$

$$\Delta M = \Sigma_j v_j \Delta M_j + \Sigma_j M_j \Delta v_j \qquad (19)$$

Equations (18) and (19) are exact decompositions of F and M. The first and the second terms on the right hand side of these equations can be interpreted, respectively, as the effects of changes in "within-groups"

17. See also the groups of members of HHs with one economically active member, with 2 or 3 members and with heads aged "Over 74". Exactly the opposite is the case in the group of members of HHs living in communes with population "2000-4999".

18. The head count ratio H can also be used for the decomposition of changes in poverty. However, as the example of the group of members of HHs headed by "Retired" persons in the last section demonstrates, the results could be misleading. Hence, it was decided to use only F and M for this section's analysis.

TABLE 5.6 Decomposition of the change in aggregate poverty (1974-1982)

Characteristic of Household Member or Household Head	Index of Poverty		Contribution to changes in poverty due to changes in* Within groups poverty	Population shares
Region of Residence	Foster et al index	F	-5.13 (91.8)	-0.46 (8.2)
	New index	M	-22.92 (91.6)	-2.09 (8.4)
Size of Municipality or Commune	Foster et al index	F	-4.98 (87.3)	-0.72 (12.7)
	New index	M	-21.56 (86.6)	-3.34 (13.4)
Sector of Employment of Household Head	Foster et al index	F	-5.11 (89.8)	-0.58 (10.2)
	New index	M	-22.77 (89.7)	-2.61 (10.3)
Type of Profession of Household Head	Foster et al index	F	-4.79 (84.3)	-0.89 (15.7)
	New index	M	-21.14 (84.2)	-3.96 (15.8)
Occupational Status of Household Head	Foster et al index	F	-4.72 (85.6)	-0.79 (14.4)
	New index	M	-21.85 (86.2)	-3.50 (13.8)
Number of Economically Active Household Members	Foster et al index	F	-5.81 (105.1)	+0.28 (-5.1)
	New index	M	-26.27 (105.4)	-1.35 (-5.4)
Age of Household Head	Foster et al index	F	-5.87 (102.9)	+0.17 (-2.9)
	New index	M	-25.63 (102.8)	+0.70 (-2.8)
Number of Household Members	Foster et al index	F	-5.33 (96.3)	-0.20 (3.7)
	New index	M	-24.18 (96.6)	-0.86 (3.4)

(continued)

Sex of Household Head	*Foster et al index*	*F*	*-5.58 (99.6)*	*-0.02 (0.4)*
	New index	*M*	*-25.16 (99.5)*	*-0.13 (0.5)*
Educational Level of Household Head	*Foster et al index*	*F*	*-1.85 (32.6)*	*-3.84 (67.4)*
	New index	*M*	*-7.19 (28.8)*	*-17.79 (71.2)*

* *Absolute changes in poverty indices multiplied by 1000*

poverty and in population shares on the relevant index. As in the decomposition of changes in inequality, the aggregation weights used in the application of (18) and (19) to our data are the arithmetic mean values of the base and the final period weights. Note that since the poverty line is exogenously determined and the group mean expenditures do not directly affect the poverty indices, (18) and (19) do not encounter the problems of (7), (8) and (9) discussed in section 3.

The results of decomposing changes in relative poverty are reported in Table 5.6. From these results it becomes clear that, in many respects, the effect of changes in population shares on poverty was different from the effect of these changes on inequality. Although when the population is grouped according to nine out of the ten criteria used in our analysis over 84% of the recorded decline in relative poverty is attributable to changes in poverty "within-groups", the picture is completely different when the population is grouped according to the educational level of HH head. In the latter case, F and M respectively suggest that 67.4% and 71.2% of the decline is due to changes in population shares. Indeed, the evidence of chapter 4 suggests that between 1974 and 1982 there was a substantial decline in the population share of the high-poverty group of members of HHs headed by persons with "Primary education not completed or no education" and a relevant increase in the share of individuals living in HHs headed by "University graduates" or persons with "Secondary education completed". Therefore, combining the evidence of Tables 3 and 6, it can be argued that although changes in the population shares regarding the educational level of HH heads had a slightly adverse effect on inequality reduction, they had a very favourable effect on poverty alleviation.

The last column of Table 5.6 represents the "ceteris paribus" impact of changes in population shares on poverty. In other words, the figures reported in that column answer the question "What would have been

the reduction in the value of the poverty index if the population shares had changed as they did, but the level of poverty within each group in 1982 was exactly the same as in 1974?". Even excluding the situation where the population is grouped according to the educational level of HH head, it can be noted that during the period under consideration the population shifts were mainly from high-poverty to low-poverty groups. Only when the population is grouped according to number of economically active HH members or age of HH head the changes in the population shares had a weak negative impact on poverty reduction.[19]

6. Cross-country inequality and welfare comparisons

The purpose of the first part of this section is to compare the level of inequality in the distribution of consumption expenditure in Greece with the relevant levels of inequality in other countries. In the second part, an attempt is made to compare the levels and rates of change of approximations of social welfare in Greece with the corresponding levels and rates of a number of other countries. Cross-country inequality comparisons are among the most widely known uses of inequality indices. However, the great majority of these comparisons are performed in terms of inequality in the distribution of income. This is mainly due to the fact that most of the relevant data sets, which are compiled and published by international organizations, concern income, not consumption expenditure.[20] Relatively few compilations of data sets on distributions of consumption expenditure have been published until recently and most of them are not as homogeneous as the relevant income distribution data sets with regard to definitions of consumption expenditure, consuming unit, geographical coverage and so on. It is worthwhile pointing out that there are several difficulties associated with the use of consumption expenditure (or income) distribution data from different countries. Some of these difficulties are discussed below and in view of them, the conclusions based on this section (particularly the second part) are severely limited. For the purposes of this study two data sets have been used. The first set was compiled by the International Labour Office (1976, 1979) and contains data on distribution of consumption expenditure for several countries around the world during the period 1960-1976. The second set was compiled by the European Economic Communities (1984, 1986) and contains data on the distribution of consumption expenditure in EEC countries in the late seventies and the early eighties. Data relating to Greece

19. The evidence of chapter 4 shows that between 1974 and 1982 there was a substantial increase in the population share of members of HHs living in the high-poverty groups of HHs headed by very old persons (aged over 74) and in HHs with no economically active members.

20. See, for example, the World Bank data sets compiled by Jain (1975), the data published annually in the *World Development Reports*, and the data reported in van Ginneken and Park (1984).

for 1974 and 1982 are contained in the respective ILO and EEC publications.

Several methodological problems have to be solved before proceeding to the calculation of inequality indices. Firstly, all the data should refer to the same type of consuming unit. Although, as noted in chapter 2, it would be better to use data on distribution of consumption expenditure pea, few countries publish such data sets. Most of the data sets reported in the above sources have the HH as the consuming unit. Therefore, only distributions of HHs by total HH expenditure have been selected for our analysis. Secondly, to ensure comparability regarding the definition of consumption expenditure, an attempt has been made to ensure that all the distributions selected include consumption of purchased commodities as well as consumption of own production and imputed rent. Thirdly, to ensure homogeneity, only distributions covering the entire population of non-centrally planned economies have been included. Fourthly, in order to have a similar reference time period, only distributions based on surveys conducted during the seventies and the eighties have been considered. As a result of these restrictions, only 19 data sets from 14 countries have been included.

Even after this filtering, the original data in the above sources are not strictly comparable. This is because the data are usually reported there in grouped form as coordinates of different points of the relevant Lorenz curves. In order to achieve comparability, these data have been transformed into estimates of consumption expenditure shares of population deciles. These estimates were obtained by fitting a Lorenz curve to the observed data.[21] The functional form used is that suggested by Kakwani and Podder (1973, 1976). They demonstrate that if the cumulative percentages of population shares and expenditure shares are denoted by F_1 and F_2 respectively, the following equation of the Lorenz curve

$$y = \theta x^{\alpha}(\sqrt{2}-x)^{\beta} \qquad (20)$$

where $y=(F_1-F_2)/\sqrt{2}$ and $x=(F_1+F_2)/\sqrt{2}$

fits most income and expenditure distributions very well. Kakwani and Podder further demonstrate that the parameters θ, α and β must be positive. The restriction $\theta>0$ implies that the Lorenz curve lies below the perfect equality line, whereas the restrictions $\alpha>0$ and $\beta>0$ ensure that $y=0$ when $x=0$ and when $x=\sqrt{2}$ (that is the population shares and income shares are equal at the bottom end and at the top end of the Lorenz curve).

21. This is not an unusual practice. For example, the widely used data set of Jain (1975) has been obtained using this method.

In addition, if $\alpha=\beta$ the Lorenz curve is symmetric, if $\alpha>\beta$ it is skewed towards its bottom end and if $\alpha<\beta$ it is skewed towards its top end.

Expressed in logarithmic form, equation (20) can be linearized and estimated using Ordinary Least Squares. This equation was estimated for the 19 data sets mentioned above and estimates of the parameters θ, α and β were obtained.[22] Then, the Raphson-Newton method of approximation was used to compute F_2 for given values of F_1.[23] The next step was to use these cumulative distributions, in order to derive frequency distributions of consumption expenditure for population deciles. These distributions are reported in Table 5.7. Finally, based on the data of Table 5.7, estimates of G, A, T, N and L were derived for the relevant countries and years. These estimates are reported in Table 5.8. Although the primary data of the two Greek HESs were available, it was decided to calculate the relevant indices and decile shares using the data reported in the ILO and EEC publications, so that they are subject to similar biases as the relevant indices and expenditure shares of the other countries.[24] The same methodology was used for the calculation of decile shares and inequality indices for the distribution of consumption expenditure by HH in urban and rural areas of Greece separately in 1957/58-1974-1982 and 1963/64-1974-1982 respectively, using the published grouped data of the relevant HESs. These expenditure shares and inequality indices are reported in the Appendix of this chapter.

The results of Tables 5.7 and 5.8 are clear. Inequality in the distribution of consumption expenditure per HH in Greece was higher than in most other countries included in these tables both in 1974 and in 1982. More specifically, the level of inequality in Greece was lower only than that of Colombia and Italy (according to most indices). Comparison of the expenditure shares of the population deciles in Greece with the unweighted mean shares of the relevant deciles of the rest of the distributions of Table 5.7 shows that the shares of the bottom seven deciles in Greece were lower, whereas those of the top two deciles substantially higher than the corresponding unweighted means. However, these results do not necessarily imply that Greece is a high-inequality country in comparison with the rest of the non-centrally planned economies of the world.

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22. These equations are not reported here. However, their goodness of fit was exceptionally good. In all the cases the adjusted squared coefficient of determination ($\bar{R}^2$) was over 95% and in 17 cases it was over 98%.

23. For a description of the Newton-Raphson method see Harvey (1981, pp 127-131).

24. It can be noted that the estimates of G, A, T, N and L for the distribution of HHs by total HH expenditure in Greece reported in Table 5.8 are lower than the relevant estimates in Tables 3.3 and 3.4. This is not surprising since the former set of indices has been calculated from the decile observations and, hence, does not take into account inequality within population deciles. In addition, the data sets used for the calculation of these indices differ in other respects, as well (adjustment for inflation, exclusion of certain HHs and expenditure items).

TABLE 5.7 Distribution of consumption expenditure by household in selected countries

Country (year)	Population Deciles									
	1	2	3	4	5	6	7	8	9	10
Belgium (1978/79)	3.3	5.7	6.9	7.9	8.9	10.0	11.2	12.7	14.6	18.8
Colombia (1971)	2.4	3.3	4.1	5.1	6.2	7.6	9.6	12.3	17.1	32.3
Denmark (1981)	4.1	5.2	6.2	7.3	8.5	10.0	11.7	13.7	16.0	17.3
France (1979)	3.2	5.6	6.9	7.9	9.0	10.1	11.3	12.7	14.7	18.7
West Germany (1978/79)	2.3	5.0	6.4	7.7	9.0	10.3	11.7	13.4	15.5	18.7
Ireland (1973)	3.0	4.9	6.2	7.4	8.6	10.0	11.5	13.4	15.8	19.2
Ireland (1980)	2.9	5.2	6.5	7.6	8.6	9.8	11.2	12.8	15.1	20.3
Italy (1976)	2.2	4.0	5.2	6.3	7.5	8.8	10.5	12.7	16.2	26.6
Italy (1979)	2.0	4.1	5.3	6.4	7.6	9.0	10.7	12.7	16.0	26.2
New Zealand (1974/75)	3.8	5.9	7.0	8.1	9.1	10.3	11.5	12.9	14.5	16.9
Pakistan (1971/72)	5.2	6.2	6.9	7.6	8.4	9.3	10.4	11.9	14.0	20.1
Spain (1973/74)	2.9	5.2	6.4	7.4	8.5	9.6	10.9	12.6	15.0	21.5
Spain (1980/81)	2.9	5.3	6.6	7.7	8.8	9.9	11.2	12.8	14.9	19.9
Sri Lanka (1969/70)	4.1	5.1	5.9	6.8	7.7	8.9	10.2	12.1	15.1	24.1
U.K. (1975)	3.2	5.0	6.1	7.3	8.4	9.8	11.4	13.3	15.8	19.7
U.K. (1979)	2.1	4.8	6.2	7.5	8.6	10.1	11.6	13.4	15.8	19.9
U.S.A. (1973)	3.7	5.3	6.3	7.3	8.4	9.6	11.0	12.7	15.1	20.6
Unweighted mean	3.1	5.1	6.2	7.3	8.3	9.6	11.0	12.8	15.4	21.1
Greece (1974)	2.5	4.0	5.1	6.2	7.3	8.7	10.4	12.6	16.3	26.9
Greece (1982)	2.5	4.4	5.5	6.6	7.9	9.2	10.9	13.0	16.2	23.8

This is because the countries included in the sample of Tables 5.7 and 5.8 cannot be considered representative of this part of the world. Only three of them are LDCs while the remainder consist of industrialized countries. Several compilations of data suggest that, in general, income inequality is higher in LDCs than in most industrialized countries.[25] In addition, the evidence provided in these sources suggests that inequality in two of the three LDCs included in the sample of these tables (Pakistan and Sri Lanka) is unusually low for LDCs. Hence, since it is not unreasonable to claim that income inequality and consumption expenditure inequality are

25. See, for example, Jain (1975) and the Appendices of the *World Development Reports*.

TABLE 5.8 Estimates of inequality indices for the distribution of consumption expenditure by household in selected countries

Country (year)	Consumption expenditure p.c. in "real" US$[a]	Gini index G	Atkinson index A	Theil index T	Theil index N	Variance of logs L
Belgium (1978/79)	88.72	0.242	0.200	0.094	0.103	0.226
Colombia (1971)	20.82	0.422	0.422	0.300	0.298	0.564
Denmark (1981)	77.02	0.247	0.187	0.095	0.101	0.212
France (1979)	90.04	0.243	0.206	0.095	0.106	0.233
West Germany (1978/79)	80.96	0.269	0.291	0.119	0.143	0.341
Ireland (1973)	47.93	0.272	0.248	0.117	0.131	0.287
Ireland (1980)	44.97	0.269	0.242	0.117	0.129	0.282
Italy (1976)	54.01	0.356	0.367	0.208	0.221	0.463
Italy (1979)	58.41	0.352	0.375	0.204	0.222	0.479
New Zealand (1974/75	63.98	0.219	0.167	0.076	0.084	0.182
Pakistan (1971/72)	8.57	0.223	0.138	0.081	0.078	0.148
Spain (1973/74)	58.17	0.279	0.248	0.125	0.135	0.291
Spain (1980/81)	63.89	0.263	0.237	0.111	0.124	0.275
Sri Lanka (1969/70)	10.49	0.292	0.225	0.141	0.135	0.255
U.K. (1975)	59.77	0.274	0.237	0.118	0.128	0.276
U.K. (1979)	67.11	0.287	0.320	0.134	0.161	0.384
U.S.A. (1973)	100.00	0.265	0.206	0.111	0.115	0.236
Greece (1974)	45.57	0.357	0.364	0.209	0.216	0.437
Greece (1982)	56.23	0.326	0.320	0.171	0.184	0.391

[a] Expressed as percentage of the 1973 U.S.A. consumption expenditure pc

positively correlated, it may be possible to argue that Greece is a medium-level inequality country in comparison with all the non-centrally planned countries of the world. Nevertheless, it is also clear that inequality in Greece is substantially higher than in most industrialized countries.[26]

Table 5.8 also reports the values of consumption expenditure per capita in "real purchasing power

26. Note also that according to the evidence of Table 5.7, the Lorenz curves of Greece cross with those of U.K. (1979) and West Germany (1978/79) close to the bottom end of the distribution. Hence, there exist inequality indices which satisfy the four desirable axioms mentioned in chapter 3 and rank the Greek distributions as more egalitarian than the corresponding distributions of these countries.

parity" U.S.A. dollars expressed as percentage of the U.S.A. consumption expenditure pc figure for 1973. These figures have been calculated using the data of Summers and Heston (1984). Several interesting results can be obtained when these figures are combined with the rest of the figures in Tables 5.7 and 5.8. For many years figures of GDP pc converted in official exchange rates were widely used to appraise the welfare levels of different countries in cross-country comparisons. However, the existence of non-traded commodities, the existence of severe quantitative and qualitative restrictions in international trade, government policies towards under-valuation or over-valuation of the exchange rate and a series of other factors make the actual purchasing power of the population of a number of countries diverge significantly from their GDP pc. For this reason, in recent years many researchers have started using figures of GDP pc in "real" purchasing power parities as an approximation of a country's level of welfare. Although these figures may sometimes be rather crude approximations of the real purchasing power of some countries and are also subject to large margins of error, they are likely to be much better proxies of a country's level of welfare than GDP pc converted in official exchange rates. In addition, for reasons already explained in chapter 2, it can be argued that consumption expenditure pc is a better approximation of the unobservable level of current welfare than GDP (income) pc.[27]

Nevertheless, even consumption expenditure pc in "real" purchasing power parities cannot be considered as a sufficiently good approximation of economic welfare because it does not take into account the distribution of consumption expenditure among population members. Naturally, welfare can be considered as a positive function of the mean and a negative function of the degree of inequality in the distribution of consumption expenditure.[28] Therefore, in the evaluation of alternative situations there is room for a tradeoff between greater inequality and higher average living standards. If a specific Social Welfare Function is adopted, the ranking of different distributions degenerates into a trivial exercise. However, since it is impossible to achieve general agreement on one particular functional form for the Social Welfare Function, it is interesting to ask whether an unambiguous partial welfare ordering of alternative distributions can be achieved using only some generally acceptable restrictions.[29] Shorrocks (1983) demonstrates that this is

27. See also the arguments of Sen (1976b) and Deaton (1980). Note, however, that the use of "real" consumption expenditure pc instead of "real" GDP pc as an indicator of economic welfare produces some unusual results (for example, welfare in France (1979) and in Spain (1981) being, respectively, higher than in West Germany (1978/79) and in Italy (1979)). This is partly due to the relatively higher savings and government expenditure ratios in the latter countries.

28. Of course, social welfare probably depends on a number of other economic and non-economic factors, as well. For the purposes of our analysis these factors are assumed to be exogenously constant.

29. Note the similarity of this approach to the approach adopted by Atkinson (1970) for the ranking of distributions with the same mean.

possible using the notion of the "generalized Lorenz curve". A generalized Lorenz curve can be constructed by scaling up the ordinary Lorenz curve by the mean of the distribution. Shorrocks shows that if the generalized Lorenz curves of two distributions do not intersect, then any Social Welfare Function which is a non-decreasing function of all incomes (or expenditures) and follows the Lorenz criterion for ranking distributions having the same mean will give the distribution corresponding to the higher generalized Lorenz curve a higher welfare ranking.[30]

Assuming that the shape of the distribution of consumption expenditure by HH is fairly similar to that of the distribution of consumption expenditure pc, generalized Lorenz curves can be constructed for the distributions of our sample. The relevant generalized Lorenz curves' values are reported in Table 5.9. According to these results, the level of welfare in Greece in 1974 was unambiguously higher than those of Pakistan (1971/72), Sri Lanka (1969/70) and Colombia (1971). A clear ranking is not possible between Greece (1974) and Ireland (1980) because their generalized Lorenz curves intersect. The generalized Lorenz curves of the rest of the distributions lie above that of Greece (1974) indicating a higher level of welfare in the respective countries and years. The generalized Lorenz curve of Greece in 1982 lies above that of Greece in 1974 and, in addition, of those of Ireland (1980) and Italy (1976) and crosses with the corresponding curves of Ireland (1973) and Italy (1979).[31]

When the generalized Lorenz curves intersect an unambiguous welfare ranking cannot be achieved. In this case a specific Social Welfare Function is needed in order to rank the relevant distributions. In chapter 3 it was noted that each index of inequality corresponds to a particular Social Welfare Function. Blackorby and Donaldson (1978) suggest a method of deriving these Social Welfare Functions from the inequality indices.[32] Their starting point is to take perfect equality as reference and scale the Social Welfare Function so that social welfare is equal to the mean income (or consumption expenditure), μ. Any departure from this point reduces the level of social welfare and social welfare is equal to zero in the case of complete inequality. Then, provided that the inequality index, I, takes values in the range zero to one, the proportional reduction in

30. Shorrocks (1983, p.3) calls these properties "efficiency preference" and "equity preference", respectively. The second property implies that the Social Welfare Function should be S-concave.

31. Comparisons of the generalized Lorenz curves are made only at the decile points. Other intersections between these points cannot be ruled out, particularly within the bottom decile.

32. See also Sen (1976b, 1979c), de Graaff (1977), Deaton (1980), Kakwani (1981b), Ebert (1987) and Chakravarty and Dutta (1987).

TABLE 5.9 Generalized Lorenz curve values for the distribution of consumption expenditure per household in selected countries

Country (year)	Cumulative expenditure share of the bottom 10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Belgium (1978/79)	2.93	7.98	14.11	21.12	29.01	37.88	47.82	59.09	72.04	88.72
Colombia (1971)	0.50	1.19	2.04	3.10	4.39	5.98	7.97	10.53	14.14	20.82
Denmark (1981)	3.16	7.16	11.94	17.56	24.11	31.81	40.82	51.37	63.70	77.02
France (1979)	2.88	7.92	14.12	21.23	29.32	38.41	48.57	60.00	73.22	90.04
West Germany (1978/79)	1.86	5.91	11.09	17.33	24.61	32.95	42.42	53.27	65.82	80.96
Ireland (1973)	1.44	3.79	6.76	10.30	14.43	19.22	24.73	31.15	38.73	47.93
Ireland (1980)	1.30	3.64	6.57	9.98	13.85	18.26	23.29	29.05	35.84	44.97
Italy (1976)	1.19	3.35	6.16	9.56	13.61	18.36	24.03	30.89	39.64	54.01
Italy (1979)	1.17	3.56	6.66	10.40	14.84	20.09	26.34	33.76	43.11	58.41
New Zealand (1974/75)	2.43	6.21	10.68	15.87	21.69	28.28	35.64	43.89	53.17	63.98
Pakistan (1971/72)	0.45	0.98	1.57	2.22	2.94	3.74	4.63	5.65	6.85	8.57
Spain (1973/74)	1.69	4.71	8.43	12.74	17.68	23.27	29.61	36.94	45.66	58.17
Spain (1980/81)	1.85	5.24	9.46	14.38	20.00	26.32	33.48	41.66	51.18	63.98
Sri Lanka (1969/70)	0.43	0.96	1.58	2.30	3.10	4.03	5.10	6.37	7.95	10.48
U.K. (1975)	1.91	4.90	8.55	12.91	17.93	23.79	30.60	38.55	48.00	59.77
U.K. (1979)	1.41	4.63	8.79	13.82	19.60	26.37	34.16	43.15	53.76	67.11
U.S.A. (1973)	3.70	9.00	15.30	22.60	31.00	40.60	51.60	64.30	79.40	100.0
Greece (1974)	1.14	2.96	5.29	8.11	11.44	15.40	20.14	25.88	33.31	45.57
Greece (1982)	1.41	3.88	6.97	10.68	15.13	20.30	26.43	33.74	42.85	56.23

social welfare due to the existence of inequality is equal to the value of I and the actual value of social welfare, w, is simply given by

$$w = \mu(1-I) \qquad (21)$$

This expression is also known in the literature as the "equally distributed equivalent income pc (consumption

TABLE 5.10 Equally distributed equivalent consumption expenditure per capita in selected countries

Country (year)	Equally distributed equivalent consumption expenditure pc according to[a]				
	Gini index G	Atkinson index A	Theil index T	Theil index N	Variance of logarithms L
Belgium (1978/79)	89.43	87.38	88.38	87.90	87.86
Colombia (1971)	16.37	15.16	16.39	16.51	11.88
Denmark (1981)	78.91	78.86	78.41	78.24	79.44
France (1979)	92.64	89.95	91.57	90.86	90.30
West Germany (1978/79)	80.52	72.29	80.23	78.40	69.83
Ireland (1973)	47.47	45.39	47.61	47.06	44.73
Ireland (1980)	44.73	42.93	44.67	44.26	42.26
Italy (1976)	47.32	43.06	48.12	47.54	37.96
Italy (1979)	51.50	45.98	52.30	51.35	39.83
New Zealand (1974/75)	67.98	67.12	66.50	66.22	68.50
Pakistan (1971/72)	9.06	9.30	8.86	8.93	9.56
Spain (1973/74)	57.06	55.09	57.25	56.86	53.98
Spain (1980/81)	64.06	61.40	63.89	63.24	60.63
Sri Lanka (1969/70)	10.10	10.23	10.13	10.24	10.22
U.K. (1975)	59.04	57.44	59.30	58.89	56.64
U.K. (1979)	65.10	57.47	65.37	63.62	54.11
U.S.A. (1973)	100.00	100.00	100.00	100.00	100.00
Greece (1974)	39.87	36.50	40.55	40.37	33.58
Greece (1982)	51.56	48.16	52.43	51.85	44.82

[a] Expressed as percentage of the 1973 U.S.A. equally distributed equivalent consumption expenditure per capita

expenditure pc) of the population according to index I". This is the level of income (consumption expenditure) which if equally distributed would produce a level of social welfare equal to the actual level of welfare.

Estimates of w for all the distributions and indices used in this section are reported in Table 5.10 as percentages of the relevant value of w for the U.S.A. in 1973. They have been calculated using the data of

Table 5.8.[33] If we are prepared to accept that equally distributed equivalent consumption expenditure pc is a sufficiently good indicator of economic welfare, we should rank the ambiguous cases of Table 5.9 involving Greek distributions in the following way. Since the values of w corresponding to all inequality indices used here are higher for Ireland (1980) than for Greece (1974), the welfare level of the former distribution is higher than that of the later. Similarly, it appears that the level of welfare in Greece in 1982 was higher than those of Ireland (1973) and (surprisingly) Italy (1979) according to all welfare indices reported in Table 5.10. Of course, the fact that all the estimates of w concerning Greek distributions give a similar ranking does not mean that this is always the case. See, for example, the relative ranking between the distributions of U.K. (1975) and U.K. (1979) and, also, between West Germany (1978/79) and Denmark (1981) where different methods of evaluating equally distributed equivalent consumption expenditure pc produce reverse welfare rankings.

A general conclusion drawn from the results of Tables 5.9 and 5.10 is that the welfare orderings reported there are determined to a far larger extent by the level of "real" consumption expenditure pc than by the level of inequality in the distribution of consumption expenditure. This can be attributed to the fact that variations in the levels of inequality between the countries of our sample - and, indeed, between all the countries of the world - tend to be substantially lower than variations in the levels of consumption expenditure. For instance, the ratio of the highest to the lowest value of any particular inequality index in Table 5.8 is less than 4, whereas the ratio of the highest to the lowest "real" consumption expenditure pc is over 11. As a result, the scaling up of a Lorenz curve to form a generalized Lorenz curve or the calculation of the equally distributed equivalent consumption expenditure pc often reveal a clear welfare dominance relationship which might not be apparent from an examination of Lorenz curves and mean consumption expenditures separately.

Another interesting exercise that can be performed using the data of Tables 5.9 and 5.10 is the calculation of welfare growth rates. In several empirical studies, the growth rates of GDP pc are used in order to evaluate changes in the level of welfare in particular countries. However, the weights used for the calculation of GDP pc growth rates are the income shares of the population members and, consequently, these rates reflect mainly changes in the incomes of the rich. For this reason, Ahluwalia and Chenery (1974) suggest

33. Expression (21) has been used for the calculation of w in Table 5.10, although some of the inequality indices used can take values grater than one. However, this is very unusual and since the values of w are expressed as percentages of the relevant 1973 U.S.A. values, this inconsistency is not expected to affect the results of Table 5.10 seriously.

two alternative methods of calculating "welfare-weighted" growth rates. The first method uses as weights population shares instead of income shares and, hence, gives equal weights to all population members. The second method assigns higher weights to the growth rates of the incomes of the poor. Since the latter method involves an element of arbitrariness (identification of the poor) one could think of the growth rate of the equally distributed equivalent consumption expenditure pc as a sufficiently good indicator of rate of change of social welfare. This growth rate takes into account changes in the mean as well as in the level of inequality in the distribution of consumption expenditure. If the inequality index used for the calculation of the equally distributed equivalent consumption expenditure pc satisfies the "strong principle of transfers" (that is, it is more sensitive to changes at the bottom than at the top of the distribution) then this growth rate assigns more weight to the growth rates of the consumption expenditure of the poor.[34]

For five of the countries included in the sample of Table 5.10 there is information about their equally distributed equivalent consumption expenditure pc for two different years during the period 1973-1982 (Ireland, Italy, Spain, U.K. and Greece). Using this information and the information of Table 5.7 annual compound growth rates for their "real" consumption expenditure pc can be calculated using as weights both income and population shares, as well as growth rates for their equally distributed equivalent consumption expenditure pc. These growth rates are reported in Table 5.11. For comparative purposes, the first column of this table reports the growth rates of GDP pc in constant prices for the relevant countries during the period under examination. The data for the calculation of GDP pc growth rates were taken from IMF (1987). Since the sample is very small and the reference periods different, no general conclusions can be derived from the results of Table 5.11. It is interesting to note that, with the exception of Ireland, the growth rates of GDP pc and "real"consumption expenditure pc are not substantially different. The difference for Ireland can be mainly attributed to two factors. Firstly, between 1973 and 1980 the average propensity to consume declined substantially (from 0.69 to 0.63) and, secondly, there was a rather serious deterioration in her terms of trade.[35]

Ceteris paribus, if inequality declined during the reference period, the growth rates of equally distributed equivalent consumption expenditure pc and "real" consumption expenditure pc using population weights should be higher than those of "real" consumption expenditure pc using expenditure weights. The

34. Among the indices used in our analysis only G does not satisfy this principle.

35. See Summers and Heston (1984).

TABLE 5.11 Growth rates of income, consumption expenditure and equally distributed equivalent consumption expenditure pc in selected countries

Country (period)	Annual growth rate of Income pc	"Real" consumption expenditure pc		Equally distributed equivalent consumption expenditure pc according to				
		Expend. weights	Populat. weights	G	A	T	N	L
Ireland (1973-1980)	2.85	-0.91	-0.87	-0.85	-0.96	-0.91	-0.87	-0.81
Italy (1976-1979)	2.71	2.64	2.64	2.86	2.21	2.82	2.60	1.62
Spain (1973/74-1980/81)	0.67	1.37	1.52	1.67	1.56	1.58	1.53	1.67
U.K. (1975-1979)	2.64	2.94	2.29	2.47	0.05	2.47	1.95	-1.14
Greece (1974-1982)	2.27	2.66	3.10	3.27	3.53	3.26	3.18	3.67

evidence of Table 5.11 suggests that the growth rate of GDP pc of Greece was slightly lower than the relevant rates for the rest of the countries of the sample apart from Spain, whereas her rate of growth of "real" consumption expenditure pc was higher than those of Ireland and Spain, almost equal to that of Italy and slightly lower than the relevant rate of the U.K. However, when changes in inequality are also taken into account, the comparative performance of Greece improves substantially. According to all the indices, equally distributed equivalent consumption expenditure pc grew faster in Greece than in any other country of the sample. In general, the highest of these growth rates are recorded when the equally distributed equivalent consumption expenditure pc is evaluated using the Social Welfare Functions underlying those indices which are relatively more sensitive to changes at the bottom end of the distribution.[36] Exactly the opposite are the cases of Italy and U.K. This difference can be explained using the evidence of Table 5.9. In Greece the poor benefited relatively more than the rich from the increase in "real" consumption expenditure pc, whereas in Italy and in the U.K. the situation was the reverse.[37] Similarly, if the growth rates of "real" consumption expenditure pc are evaluated using as weights population instead of income shares, the results of Table 5.11

36. In fact, this is true for L and A, but not for N. The growth rate of w evaluated using the Social Welfare Function underlying N is lower than the relevant rates using the Social Welfare Functions associated with G and T.

37. According to the evidence of Table 5.9, between 1975 and 1979 the "real" consumption expenditure of the bottom 20% of the population in the U.K. declined not only in relative but in absolute terms, as well. As a result, although the U.K. has the highest growth rate of "real" consumption expenditure pc, when w is evaluated using the Social Welfare Function corresponding to L its growth rate is negative.

show that the growth rate of Greece was higher than those of the rest of the countries of the sample. Therefore, using the evidence of Table 5.11, it may not be unreasonable to speculate that between 1974 and 1982 Greece experienced a relatively important improvement in her level of welfare, at least in comparison with the four other EEC countries of our sample.

Cross-country poverty comparisons, similar to the cross-country inequality comparisons reported in this section can, also, be performed using the information of Tables 5.7-5.11. However, as Ahluwalia et al (1979) point out, cross-country poverty comparisons are meaningful only if the countries involved in these comparisons have relatively similar levels of mean income/consumption expenditure (and, probably, relatively similar cultural and physical environments, since the poverty lines can be considered as functions of cultural and environmental factors). Otherwise, if the same poverty line is used for all the countries the comparisons will be determined, to a very large extent, by the level of mean income/consumption expenditure of the countries included in the sample. Alternatively, if a different ("relativist") poverty line is used for each country the comparison can degenerate to a comparison of levels of inequality. In view of these difficulties and taking into account the huge differences in the mean consumption expenditures of the countries of our sample, it was decided to avoid cross-country poverty comparisons.

APPENDIX I. Intertemporal changes in the distribution of consumption expenditure by household in urban and rural areas of Greece

Apart from the two HESs with national coverage which are used in this study, a number of other similar surveys covering parts of the Greek population have been conducted by the NSSG. The most important of these were two large-sample surveys: one in 1957/58 covering the urban areas and one in 1963/64 covering the rural areas.[38] The published grouped data of these surveys can be used for the estimation of Lorenz curves using the method of Kakwani and Podder (1973, 1976). Then, decile expenditure shares and inequality indices for the distribution of consumption expenditure by HH can be calculated. The same methodology can be used for the calculation of decile shares and inequality indices from the published grouped data of the 1974 and 1982 HESs for urban and rural areas separately.[39] These shares and indices are reported in Table 5.12.

The evidence of this Table suggests that the level of inequality in the distribution of consumption expenditure by HH in the rural areas of Greece declined both between 1963/64 and 1974 and between 1974 and 1982. The picture in the urban areas appears to be different. The results of Table 5.12 indicate that inequality in these areas was relatively low in 1957/58, rose substantially between 1957/58 and 1974 and, then, between 1974 and 1982, declined but remained in levels higher than those of 1957/58. However, there are grounds for believing that the 1957/58 level of inequality reported in Table 5.12 may be "artificially" low. This is because in the published results of the 1957/58 HES the HHs are grouped according to their total income, whereas in the rest of the surveys they are grouped according to their total expenditure. Although total HH expenditure and total HH income are, probably, closely related, it is highly unlikely that there is an one to one correspondence in the ranking of the HHs according to these criteria. Therefore, the use of total HH income as grouping criterion inevitably ranks some relatively high-expenditure HHs below some others which have lower expenditures but higher incomes. As a result, the disparities between the mean expenditures of the groups of HHs ranked according to total HH income are lower than the disparities between the mean expenditures of the groups of HHs ranked according to total HH expenditure. Consequently, the use of total HH income as grouping criterion causes an underestimation of the "true" level of inequality in the distribution

38. See NSSG (1961, 1967).
39. See NSSG (1977, 1985).

TABLE 5.12 Intertemporal changes in the level of inequality in urban and rural areas of Greece

	Urban areas			Rural areas		
Year	1957/58	1974	1982	1963/64	1974	1982
Decile						
1	3.6	2.7	2.9	2.2	2.6	2.6
2	5.4	4.4	4.6	3.9	4.0	4.4
3	6.3	5.4	5.6	5.0	5.1	5.6
4	7.3	6.4	6.7	6.0	6.1	6.6
5	8.1	7.6	7.8	7.2	7.2	7.8
6	9.2	8.9	9.2	8.6	8.7	9.2
7	10.6	10.4	10.8	10.3	10.3	10.8
8	12.1	12.6	12.9	12.6	12.6	12.9
9	14.7	15.9	16.0	16.3	16.2	16.0
10	22.7	25.7	23.5	27.9	27.2	24.1
Index						
G	0.277	0.337	0.315	0.370	0.358	0.325
A	0.219	0.315	0.286	0.379	0.342	0.310
T	0.125	0.185	0.159	0.226	0.211	0.170
N	0.125	0.191	0.167	0.236	0.216	0.181
L	0.249	0.385	0.344	0.484	0.430	0.380

of consumption expenditure by HH. Nevertheless, using the existing evidence, it is impossible to judge whether the "true" level of inequality in the urban areas of Greece in 1957/58 was higher than in 1974 or in 1982.

CHAPTER SIX

CONCLUSIONS

1. Summary and conclusions

This study has attempted to provide a documentation of the state and the nature of inequality and poverty in Greece using the primary consumption expenditure data of two HESs conducted in 1974 and 1982. In this chapter a summary of the main findings and their possible policy implications is presented.

The first chapter provided an outline of developments in the Greek economy during the postwar period, a survey of the literature on inequality and poverty in Greece and a comparison of the data used in this study with data from other sources. From the survey of literature it became clear that, until very recently, questions concerning poverty in Greece were a *terra incognita* for economic research and, moreover, the findings of the few systematic studies on inequality contradict each other. However, there does seem to exist an agreement regarding the sources of inequality. Some economists (and many politicians and policy-makers) seem to support the idea that a large part of the observed inequality should be attributed to regional disparities or inequalities between urban and rural areas. Turning to the data utilized, it was noted that the definition of consumption expenditure used in the HESs appears to be fairly comprehensive and their sampling errors and non-response rates comparable with those of similar surveys of other countries. A comparison of the samples of the HESs with the Population Censuses of 1971 and 1981 revealed that both of them could be considered as representative of the Greek population living in non-institutional HHs. Similarly, the comparison of the HESs data with the relevant National Accounts tables showed that the grossed-up total consumption expenditures of the two HESs were equal to 90% and 114% of the corresponding National Accounts figures in 1974 and 1982, respectively. These percentages are not dramatically different from the relevant percentages of similar surveys of industrialized countries (such as the FES in the U.K.).

In the second chapter it was argued that the distribution of consumption pea is a relatively good approximation of the (unobservable) distribution of the economic welfare. For this reason three models of

equivalence scales for the cost of children were presented, compared and estimated (Engel, Rothbarth and Barten). The estimated scales varied substantially across models. As the theory predicted, in general, the Engel scales were higher than the Barten scales and the latter were, in turn, higher than the Rothbarth scales. On the basis of the empirical evidence, it was decided to assign the values of 1.00, 0.40 and 0.25 to each adult, child aged 6-16 and child aged less than 6, respectively. Then, the consumption expenditure of each HH was divided by the number of equivalent adults in the HH and the resulting consumption expenditure figure was assigned to each HH member. Thus, the distributions of consumption expenditure pea for each survey year were derived. These were the main distributions used in the rest of the study.

The most important findings of the study were reported in the next three chapters. The third chapter was devoted to the measurement and decomposition of inequality in the distribution of consumption expenditure pea. The estimates of the Gini index G, the Atkinson index A (ε=2), the Theil indices T and N and the variance of logarithms L for the entire population were, respectively, 0.342, 0.323, 0.200, 0.196 and 0.387 in 1974, and 0.309, 0.273, 0.159, 0.159 and 0.318 in 1982. The expenditure shares of the bottom 40% and the top 10% of the population were 19.2% and 26.1% in 1974 and 20.8% and 23.7% in 1982. For the purposes of decomposition analysis, the population was grouped into homogeneous groups according to ten criteria (regional, occupational, demographic and educational). The clear conclusion of the one-way decomposition analysis was that variations "within-groups" were far more important in accounting for aggregate inequality than variations "between-groups", according to any grouping of the population. This pattern was more profound in 1982 than in 1974. With the exception of the "between-educational groups" component of inequality, no other "between-groups" component was contributing more than 17.5% to aggregate inequality in either survey year. Even when the population was grouped into 512 very fine locational-regional-occupational-demographic-educational groups, variations "between-groups" accounted for only one third of the overall inequality in 1974 and for even less in 1982. Contrary to popular belief, the results of decomposition analysis further demonstrated that, if "within-groups" disparities were kept constant, complete elimination of inter-regional consumption expenditure disparities would reduce aggregate inequality by less than 14% in 1974 and by less than 9% in 1982. Similarly, although the mean consumption expenditure pea of the urban areas in 1974 (1982) was 50.5% (42.1%) higher than that of the rural areas, the effect of eliminating urban-rural consumption expenditure differentials would be a mere decline in aggregate inequality

by approximately 10%. The only factor which was found relatively closely associated with inequality in both surveys was the educational level of the HH head.[1] This finding has some interesting implications for further research which are discussed below.

The results of measurement and decomposition of poverty were reported in the fourth chapter. For the purposes of that chapter, the poverty line was fixed at the level of two thirds of the median consumption expenditure pea of the relevant year. Some 24.3% (22.7%) of the population were below this expenditure level in 1974 (1982). "Distribution-sensitive" poverty indices were also estimated: Thon's T version of the Sen index, the Clark et al index C, the Foster et al index F and a new index derived in that chapter, M. The last two are additively decomposable. The estimates of the above indices for the entire population were 0.129, 0.118, 0.029 and 0.134 for 1974 and 0.111, 0.098, 0.023, and 0.109 for 1982. It was found that in both surveys more than half of the poor were living in HHs headed either by farmers or by retired persons. These groups taken together accounted for over 60% of aggregate poverty (around 68% in 1974 and 61% in 1982). Hence, although occupational variables, such as sector of employment and type of profession of HH head, turned out to be relatively poor in explaining aggregate inequality, they were fairly good guides in identifying poverty in Greece. Poverty was also found associated with residence in small communes, large HH size, low educational level and old age of HH head. The results of the two-way measurement and decomposition of poverty showed that the population subgroups most exposed to poverty were those combining employment in the agricultural sector or no employment of the HH head with one of the above characteristics. At the other end, low levels of poverty were linked with residence in big cities, young age and, particularly, high educational level of the HH head as well as with specific occupational characteristics of the HH head. These characteristics were employment in the sectors "Banks and Insurances", "Services" or "Transport and Communications", type of profession "Executive and Manager", "Professional and Technical worker", or "Clerical worker" and occupational status "Employer". Nevertheless, almost all the population subgroups had representatives both in the poverty group and in the high-expenditure group (top 5%).

The fifth chapter dealt with intertemporal changes in inequality and poverty and with international

1. It should be repeated that all the factors examined in our analysis *are* statistically significant for the determination of aggregate inequality. However, only the "between-educational groups" component of inequality was higher than 15% in both surveys and its contribution to the multi-variate decomposition of inequality was also high.

inequality and welfare comparisons. Its results demonstrated that, in most cases, between 1974 and 1982 inequality declined quite substantially both "within" and "between" population subgroups. There were considerable proportional increases in the relative expenditure shares of the poorest population deciles and substantial decreases in the expenditure share of the top expenditure decile. As a result of the combination of relatively rapid increases in the mean consumption expenditure and increases in the expenditure share of the poorest segments of the population, absolute poverty declined dramatically (around 80%) and in many socioeconomic groups it was completely eradicated. The second of the above factors contributed to a considerable reduction in relative poverty, too (between 14% and 20%). As a general pattern, relative poverty declined proportionately more in those socioeconomic groups where it was very high in 1974. The structure of the population (reflected in the population shares of the socioeconomic groups) did not change dramatically between 1974 and 1982. As a consequence, the impact of changes in the structure of the population on the overall degrees of inequality and poverty was rather limited, with one exception. The improvement in the average educational level of HH heads had a strong positive effect on poverty reduction. Apart from this, the bulk of the observed decline in inequality and poverty should be attributed to changes in inequality and poverty "within" socioeconomic groups, rather than to changes in the composition of the population. Even though the level of inequality declined substantially between 1974 and 1982, it remained relatively high in comparison with most of the other EEC countries (at least). In addition, if we accept that the "equally distributed equivalent consumption expenditure per capita" is a sufficiently good approximation of a country's level of social welfare, the results of the fifth chapter suggest that during the seventies the level of social welfare in Greece was lower - sometimes substantially lower - than in most other EEC countries. However, these results also suggest that the level of social welfare was improving faster in Greece than in some other EEC countries for which similar data exist for that period.

2. Some notes on policy

The 1982 HES coincided with the election of the first ever socialist government in Greece. That government embarked on a massive redistribution programme. Real average and minimum salaries, wages and pensions were increased and the social security system was extended to cover segments of the population which were not covered until then.[2] It is interesting, therefore, to examine the impact of these policies on

2. Real hourly wage earnings rose by 10.4% between 1981 and 1982 [IMF (1987, p. 104)] and Social Security

TABLE 6.1 Changes in the level of inequality between the first and the fourth quarter of the 1982 HES

Quarter	Gini Index G	Atkinson Index (ε=2) A	Theil Index T	Theil Index N	Variance of Logs L
First	0.317	0.293	0.167	0.170	0.347
Fourth	0.291 (-8.2)	0.250 (-14.7)	0.159 (-4.8)	0.137 (-19.4)	0.294 (-15.3)

inequality and poverty. A partial examination of this impact is provided in Tables 6.1 and 6.2. Table 6.1 reports estimates of G, A, T, N and L for the subgroups of members of the 1982 HES interviewed in the first (November 1981 - January 1982) and the last (August - October 1982) quarters of the survey. The figures in parentheses, below the estimates for the fourth quarter, are the percentage changes in the values of the indices between the two quarters. It can be argued that since there is a time lag between the announcement and the full implementation of policy measures, the difference in the two sets of estimates, probably, reflects the impact of these policies. All the indices record a decline in inequality. However, the proportional decline varies substantially across indices. The indices which are relatively more sensitive to changes at the bottom of the distribution (A, N and L) record considerably larger reductions (14.7%, 19.4%, 15.3%) than those which are more sensitive to changes at the top (T, 4.8%) and the middle (G, 8.2%) of the distribution. Hence, it can be claimed that the above policies had a marked positive effect on inequality reduction.[3] Taking into account that between 1981 and 1982 real consumption expenditure pc declined by 0.7%,[4] these figures imply that the "equally distributed equivalent consumption expenditure pc" of the population rose substantially within a very short period.

Table 6.2 reports the changes in the level of poverty between the first and the last quarter of the 1982 survey, both for the entire population and for the two groups with the highest poverty levels (members of HHs

expenditure as proportion of the GDP rose from 15.1% in 1980 to 21.7% in 1983 [NSSG (1985, p. 104)].

3. A redistributive attempt took place in 1974, as well. However, its impact was rather negligible. Between the first and the last quarter of that survey the values of A, T and L declined by 1.8%, 1.4% and 1.2%, the value of N remained unchanged and that of G rose by 0.6%.

4. IMF (1987, p. 361).

TABLE 6.2 Changes in the level of poverty between the first and the fourth quarter of the 1982 HES

Group/Quarter	Head Count H	Thon Index T	Clark et al Index (ε=2) C	Foster et al Index (ε=2) F	New Index (ε=1) M
Greece/First	0.216	0.120	0.108	0.027	0.121
Greece/Fourth	0.236 (+9.3)	0.102 (-15.0)	0.088 (-18.5)	0.019 (-29.6)	0.096 (-20.7)
Farmer/First	0.342	0.204	0.192	0.053	0.237
Farmer/Fourth	0.461 (+38.4)	0.207 (+1.5)	0.178 (-7.3)	0.045 (-15.1)	0.216 (-8.9)
Retired/First	0.348	0.209	0.179	0.050	0.218
Retired/Fourth	0.337 (-12.2)	0.159 (-23.9)	0.147 (-17.9)	0.035 (-30.0)	0.173 (-20.6)

headed by "Farmers" and "Retired"). The results of this table show that although the incidence of poverty (H) in the entire population rose by 9.3% between these quarters, aggregate poverty declined dramatically. T, C, F and M declined by 15.0%, 18.5%, 29.6% and 20.7%, respectively. It is likely that these percentages understate the "real" decline in poverty between the first and the last quarters of the survey, because the first quarter includes the Christmas period which is, normally, associated with higher consumption expenditure. Nevertheless, these results may also imply that between the first and the last quarters of the survey some redistribution took place from the relatively better-off poor to the very poor. Turning to the part of the results concerning the two high-poverty groups, it can be claimed that the policies adopted in late 1981 had a relatively more important effect on the poor members of HHs headed by "Retired" persons than on the group of poor headed by "Farmers". Therefore, the evidence of Tables 6.1 and 6.2 seems to suggest that the above policies had a very strong positive effect on inequality reduction and poverty alleviation. Nevertheless, it can also be claimed that these policies might have had a detrimental effect on the growth prospects of the economy. Between 1981 and 1985 GDP pc grew at a meagre annual rate of 1.0%, the central government

deficit as percentage of the GDP rose from 8.6% to 11.0%[5] and the current account deficit as proportion of the GDP increased from 6.5% to 9.8%.[6] For this reason, after their second election victory in 1985, the socialists adopted a macroeconomic stabilization programme. It is still relatively early to evaluate the distributional effects of this programme. However, the experience of other countries which adopted similar programmes seems to suggest that, at least in the short-run, they have a rather adverse effect on inequality and poverty.[7]

We now turn to a brief discussion of the policy implications of the empirical findings of the study. Before doing so, two warnings must be given. Firstly, the analysis of this study was in terms of consumption expenditure. However, it is likely that any potential redistribution will be carried out in terms of income. Although it is possible that the two distributions are closely related they are probably not identical.[8] Secondly and more importantly, in our analysis labour supply was assumed to be exogenous. Although this assumption may not be unreasonable for the short-run, it seems quite reasonable to assert that in the medium- and the long-run any redistribution would affect incentives to work and, hence, the labour supply. Changes in the labour supply can affect both the growth rate of the economy and the distribution of income (and consumption expenditure).[9] The relationship between incentives, labour supply and inequality is very complex and has not yet been fully investigated even in the most advanced industrialized economies.[10] The investigation of this relationship for Greece is, of course, beyond the scope of the present study. Nevertheless, in the light of the detailed information of chapters 3, 4 and 5 it is possible to speculate on the areas where the redistributive effort should be concentrated.

The first question to be asked is whether there is any room for redistribution. If we take as reference the inequality levels of Greece's partners in the EEC (or even those of Sri Lanka and Pakistan) presented in chapter 5, the answer must be positive. Then the question is "Which are the most appropriate redistribution

5. If the deficit of the nationalized industries is also included, the increase would be even higher.

6. IMF (1987, p. 361).

7. See Pastor (1987) and the references cited there. For theoretical attempts to combine macroeconomic stabilization policies with poverty alleviation programmes see Kanbur (1987b, 1987c). For a first attempt to evaluate the effects of the Greek stabilization programme see Spraos (1988). Spraos asserts that although unemployment did not rise between 1985 and 1987, the real disposable income of the wage and salary earners declined by almost 12%. The decline in the incomes of the self-employed was substantially lower, whilst profits rose. Therefore, one can speculate that inequality and (at least) absolute poverty rose during that period.

8. See Berry (1987).

9. A similar argument can be put forward for savings, as well.

10. For an attempt to investigate this relationship in the U.K. see the ESRC Programme on *Taxation, Incentives and the Distribution of Income.*

policies?". As noted in chapter 1, many Greek politicians and policy-makers seem to believe that the most appropriate policy is a regional redistribution of resources, or a transfer of resources from urban to rural areas. Since in 1982 the "between urban/rural areas" component of inequality was higher than the "between regions" component, let us examine the magnitude of the transfer required to eliminate urban/rural differentials and the impact of this transfer on inequality and poverty. In 1982, the implementation of this policy would require the transfer of 8.15% of total consumption expenditure from the urban to the rural areas of the country. This amount is equal to 13.79% of the total urban consumption expenditure.[11] Provided that inequalities within urban and rural areas remain intact, the results of chapter 3 show that such a transfer would cause a decline of less than 10% in aggregate inequality (9.3% according to the strictly additively decomposable indices N and L).[12] After the transfer the values of the poverty indices H, T, C, F and M would be 0.215, 0.095, 0.083, 0.019 and 0.091, that is they would decline by 5.3%, 14.4%, 15.3%, 17.4% and 16.5%.

Let us examine now another policy which would be more "poverty-oriented" than "inequality-oriented". This policy would involve filling the poverty-gaps of all the poor, irrespective of region of residence or size of locality. The overall amount required to finance such a transfer in 1982 would be equal to 3.41% of total consumption expenditure,[13] or 3.77% of the consumption expenditure of the non-poor, or 5.49% of the consumption expenditure of the top 40%, or 14.39% of the consumption expenditure of the top 10%.[14] Therefore, the policy of eliminating the aggregate poverty gap would require the transfer of considerably fewer resources than a policy of eliminating urban/rural differentials. By definition, this policy would eradicate poverty completely. The effect of this policy on inequality is described on Table 6.3. This table reports the results of four simulations. In each of these simulations the aggregate poverty gap is eliminated using alternative methods of financing the transfer. In the first simulation the transfer is financed through a 3.41% increase in the aggregate consumption expenditure, which is devoted to fill all the poverty gaps. In the next three simulations the transfer is financed through equiproportionate reductions in the consumption expenditures of all the non-poor, the top 40% and top 10%, above 11425, 19784 and 35315

11. Naturally, these percentages should be considered as lower bounds since they do not take into account administrative costs, leakages and so on. The relevant percentages for 1974 would be 9.64% and 16.97%, respectively.

12. G, A and T would decline by 6.2%, 7.8% and 9.4%, respectively.

13. If the first (second) 1982 "absolutist" poverty line of chapter 5 [7185 (7366) drachmas] is used instead, the required transfer is considerably lower; 0.47% (0.52%) of total consumption expenditure.

14. Once again, we assume that there are no administrative costs, leakages to the non-poor and so on. The corresponding percentages for 1974 would be 3.76%, 4.15%, 5.84% and 14.41%.

TABLE 6.3 The effect of eliminating poverty on aggregate inequality (1982)

Method of financing the transfer	Gini Index G	Atkinson Index (ε=2) A	Theil Index T	Theil Index N	Variance of Logs L	Ratio of mean urban/rural consumption expenditure
Original distribution	0.309	0.273	0.159	0.159	0.318	1.42
3.41% increase in mean consum. expenditure	0.270 (-12.6)	0.184 (-32.6)	0.126 (-20.8)	0.114 (-28.3)	0.203 (-36.2)	1.35
Proportionally by all the non-poor (above 11425 drs)	0.259 (-16.2)	0.171 (-37.4)	0.117 (-26.4)	0.105 (-34.0)	0.187 (-41.2)	1.33
Proportionally by the top 40% (above 19784 drs)	0.252 (-18.4)	0.164 (-39.9)	0.109 (-31.4)	0.099 (-37.7)	0.179 (-43.7)	1.32
Proportionally by the top 10% (above 35315 drs)	0.247 (-20.1)	0.160 (-41.4)	0.099 (-37.7)	0.094 (-40.1)	0.177 (-44.3)	1.31

drachmas, respectively. 11425, 19784 and 35315 drachmas are the poverty line, and the thresholds of the top 40% and the top 10%. In this way there is no reranking of the population. Note that the first simulation is not strictly comparable with the rest of the policy alternatives discussed in this section, since it involves an increase of the mean consumption expenditure of the population. The Lorenz curves of the new distributions lie nowhere below the original Lorenz curve and, hence, there is an unambiguous decline in inequality. Naturally, the richer the segment of the population which bears the burden of financing the transfer, the larger the reduction in aggregate inequality. The recorded reductions in G, A, T, N and L vary between 12.6%-20.1%, 32.6%-41.4%, 20.8%-37.7%, 28.3%-40.1% and 36.2%-44.3%, respectively. Note also that, as the results of the last column of Table 6.3 suggest, the implementation of each of the alternatives examined there would reduce the urban/rural consumption expenditure ratios from 1.42 to 1.35-1.31. This is because the majority of the poor live in rural areas and, hence, closing the aggregate poverty gap (particularly through transfers from the non-poor) reduces the mean consumption expenditure disparities between urban and rural areas. Therefore, the policy of closing the poverty gaps is not only cheaper but more effective in terms of inequality reduction and poverty alleviation than the policy of eliminating urban/rural consumption expenditure differentials.

The above evidence suggests that raising the consumption of the poor by even a few percentage points generates a large increase in social welfare. Thus, if a poverty-oriented policy is considered superior, attention should focus on the high-poverty groups: members of HHs headed by "Farmers" and "Retired" persons. Under the assumptions that: (a) no poverty alleviation action is undertaken, (b) the consumption expenditure of all the population members grows at the same rate, and (c) consumption expenditure pc grows at 1% per annum, as in the early eighties, the time period required for an average 1982 poor person to cross the poverty line is 31 years.[15] Even using either of the 1982 "absolutist" poverty lines of chapter 5, this period is around 25 years. Under the assumption of a 2% growth rate, these time periods are halved. Nevertheless, even twelve to fifteen years can be considered as long periods. Within this context, poverty alleviation policies may be regarded as urgent.

In Greece, it is widely accepted that farmers are in a relatively disadvantageous position vis-a-vis the rest of the population. For this reason, several policy measures have been adopted in order to help them: price support schemes (nowadays within the framework of the Common Agricultural Policy of the EEC), provision of credit and input subsidies, land development and so on. However, the main support to farmers is considered to be their virtually complete exemption from the payment of personal income taxes. For instance, in 1981 although agricultural incomes accounted for 18.0% of the national income, farmers paid only 0.1% of the total personal income taxes.[16] The evidence of the Appendix of chapter 4 suggests that this is a very inefficient method of helping poor farmers. Although many members of HHs headed by farmers live in poverty, in both surveys some members of HHs headed by "Farmers" were among the top 5%. Support to the latter subgroup cannot be justified on the grounds of fighting inequality and poverty. Other policies have to be devised for this purpose and further research is required regarding the type of produce of the poor farmers. The evidence of chapter 4 suggests that poor farmers are disproportionately concentrated into three regions of the country: Epirus, East Macedonia and Thrace, and Central and West Macedonia. Hence, the redistributive effort to help poor farmers should focus on these regions. The evidence of several studies for other countries suggests that it is preferable the redistribution to support investment rather than consumption activities, so that a long-run

15. See Kanbur (1987b, p. 70).

16. Ministry of National Economy (1985, p. 12) and NSSG (1983, p.53).

solution to the problem of poverty can be achieved.[17] A widely advocated investment-oriented policy to help the poor and (under certain conditions) to achieve higher growth rates in the agricultural sector is land reform. However, in the case of Greece this may not be the best alternative. The evidence of Athanasiou (1984, p. 154) suggest that the distribution of agricultural property in Greece is already relatively equal in comparison with many EEC countries. In addition, as noted in chapter 1, the average farm size in Greece is very small in comparison with these countries. Therefore, a better policy may be to give incentives to farmers to change jobs and redistribute their land so that the remaining farms have a viable size. Unlike taxation relief, this policy has the potential of raising the productivity of specific population subgroups and is easier to focus on beneficiaries below the poverty line. Nevertheless, care should be taken in the design of such policies so that the farmers who decide to change jobs remain in the rural areas instead of migrating to the already overcrowded Greater Athens region.

The above arguments regarding support to investment-oriented redistribution policies do not apply to the other major group in poverty (members of HHs headed by "Retired" persons) since its majority lives in HHs with no economically active members. Probably, the main source of income for this group is pensions. The evidence of chapter 3 shows that the bulk of this group's aggregate poverty can be located in communes with population less than 2000. Taking into account that the main activity of the population in these communes is agriculture, it is very likely that a large part of the poor retired persons are retired farmers. The pensions of farmers - and, indeed, almost all pensions in Greece - are administered by the central government. Therefore, any attempt to reduce poverty in this group is in the discrete choice of the government.[18] Nevertheless, increases in real pensions seem rather unlikely in the near future. One of the most pressing problems facing the Greek government at the moment is the enormous deficit of the Social Security system. In spite of this, since the evidence of chapter 3 shows that inequality was very high within this group, there may be some scope for redistribution among the group's members.

The evidence of chapter 3 shows that inequality "between-educational groups" accounts for between

17. See,for example, Chenery et al (1974, part 3) and Anand (1983, ch.8). Of course, if the discount rate of the poor is extremely high, consumption-oriented redistribution should be considered, as well. However, since the majority of the poor in Greece do not seem to be close to starvation, it may be better to promote investment-oriented redistribution.

18. It should be noted that two of the most important policies adopted in late 1981 were a substantial increase in the pensions of retired farmers and an extension of the farmers' pension scheme to cover many persons not covered by it until then (mainly retired farmers' wives and widows).

one sixth and one quarter of aggregate inequality. Even in the multivariate-decomposition of inequality, educational factors alone accounted for around 10% of aggregate inequality. Therefore, the elimination of "between-educational groups" disparities can have an important negative impact on aggregate inequality. As noted in chapter 3, within the framework of the human capital theory, income disparities between educational groups can be justified. However, provided that the markets for capital and labour function perfectly, the human capital theory predicts that consumption disparities between educational groups should not be observed. If such disparities are observed, they can be attributed to one of the following four factors. Firstly, there may be excess labour demand for some educational groups and excess supply for some others. Secondly, education may be related to other characteristics of the individual (presumably, ability). Thirdly, education may be used as a "screening device", so that persons with specific educational characteristics cannot compete for particular jobs and the result is a "segmented" labour market. Fourthly, the capital market may be far from perfect for some educational groups. Each of these factors has different policy implications and further research is required in order to establish the quantitative effect of each of them on the observed disparities. In addition, chapter 4 shows that high levels of poverty could be observed among members of HHs headed by persons with low educational level and chapter 5 suggests that although the improvement in the educational level of HH heads had a slightly adverse effect on inequality, it had a very high contribution to the observed decline in poverty between the two surveys. Therefore, these results seem to suggest that a policy aimed to improve the educational level of the population can have an important contribution to poverty eradication.

Naturally, the most difficult problem is that of financing the redistribution. As noted before, closing the aggregate poverty gap can cost considerably more than 3.41% of aggregate consumption expenditure. Even setting aside problems of corruption and incentives to work,[19] there are several costs associated with the administration of such a transfer and, inevitably, the targeting of the poor cannot be perfect.[20] The simulations of Table 6.3 suggest that even when the transfer is funded by a mildly progressive form of taxation (equiproportionate decreases in the expenditures of all the non-poor above the poverty line) apart from poverty eradication, inequality declines substantially too. Although there is some controversy regarding the overall tax

19. For instance, if an income maintenance programme designed to eliminate poverty was introduced in 1982 and the incomes (and consumption expenditures) of all the poor dropped to zero, the poverty gap would increase from 3.41% to 12.91% of the aggregate consumption expenditure (14.48% of the consumption expenditure of the non-poor).

20. It has been calculated that in an average OECD country about two thirds of the income maintenance expenditure leaks to non-poor [OECD (1976)].

structure of Greece, there seems to exist an agreement that the direct taxes are progressive, whereas indirect taxes have a rather regressive impact.[21] Therefore, one could argue in favour of increasing direct taxes. However, the evidence of Messere and Owens (1987, p. 118) shows that taxes as proportion of the GDP are already relatively high in Greece. In 1983 the relevant percentages for Greece and OECD (unweighted) were 33.59% and 36.94%. In addition, the percentage of Greece was rising fast in the 1980s (from 28.62% in 1980 to 35.23% in 1984) and it was higher than those of countries at similar levels of GDP pc (New Zealand, Spain, Portugal, although it was lower than that of Ireland). However, the same study also shows that in 1983 the proportion of personal income and property taxes in total taxes in Greece was 16%, whereas the contribution of general consumption taxes and excises was 37%. The corresponding average OECD percentages were 38% and 28%.[22] Hence, there may be some scope for a partial switch from indirect to direct taxation. The problem in this case is that the structure of personal income taxation in Greece is already very progressive. The marginal income tax rate for the top bracket is as high as 60%.[23] Therefore, there is very little room to make it even more progressive. What can be done is to increase the tax-paying proportion of the population. Combining information from the Population Censuses, the National Accounts and the tax returns it can be shown that in 1981 only 40.1% of the economically active population paid income taxes[24] and the declared income was just 27.6% of the total personal income figure of the National Accounts.[25]

Provided that the poor will be exempted from the payment of income taxes, a switch from indirect to direct taxation combined with an increase in the tax-paying proportion of the population can achieve two targets simultaneously.[26] On the one hand it will reduce inequality and on the other it will increase the purchasing power of the poor, hence, reducing their aggregate poverty gap. If the impact of the increase in the tax-paying proportion of population on the overall amount of taxes is higher than the impact of the decline in the indirect taxes, extra resources will be available to finance other redistributive policies, as well. The effect

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21. See Karayiorgas (1973, 1977), Germidis and Negreponti-Delivanis (1975), Provopoulos (1979), Tatsos (1982), Loizides (1986).

22. Messere and Owens (1987, p. 110). The rest is accounted by corporation income taxes and national insurance contributions by employers and employees.

23. NSSG (1983, p.54)

24. A number of pensioners equal to 5.9% of the economically active population paid income taxes, as well.

25. NSSG (1984, p. 51), Ministry of National Economy (1985, p.14) and NSSG (1983, p.53). For the farmers the corresponding percentages were 1.5% and 0.4%.

26. A serious constraint to broadening the personal income tax base is the own-account nature of employment of a very large part of the population. In the 1981 Population Census, 44.0% of the economically active population members were either "Self-employed" or "Unpaid family members" [NSSG (1984, p. 59)].

on inequality and poverty will be even higher if such a policy is combined with an attempt to increase the progressiveness of the indirect taxation. In this case a detailed study of the structure of the optimal commodity taxation in Greece incorporating distributional considerations will be needed. Such a study does not yet exist. However, the investigation of the distributive impact of a tax reform in Greece would require the writing of another thesis, so it is not discussed any further here.

REFERENCES

Adelman I. and Levy A. (1984) "Decomposing Theil's index of income inequality into between and within components: A note", *Review of Income and Wealth* 30, pp 119-121.

Adelman I. and Levy A. (1985) "Decomposing Theil's index of income inequality: A reply", *Review of Income and Wealth* 31, pp 107-108.

Ahluwalia M. (1974) "Income inequality, some dimensions of the problem", in H. Chenery et al (1974).

Ahluwalia M. (1976) "Inequality, poverty and development", *Journal of Development Economics* 3, pp 307-342.

Ahluwalia M. and Chenery H. (1974) "The economic framework", in H. Chenery et al (1974).

Ahluwalia M., Carter N. and Chenery H. (1979) "Growth and poverty in developing countries", *Journal of Development Economics* 6, pp 299-341.

Ahmad E. (1981) "The distribution of rural income in Pakistan II: Reflections of the inverse U-hypothesis", Development Economics Research Centre, University of Warwick, Discussion Paper No 7.

Alamgir M. (1975) "Poverty, inequality and social welfare: Measurement, evidence and policies", *Bangladesh Development Review* 3, pp 153-180.

Altimir O. (1982) "The extend of poverty in Latin America", World Bank Staff Working Paper No 522.

Anand S. (1977) "Aspects of poverty in Malaysia", *Review of Income and Wealth* 23, pp 1-16.

Anand S. (1983) *Inequality and poverty in Malaysia: Measurement and decomposition*, Oxford University Press, New York etc.

Anand S. and Kanbur S. M. R. (1981) "Inequality and development: A critique", St. Catherine's College, Oxford (mimeo).

Athanasiou L. (1984) *The distribution of income in Greece*, Center of Planning and Economic Research, Scientific Studies No 6, Athens (in Greek).

Atkinson A. B. (1970) "On the measurement of inequality", *Journal of Economic Theory* 2, pp 244-263.

Atkinson A. B. (1983) *The economics of inequality* (2nd ed.), Clarendon Press, Oxford.

Atkinson A. B. (1985) "How should we measure poverty? Some conceptual issues" ESRC Programme on Taxation, Incentives and the Distribution of Income Discussion Paper No 82.

Atkinson A. B. (1987) "On the measurement of poverty" *Econometrica* 55, pp 749-764.

Atkinson A. B., Gomulka J. and Stern N. H. (1984) "Expenditure on alcoholic drinks by households", ESRC Programme on Taxation Incentives and the Distribution of Income Discussion Paper No 60.

Babanasis S. (1981) "The formation of poverty in Greece during the 20th century", *Greek Review of Social Research* 42-43, pp 110-144 (in Greek).

Bakarezos P. (1981) "Income inequality and public policy in Greece", Unpublished Ph.D. Thesis, Rutgers University.

Bakarezos P. (1984) "Personal non-wealth income inequality and tax evasion in Greece". *Spoudai* 35, pp 233-257.

Bane M. J. (1986) "Household composition and poverty", in S. H. Danziger and D. H. Weinberg (eds) *Fighting poverty*, Harvard University Press, Cambridge Ma. and London, pp 209-231.

Barten A. P. (1964) "Family composition, prices and expenditure patterns" in P. Hart and G. Mills(eds) *Economic analysis for national economic planning*, 16th Symposium of the Colston Society, Butterworth, London.

Barten A. P. (1977) "The systems of consumer demand functions approach: a review", *Econometrica* 45, 1977, pp 23-51.

Basu K. (1985) "Poverty measurement: A decomposition of the normalization axiom", *Econometrica* 53, pp 1439-1443.

Beckerman W. and Clark S. (1982) *Poverty and Social Security in Britain since 1961*, Oxford University Press, Oxford.

Berry A. (1985) "On trends in the gap between rich and poor in less developed countries: Why we know so little", *Review of Income and Wealth* 31, pp 337-354.

Berry A. (1987) "Evidence on relationships among alternative measures of concentration: A tool for analysis of LDC inequality", *Review of Income and Wealth* 33, pp 417-429.

Blackorby C. and Donaldson D. (1978) "Measures of relative equality and their meaning in terms of social welfare", *Journal of Economic Theory* 18, pp 59-80.

Blackorby C. and Donaldson D. (1980) "Ethical indices for the measurement of poverty" *Econometrica* 48, pp 1053-1060.

Blackorby C., Donaldson D., and Auersperg M. (1981) "A new procedure for the measurement of inequality within and among population subgroups", *Canadian Journal of Economics* 14, pp 665-685.

Blokland J. (1976) *Continuous consumer equivalence scales*, Martinus Nijhoff, The Hague.

Bourguignon F. (1979) "Decomposable income inequality measures", *Econometrica* 47, pp 901-920.

Breusch T. S. and Pagan A. R. (1979) "A simple test for heteroscedasticity and random coefficient variation", *Econometrica* 47, pp 1287-1294.

Brown J. A. C. and Deaton A. S. (1972) "Models of consumer behaviour: a survey", *Economic Journal* 82, pp 1145-1236.

Buce R. C. and Salathe L. E. (1987) "Adult equivalence scales: An alternative approach", *American Journal of Agricultural Economics* 60, pp 460-468.

Carantinos D. (1981) "Aspects of income and wealth distribution in Greece", Unpublished Ph.D. Thesis, University of Strathclyde.

Chakravarty S. R. (1983a) "Ethically flexible measures of poverty", *Canadian Journal of Economics* 16, pp 74-85.

Chakravarty S. R. (1983b) "Measures of poverty based on the representative income gap", *Sankya* 45, Series B, 69-74.

Chakravarty S. R. (1988) "Extended Gini indices of inequality", *International Economic Review* 29, pp 147-156.

Chakravarty S. R. and Dutta B. (1987) "A note on measures of distance between income distributions", *Journal of Economic Theory* 41, pp 185-188.

Champernowne D. (1974) "A comparison of measures of inequality of income distribution", *Economic Journal* 84, pp 787-816.

Chenery H., Ahluwalia M., Bell C., Duloy J., and Jolly R. (1974) *Redistribution with growth*, Oxford University Press, New York.

Clark S. Hemming R. and Ulph D. T. (1981) "On indices for the measurement of poverty", *Economic Journal* 91, pp 515-526.

Cowell F. A. (1977) *Measuring inequality*, Philip Allan, Oxford.

Cowell F. A. (1980) "On the structure of additive inequality measures", *Review of Economic Studies* 47, pp 521-531.

Cowell F. A. (1984) "The structure of American inequality", *Review of Income and Wealth* 30, pp 351-375.

Cowell F. A. (1985) "Multilevel decomposition of Theil's index of inequality", *Review of Income and Wealth* 31, pp 201-205.

Cowell F. A. and Kuga K.(1981) "Additivity and the entropy concept: An axiomatic approach to inequality measurement", *Journal of Economic Theory* 25, pp 131-143.

Cramer J. S. (1969) *Empirical econometrics*, North Holland Publishing Company, Amsterdam-London.

Creedy J. (1977) "The principle of transfers and the variance of the logarithms", *Oxford Bulletin of Economics and Statistics* 39, pp 152-158.

Crockett J. (1967) *Consumer expenditures and incomes in Greece*, Center of Planning and Economic Research, Research Monograph Series No 17, Athens.

Dalton H. (1920) "The measurement of inequality of incomes", *Economic Journal* 30, pp 348-361.

Dandekar V. M. (1982) "On the measurement of undernutrition", *Economic and Political Weekly* 17, pp 203-212.

Das T. and Parikh A. (1982) "Decomposition of inequality and a comparative analysis", *Empirical Economics* 7,pp 23-48.

Dasgupta P., Sen A. K. and Starrett D. (1973) "Notes on the measurement of inequality", *Journal of Economic Theory* 6, pp 180-187.

Datta G. and Meerman J. (1980) "Household income or household income per capita in welfare comparisons", *Review of Income and Wealth* 26, pp 401-418.

Davidson R. and McKinnon J. (1981) "Several tests for model specification in the presence of alternative hypotheses", *Econometrica* 49, pp 781-793.

De Witte M. A. C. and Cramer J. S. (1986) "Functional form of the Engel curves for foodstuffs", *European Economic Review* 30, pp 909-913.

Deaton A. S. (1974) "A reconsideration of the empirical implications of additive preferences", *Economic Journal* 84, pp 338-348.

Deaton A. S. (1980) "Measurement of welfare: theory and practical guidelines", World Bank Living Standards Measurement Study Working Paper No 7.

Deaton A. S. (1981a) "Three essays on a Sri Lanka Household Survey", World Bank Living Standards Measurement Study Working Paper No 11.

Deaton A. S. (1981b) "NLFIML: a progam for the estimation of the parameters of non-linear relationships", Department of Economics, University of Bristol.

Deaton A. S. and Muellbauer J. (1980a) *Economics and consumer behaviour*, Cambridge University Press, New York.

Deaton A. S. and Muellbauer J. (1980b) "An almost ideal demand system", *American Economic Review* 70, pp 312-326.

Deaton A. S. and Muellbauer J. (1986) "Measuring child costs in poor countries" *Journal of Political Economy* 94, pp 720-744.

Deaton A. S., Ruiz-Castillo J. and Thomas D. (1985) "The influence of household composition on Household expenditure patterns: theory and Spanish evidence" Discussion Paper No 122, Research Program in Development Studies, Woodrow Wilson School, Princeton University.

Donaldson D. and Weymark J. (1980), "A single parameter generalization of the Gini indices of inequality", *Journal of Economic Theory* 22, pp 67-86.

Donaldson D. and Weymark J. (1983), "Ethically flexible Gini indices for income distributions in the continuum", *Journal of Economic Theory* 29, pp 353-358.

Drewnowski J. (1977) "Poverty: Its meaning and measurement" *Development and Change* 8, pp 183-208.

Ebert U. (1987) "Size and distribution of incomes as determinants of social welfare", *Journal of Economic Theory* 41, pp 23-33

Ebert U. (1988) "A family of aggregative compromise inequality measures", *International Economic Review* 29, pp 363-376.

Elteto O. and Frigyes E. (1968) "New income inequality measures as efficient tools for causal analysis", *Econometrica* 36, pp 383-396.

Espenhade T. J. (1973) *The cost of children in urban United States*, Monograph Series No 14, Institute of International Studies, Berkeley, University of California.

Fei J., Ranis G. and Kuo S. (1978) "Growth and the family distribution of income by factor components", *Quarterly Journal of Economics* 92, pp 16-53.

Fiegehen G. C., Lansley P. S., and Smith A. D. (1977) *Poverty and progress in Britain 1953-1973*, Cambridge University Press, Cambridge.

Fields G. S. (1979a) "Income inequality in urban Colombia: A decomposition analysis", *Review of Income and Wealth* 25, pp 327-341.

Fields G. S. (1979b) "Decomposing LDC inequality", *Oxford Economic Papers* 31, pp 437-459.

Fisher F. M. (1987) "Household equivalence scales and interpersonal comparisons", *Review of Economic Studies* 54, pp 519-524.

Fishlow A. (1972) "Brazilian size distribution of income", *American Economic Review* 62 (Papers and Proceedings), pp 391-402.

Forsyth F. G. (1960) "The relationship between family size and family expenditure", *Journal of the Royal Statistical Society* (Series A) 123, pp 367-397.

Foster J. E. (1984) "On economic poverty: A survey of aggregate measures", in R.L. Basmann and G.F.Rhodes (eds) *Advances in Econometrics* Vol. 3, JAI Press, pp 215-251.

Foster J. E., Greer J. and Thorbecke E. (1984) " A class of decomposable poverty measures", *Econometrica* 52, pp 761-766.

Foster J. E. and Shorrocks A. F. (1987) "Subgroup consistent poverty indices", (mimeo), University of Essex.

Freris A. F. (1986) *The Greek economy in the twentieth century*, Groom Helm, Beckenham.

Freud J. and Walpole R. (1980) *Mathematical statistics* (3rd ed), Prentice-Hall, London.

Friedman M. (1952) "A method of comparing incomes of families differing in composition" in *Studies in income and wealth* Vol. 15, NBER, New York.

Friedman M. (1957) *A theory of consumption function*, Princeton University Press, Princeton.

Fuchs V. R. (1986) "The feminization of poverty", National Bureau of Economic Research Working Paper No 1934.

van der Gaag J. and Smolensky E. (1982) "True household equivalence scales and characteristics of the poor in the United States", *Review of Income and Wealth* 28, pp 17-28.

Garganas N. (1977) "Family composition, expenditure patterns and equivalence scales for children", in Fiegehen et al (1977).

Germidis D. and Negreponti-Delivanis M. (1975) *Industrialisation, employment and income distribution in Greece: A case study*, O.E.C.D. Employment Series No 12, Paris.

Geronymakis S. (1970) "The redistribution of income in Greece during the postwar period (1948-1967)", *Statistician* 7, pp 3-23 (in Greek).

van Ginneken W. (1980a) *Socioeconomic groups and income distribution in Mexico*, Groom Helm, London.

van Ginneken W. (1980b) "Some methods of poverty analysis: An application to Iranian data, 1975-1976", *World Development* 8, pp 639-646.

van Ginneken W. and Park J. G. (eds) (1984) *Generating internationally comparable income distribution estimates*, I.L.O., Geneva.

Glewwe P. (1986) "The distribution of income in Sri Lanka 1969-70 and 1980-81: A decomposition analysis", *Journal of Development Economics* 24, pp 255-274.

Glewwe P. (1988) "Economic liberalization and income inequality: Further evidence on the Sri Lanka experience", *Journal of Development Economics* 28, pp 233-246.

Goedhart T., Halberstad V., Kapteyn A. and van Praag B. (1977) "The poverty line: concept and measurement", *Journal of Human Resources* 12, pp 503-520.

Gorman W. M. (1976) "Tricks with utility functions", in M. Artis and A. Nobay (eds) *Essays in economic analysis*, Cambridge University Press, Cambridge etc.

de Graaff J. (1977) "Equity and efficiency as components of the general welfare", *South African Journal of Economics* 45, pp 362-375.

Greer J. and Thorbecke E. (1986a) "Food poverty profiles applied to Kenyan smallholders", *Economic Development and Cultural Change* 35, pp 115-141).

Greer J. and Thorbecke E. (1986b) "A methodology for measuring food poverty applied to Kenya", *Journal of Development Economics* 24.

Grootaert C. (1983) "The conceptual basis of measures of household welfare and their implied data requirements", *Review of Income and Wealth* 29, pp 1-21.

Grootaert C., Cheung K., Fung H. and Tam S. (1982) "Statistical experimentation for Household Surveys: Two case studies of Hong Kong", World Bank Living Standards Measurement Study Working Paper No 20.

Hagenaars A. J.M. (1986) *The perception of poverty*, North Holland, Amsterdam - New York - Oxford.

Hagenaars A. J. M. (1987) "A class of poverty indices", *International Economic Review* 28, pp 583-607.

Hamada K. and Takayama N. (1977) "Censored income distributions and the measurement of poverty", *Bulletin of the International Statistical Institute* 47, pp 617-630.

Harris R. (1977) "Differential response rates in the Family Expenditure Survey: The effect on estimates of redistribution of income", *Statistical News* 39, pp 7-12.

Harvey A. C. (1981) *The econometric analysis of time-series* Philip Allan, Oxford.

Henderson A. M. (1949-50a) "The cost of a family", *Review of Economic Studies* 17, pp 127-148.

Henderson A. M. (1949-50b) "The cost of children: part I", *Population Studies* 3, pp 130-150.

Henderson A. M. (1950-51) "The cost of children: parts II and III", *Population Studies* 4, pp 267-298.

Iyengar N. S. and Gopalakrishna M. (1985) "Appropriate criteria for the measurement of standards of living", *Indian Economic Review* 20, 191-229.

Jain S. (1975) *Size distribution of income: A compilation of data*, Johns Hopkins University Press, Baltimore.

Kakwani N. (1977a) "On the estimation of consumer unit scales", *Review of Economics and Statistics* 59, pp 507-510.

Kakwani N. (1977b), "Applications of Lorenz curves in economic analysis", *Econometrica* 45, pp 719-727.

Kakwani N. (1980a) *Income inequality and poverty*, Oxford University Press, New York etc,

Kakwani N. (1980b) "On a class of poverty measures", *Econometrica* 48, pp 437-446.

Kakwani N. (1981a) "Note on a new measure of poverty", *Econometrica* 49, pp 525-526.

Kakwani N. (1981b) "Welfare measures: An international comparison", *Journal of Development Economics* 8, pp 21-45.

Kakwani N. (1984) "Issues in measuring poverty", in R.L. Basmann and G.F.Rhodes (eds) *Advances in Econometrics* Vol. 3, JAI Press, pp 253-282.

Kakwani N. (1986) "Income inequality, welfare and poverty in a developing economy with applications to Sri Lanka", United Nations University WIDER Working Paper No 4.

Kakwani N. and Podder N. (1973) "On the estimation of Lorenz curves from grouped observations", *International Economic Review* 14, pp 278-292.

Kakwani N. and Podder N. (1976) "Efficient estimation of the Lorenz curve and associated inequality measures from grouped observations", *Econometrica* 44, pp 137-148.

Kanbur S. M. R. (1984) "The measurement and decomposition of inequality and poverty" in F. van der Ploeg (ed) *Mathematical methods in Economics*, Wiley, New York.

Kanbur S. M. R. (1987a) "Transfers, targeting and poverty", *Economic Policy* 4, pp 112-147.

Kanbur S. M. R. (1987b) "Measurement and alleviation of poverty: With an application to the effects of macroeconomic adjustment", *IMF Staff Papers* 34, pp 60-85.

Kanbur S. M. R. (1987c) "Structural adjustment, macroeconomic adjustment and poverty: A methodology for analysis", *World Development* 15, pp 1515-1526.

Kanellopoulos C. N. (1980) "Individual pay, discrimination and labour mobility in Greece in the early 1960s", Unpublished Ph.D Thesis, University of Kent.

Kanellopoulos C. N. (1985) "Individual pay differentials in Greece", *Spoudai* 35, pp 109-125.

Kanellopoulos C. N. (1986) *Incomes and poverty in Greece: Determining factors*, Center of Planning and Economic Research, Scientific Studies No 22, Athens (in Greek).

Kapteyn A. and van Praag B. (1976) "A new approach to the construction of family equivalence scales", *European Economic Review* 7, pp 313-335.

Karamanlis K. (1974) "Opening address to the Parliament", *Proceedings of the Parliament*, pp 11-14 (in Greek).

Karamanlis K. (1977) "Opening address to the Parliament", *Proceedings of the Parliament*, pp 11-16 (in Greek).

Karayiorgas D. (1973) "The distribution of tax burden by income groups in Greece", *Economic Journal* 83, pp 436-448.

Karayiorgas D. (1977) "The distribution of tax burden by income groups in Greece", *Spoudai* 27, pp 390-402.

Karayiorgas D. and Pakos T. (1985) "Les inégalités économiques et sociales actuelles", *Les Tempes Modernes* 473, pp 960-974.

Kavouriaris M. (1983) "An explanatory framework for the analysis of poverty in Greece", *European Communities Review* 4, pp 292-302 (in Greek).

Kay J. A., Keen M. J. and Morris C. N. (1984) "Estimating consumption from expenditure data", *Journal of Public Economics* 23, pp 169-181.

Kemsley W. F. F. (1966) "Sampling errors in the Family Expenditure Survey", *Applied Statistics* 15, pp 1-14.

Kemsley W. F. F. (1975) "Family Expenditure Survey: A study of differential response based on a comparison of the 1971 sample with the Census", *Statistical News* 31, pp 16-21.

Kemsley W. F. F. (1979) "Collecting data on economic flow variables using interviews and record keeping", in L. Moss and H. Golding (eds) *The recall method in social surveys*, Studies in Education 9, University of London Institute of Education, London.

Kemsley W. F. F., Redpath R. U., and Holmes M. (1980) *Family Expenditure Survey handbook*, H.M.S.O., London.

Kilpatrick R. W. (1973) " The income elasticity of the poverty line", *Review of Economics and Statistics* 55, pp 327-332.

Kolm S. C. (1976a) "Unequal inequalities I", *Journal of Economic Theory* 12, pp 416-442.

Kolm S. C. (1976b) "Unequal inequalities II", *Journal of Economic Theory* 13, pp 82-111.

de Kruijk H. and van Leeuwen M. (1985) "Changes in poverty and income inequality in Pakistan during the 1970's", *Pakistan Development Review* 24, pp 407-419.

Kundu A. and Smith T. E. (1983) "An impossibility theorem for poverty indices", *International Economic Review* 24, pp 423-434.

Kusnic M. and Davanzo J. (1986) "Accounting for the non-market activities in the distribution of income", *Journal of Development Economics* 21, pp 211-227.

Kuznets S. (1955) "Economic growth and income inequality", *American Economic Review* 45, pp 1-28.

Kuznets S. (1957) "Quantitative aspects of the economic growth of nations II: Industrial distribution of national product and labour force", *Economic Development and Cultural Change* 5 (Supplement), pp 1-80.

Kuznets S. (1963) "Quantitative aspects of the economic growth of nations II: Distribution of income by size", *Economic Development and Cultural Change* 11, pp 1-80.

Kuznets S. (1976) "Demographic aspects of the size distribution of income: an exploratory essay", *Economic Development and Cultural Change* 24, pp 1-94.

Kuznets S. (1982) "Children and adults in the income distribution", *Economic Development and Cultural Change* 30, pp 697-738.

Leibenstein H. (1967) "Rates of return to education in Greece", Economic Development Report No 94, Harvard University.

Lewbel A. (1986) "Additive separability and equivalent scales", *Econometrica* 54, pp 219-222.

Lewis G. W. and Ulph D. T. (1988) "Poverty, inequality and welfare", *Economic Journal* 98 (Conference Papers), pp 117-131.

Lianos T. and Prodromidis K. (1974) *Aspects of income distribution in Greece*, Center of Planning and Economic Research, Lecture Series No 28, Athens.

Loizides I. (1986) "On income tax progression: A decomposition analysis", *Greek Economic Review* 8, pp 79-94.

Love R. and Wolfson M. C. (1976) *Income inequality: Statistical methodology and Canadian illustrations*, Statistics Canada, Ottawa.

Maddala G. S. (1983) *Limited dependent and qualitative variables in econometrics*, Cambridge University Press, Cambridge etc.

Mangahas M. (1975) "Income inequality in the Philippines: A decomposition analysis", in *Income distribution, employment and economic development in Southeast and East Asia*, (Papers and Proceedings of a seminar sponsored by the Japan Economic Research Center and the Council for Asian Manpower Studies), Tokyo and Manila.

Manser M. (1979) "Comparing households with different structures: the problem of equity", *American Economic Review* 69 (Papers and Proceedings), pp 222-226.

McClements L. D. (1977) "Equivalence scales for children", *Journal of Public Economics* 8, pp 191-210.

McClements L. D. (1979) "Muellbauer on equivalence scales", *Journal of Public Economics* 12, pp 233-242.

Meager G. A. and Deaxon P. B. (1987) "Analyzing income distribution in Australia", *Economic Record* 63, pp 427-441.

Messere K. C. and Owens J. P. (1987) "International comparisons of tax levels: Pitfalls and insights", *OECD Economic Studies* 8, pp 93-119.

Ministry of Coordination (1979) *Economic and Social Development Plan 1978-1982: Preliminary Guidelines*, Athens.

Ministry of National Economy (1985) *Economic and Social Development Plan 1983-1987*, Athens (in Greek).

Modigliani F. and Brumberg R. (1954) "Utility analysis and the consumption function: an interpretation of cross-section data", in K. Kurihara (ed) *Post-Keynesian Economics*, Rutgers University Press, New Brunswick.

Mohan R. (1984) "An anatomy of the distribution of urban income: A tale of two cities in Colombia", World Bank Staff Working Paper No 650.

Mookherjee D. and Shorrocks A. F. (1982) "A decomposition of the trend in U.K. income inequality", *Economic Journal* 92, pp 886-902.

Morris N. and Preston I. (1986) "Inequality, poverty and the distribution of income", *Bulletin of Economic Research* 38, pp 277-344.

Mourgos S. (1980) "Economic development and distributional trends in postwar Greece", Unpublished Ph.D Thesis, New York University.

Muellbauer J. (1974) "Household composition, Engel curves and welfare comparisons between households", *European Economic Review* 5, pp 103-122.

Muellbauer J. (1975) "Identification and consumer unit scales", *Econometrica* 43, pp 807-809.

Muellbauer J. (1977) "Testing the Barten model of household composition effects and the cost of children", *Economic Journal* 87, pp 460-487.

Muellbauer J. (1979) "McClements on equivalence scales for children", *Journal of Public Economics* 12, pp 221-231.

Muellbauer J. (1980) "The estimation of the Prais-Houthakker model of equivalence scales", *Econometrica* 48, pp 153-176.

Nerlove M., Razin A., and Sadka E. (1986) "Some welfare theoretic implications of endogenous fertility", *International Economic Review* 27, pp 3-32.

Newbery D. (1970) "A theorem on the measurement of inequality", *Journal of Economic Theory* 2, pp 264-266.

Nicholson J. L. (1949) "Variation in working-class family expenditure", *Journal of the Royal Statistical Society* (Series A) 112, pp 359-411.

Nicholson J. L. (1976) "Appraisal of different methods of estimating equivalence scales and their results", *Review of Income and Wealth* 22, pp 1-11.

OECD (1976) *Public expenditure on income maintenance programmes*, Studies in Resource Allocation No 3, OECD, Paris.

Orchansky M. (1965) "Counting the poor: Another look at the poverty profile", *Social Security Bulletin* 28, pp 3-29.

Oshima H. T. (1962) "The international comparison of size distribution of family incomes, with special reference to Asia", *Review of Economics and Statistics* 44, pp 439-445.

Paglin M. (1975) "The measurement and trend of inequality: A basic revision", *American Economic Review* 65, pp 598-609.

Papandreou A. (1981) "Opening address to the Parliament", *Proceedings of the Parliament*, pp 15-27 (in Greek).

Papandreou A. (1985) "Opening address to the Parliament", *Proceedings of the Parliament*, pp 22-32 (in Greek).

Papanek G. and Kyn O. (1986) "The effect on income distribution of development, the growth rate and economic strategy", *Journal of Development Economics* 23, pp 55-65.

Parks R. and Barten A. P. (1973) "A cross-country comparison of the effects of prices, income and population on consumption patterns", *Economic Journal* 83, pp 834-852.

Pashardes P. (1980a) "Income redistribution as a development policy: the case of Greece", Unpublished Ph.D. Thesis, Birkbeck College, University of London.

Pashardes P. (1980b) "Income distribution, the structure of consumer expenditure and development policy", *Journal of Development Studies* 16, pp 224-245.

Pastor M. (1987) "The effects of IMF programs in the Third World: Debate and evidence from Latin America", *World Development* 15, pp 249-262.

Pollak R. and Wales T. (1978) "Estimation of complete systems of demand equations from household budget data: the linear and quadratic expenditure systems", *American Economic Review* 68, pp 348-359

Pollak R. and Wales T. (1979) "Welfare comparisons and equivalence scales", *American Economic Review* 69 (Papers and Proceedings), pp 216-221.

Pollak R. and Wales T. (1981) "Demographic variables in demand analysis", *Econometrica* 49, pp 1533-1551.

van Praag B., Goedhart T., and Kapteyn A. (1980) "The poverty line: A pilot survey in Europe", *Review of Economics and Statistics* 62, pp 461-465.

van Praag B., Hagenaars A., and van Weeren H. (1982) "Poverty in Europe", *Review of Income and Wealth* 28, pp 345-359.

van Praag B., Spit J., and van de Stadt H. (1982) "A comparison between the food ratio poverty line and the Leyden poverty line", *Review of Economics and Statistics* 64, pp 691-694.

Prais S. J. and Houthakker H. S. (1955) *The analysis of family budgets*, Monograph No 4, Department of Applied Economics, University of Cambridge, Cambridge University Press, Cambridge.

Prodromidis K. (1975) "Regional distribution of employment and income in Greece: 1961-1971", *Spoudai* 25, pp 529-550 (in Greek).

Provopoulos G. (1979) "The distribution of fiscal burdens and benefits by income groups in Greece", *Greek Economic Review* 1, pp 77-99.

Psacharopoulos G. (1982) "Earnings and education in Greece, 1960-1977", *European Economic Review* 17, pp 333-347.

Pyatt G. (1976) "On the interpretation and disaggregation of Gini coefficients", *Economic Journal* 86, pp 243-255.

Pyatt G. (1985) "An axiomatic approach to the Gini coefficient and the measurement of welfare", in R. L. Basmann and G. F. Rhodes (eds) *Advances in Econometrics*, Vol. 4, JAI Press.

Pyatt G. (1987) "Measuring welfare, poverty and inequality", *Economic Journal* 97, pp 459-467.

Pyatt G., Chen C., and Fei J., (1980) "The distribution of income by factor components", *Quarterly Journal of Economics* 94, pp 451-474.

Ray R. (1983) "Measuring the cost of children: an alternative approach", *Journal of Public Economics* 22, pp 89-102.

Ray R. (1985) "Prices, children and inequality: further evidence for the United Kingdom, 1965-82", *Economic Journal* 95, pp 1069-1077.

Ray R. (1986) "Demographic variables and equivalence scales in a flexible demand system: the case of AIDS", *Applied Economics* 18, pp 265-278.

Rosenzweig M. R. (1986) "Program interventions, intrahousehold distribution and the welfare of individuals", *World Development* 14, pp 233-243.

Rothbarth E. (1943) "Note on a method of determining equivalent income for families of different composition", Appendix IV in C. Madge *War-time pattern of saving and spending*, Cambridge University Press, Cambridge.

Rowntree S. (1901) *Poverty: A study of town life*, Macmillan, London.

Saith A. (1983) "Development and distribution: A critique of the cross-country U-hypothesis", *Journal of Development Economics* 13, pp 367-382.

Sapounas G. S. (1981) "An econometric analysis of household size, composition and expenditure patterns in Greece", Unpublished Ph.D Thesis, University of Exeter.

Sapounas G. S. (1985) "Consumption patterns and comparative poverty in the Greek countryside and in the Greater Athens area", *Greek Review of Agrarian Studies* 1, pp 57-78 (in Greek).

Sawyer M. (1976) *Income distribution in OECD countries*, OECD, Paris.

Scheffe H. (1959) *The analysis of variance*, Wiley, New York.

Scott A. J. and Holt L. D. (1982) "The effect of two stage sampling on Ordinary Least Squares methods", *Journal of the American Statistical Association* 77, pp 848-854.

Scott C., de Andre P. T. A. and Chander R. (1980) "Conducting surveys in developing countries: Practical problems and experience in Brazil, Malaysia and the Philippines", World Bank Living Standards Measurement Study Working Paper No 5.

Semple M. (1975) "The effect of changes in household composition on the distribution of income: 1961-73", *Economic Trends* 266, pp 99-105

Sen A. K. (1973) *On economic inequality*, Clarendon Press, Oxford.

Sen A. K. (1976a) "Poverty: An ordinal approach to measurement", *Econometrica* 44, pp 219-231.

Sen A. K. (1976b) "Real national income", *Review of Economic Studies* 43, pp 19-39.

Sen A. K. (1977) "Social choice theory: A reexamination", *Econometrica* 45, pp 53-89.

Sen A. K. (1978) "Ethical measurement of inequality: Some difficulties", in W. Krelle and A. Shorrocks (eds) *Personal income distribution*, North Holland, Amsterdam.

Sen A. K. (1979a) "Personal utilities and public judgments: or what's wrong with welfare economics", *Economic Journal* 89, pp 537-558.

Sen A. K. (1979b) "Issues in the measurement of poverty", *Scandinavian Journal of Economics* 81, pp 285-307.

Sen A. K. (1979c) "The welfare basis of real income comparisons: A survey", *Journal of Economic Literature* 17, pp 1-45.

Sen A. K. (1981) *Poverty and famines*, Oxford University Press, Oxford.

Sen A. K. (1983) "Poor, relatively speaking", *Oxford Economic Papers* 35, pp 153-169.

Sen A. K. (1985) "A sociological approach to the measurement of poverty: A reply to Professor Peter Townsend", *Oxford Economic Papers* 37, pp 669-676.

Seneca J. J. and Taussing M. K. (1971) "Family equivalence scales and personal income tax exemptions for children", *Review of Economics and Statistics* 53, pp 253-262.

Sheshinski E. (1972) "Relation between a social welfare function and the Gini index of income inequality", *Journal of Economic Theory* 4, pp 98-100.

Shorrocks A. F. (1980) "The class of additively decomposable inequality measures", *Econometrica* 48, pp 613-625.

Shorrocks A. F. (1982) "Inequality decomposition by factor components", *Econometrica* 50, pp 193-211.

Shorrocks A. F. (1983) "Ranking income distributions", *Economica* 50, pp 3-17.

Shorrocks A. F. (1984) "Inequality decomposition by population subgroups", *Econometrica* 52, pp 1369-1385.

Shorrocks A. F. and Foster J. E. (1987) "Transfer sensitive inequality measures", *Review of Economic Studies* 54, pp 485-497.

Spraos J. (1988) "Means and targets of macroeconomic policy: Some thoughts on the recent Greek experience", paper presented in Pantios Graduate School of Economic and Political Studies, Athens, May 1988 (in Greek).

Stern N. H. (1977) "Welfare weights and the elasticity of the marginal valuation of income", in M. Artis and R. Nobay (eds) *Current economic problems*, Blackwell, Oxford.

Stone J. R. N. (1954) "Linear expenditure systems and demand analysis: an application to the pattern of British demand", *Economic Journal* 64, pp 511-527.

Sukhatme P. V. (1982) "Measurement of undernutrition", *Economic and Political Weekly* 17, pp 2000-2016.

Summers R. and Heston A. (1984) "Improved international comparisons of real product and its composition, 1950-80", *Review of Income and Wealth* 30, pp207-262.

Takayama N. (1979) "Poverty, income inequality and their measures: Professor Sen's axiomatic approach reconsidered", *Econometrica* 47, pp 747-759.

Tatsos D. (1982) "The progressivity of the personal income tax: 1972-1981", *Spoudai* 32, pp 527-549.

Tedford J. R., Capps O. and Havlicek J. (1986) "Adult equivalent scales once more: A developmental approach", *American Journal of Agricultural Economics* 68, pp 322-333.

Theil H. (1967) *Economics and information theory*, North Holland Publishing Company, Amsterdam.

Thomas V. (1987) "Differences in income and poverty within Brazil" *World Development* 15, pp 263-273.

Thon D. (1979) "On measuring poverty", *Review of Income and Wealth* 25, pp 429-439.

Thon D. (1981) "Income inequality and poverty: Some problems", *Review of Income and Wealth* 27, pp 207-210.

Thon D. (1983) "A note on a troublesome axiom for poverty indices", *Economic Journal* 93, pp 199-200.

Tobin J. (1970) "On limiting the domain of inequality", *Journal of Law and Economics*, pp 263-277.

Tobin J. (1973) "Comment", *Journal of Political Economy* 91, pp S275-S278.

Townsend P. (1962) "The meaning of poverty", *British Journal of Sociology* 13, pp 210-227.

Townsend P. (1970) *The concept of poverty*, Heineman, London.

Townsend P. (1979) *Poverty in the United Kingdom: A survey of household resources and standards of living*, Penguin, Harmondsworth.

Townsend P. (1985) "A sociological approach to the measurement of poverty - A rejoinder to Professor Amartya Sen", *Oxford Economic Papers* 37, pp 659-668.

Tsakloglou P. (1988a) "Development and inequality revisited", *Applied Economics* 20, pp 509-531.

Tsakloglou P. (1988b) "A family of decomposable poverty indices", University of Bristol, Department of Economics Discussion Paper No 88/195.

Tsoris N. (1975) "The distribution of income in Greece", *Spoudai* 25, pp 646-650 (in Greek).

United Nations (1977) *Provisional guidelines on statistics of the distribution of income, consumption expenditure and accumulation of households*, New York.

Vaughan R. N. (1987) "Welfare approaches to the measurement of poverty", *Economic Journal* 97 (Conference Papers), pp 160-170.

Visaria P. (1980) "Demographic factors and the distribution of income: some issues", World Bank reprint No 129.

Voloudakis E. and Panourgias E. (1980) "An estimate of regional distribution of national income: 1961, 1971", in Bank of Greece *The Greek economy: Research essays and statistical series*, Athens (in Greek).

de Vos K. and Hagenaars A. (1988) "A comparison between the poverty concepts of Sen and Townsend", paper presented at the Third Congress of the European Economic Association, Bologna, Italy (forthcoming in *Oxford Economic Papers).*

Wahab M. A. (1980) "Income and expenditure surveys in developing countries: Sample design and execution", World Bank Living Standards Measurement Study Working Paper No 9.

Watts H. (1968) "An economic definition of poverty", in D.P. Moynihan (ed) *On understanding poverty*, Basic Books, New York.

White H. (1980) "A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity", *Econometrica* 48, pp 817-838.

Williamson J. (1965) "Regional inequality and the process of national development: A description of the patterns", *Economic Development and Cultural Change* 13, pp 3-84.

Official Sources of Statistical Material

European Economic Communities (1975) *Eurostat: Regional Statistics*, Bruxelles and Luxemburg.

European Economic Communities (1984) *Eurostat: Family Budgets*, Bruxelles and Luxemburg.

European Economic Communities (1986) *Eurostat: Family Budgets*, Bruxelles and Luxemburg.

International Labour Office (1976) *Household Income and Expenditure Statistics*, Vol. 2, Geneva.

International Labour Office (1979) *Household Income and Expenditure Statistics*, Vol. 3, Geneva.

International Monetary Fund (1987) *International Financial Statistics Yearbook*, New York.

Ministry of Coordination (1981) *National Accounts of Greece 1970-1979*, Athens (in Greek).

Ministry of National Economy (1985) *Provisional National Accounts of Greece 1984*, Athens (in Greek).

National Statistical Service of Greece (1961) *Household Expenditure Survey 1957/58*, Athens (in Greek).

National Statistical Service of Greece (1967) *Household Expenditure Survey 1963/64*, Athens (in Greek).

National Statistical Service of Greece (1976) *Statistical Yearbook of Greece 1975*, Athens (in Greek).

National Statistical Service of Greece (1977) *Household Expenditure Survey 1974: Part I*, Athens (in Greek).

National Statistical Service of Greece (1978) *Household Expenditure Survey 1974: Part II*, Athens (in Greek).

National Statistical Service of Greece (1983) *Statistic of the declared personal income and its taxation in the economic year 1981*, Athens (in Greek).

National Statistical Service of Greece (1984) *Statistical Yearbook of Greece 1983*, Athens (in Greek).

National Statistical Service of Greece (1985) *Statistical Yearbook of Greece 1984*, Athens (in Greek).

World Bank (1984a) *World Tables Vol.I: Economic Data* (3rd ed), Oxford University Press, New York.

World Bank (1984b) *World Tables Vol.II: Social Data* (3rd ed), Oxford University Press, New York.

World Bank (1988) *World Debt Tables Vol.II*, World Bank.