Interregional Inequalities in Israel: Explanatory Model and Empirical Data

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Abstract

An explanatory model of regional inequality is proposed, which attempts to explain a spatial distribution of different income groups in a given population. According to this model, such a distribution is a function of the relation between the cost of living in a particular geographic area and actual income of its inhabitants. The applicability of this model to spatial inequalities in Israel is investigated, using data from five subsequent censuses of population and housing. The analysis indicates that there is *no universal* trend in the development of inequalities, examined from either a temporal or a spatial point of view. Instead, the extent of interregional disparities appears to differ when various indicators of inequality are considered. Measures of population distribution and wealth indicate the highest extent of interregional disparities, whilst the country's regional development appears to be the least uneven when indicators of education and participation in the labor force are considered. Temporally, most indicators of welfare and population distribution tend to diverge over time, reflecting increasing interregional disparities. In contrast, variables related to education and housing tend to converge, indicating a reduction in inequality. Moreover, the change in inequality appears to differ across various geographic areas: Whereas development in the central part of Israel has tended to become more uniform over time, the country's peripheral regions have developed towards further polarization of their socio-economic development. As a result of the analysis, several strategies are proposed aimed at reducing the extent of interregional disparities.

1. Introduction

Socio-economic development across a geographic space is most often uneven. In almost all countries, there are regions that are well developed, whereas other regions lag behind [1-5]. Such disparities in regional development are termed "interregional inequalities," indicating the spatial nature of the phenomenon of social inequalities inherent to any society.

Interregional inequalities are commonly associated with two factors - income and unemployment [6-8]. However, other measures of inequality are also used. These include gross regional product, labor and investment, population growth, housing conditions, and the average level of education [9-13].

Like many other developed countries, regional development in Israel is considerably uneven. *What are the general patterns of interregional inequalities in Israel? Do they change over time? Are there any policies and strategies that may help to reduce the spatial unevenness of the local regional development?*

The present paper attempts to provide answers to these important questions, using data obtained from Israel's Censuses of Population and Housing. Five such censuses have been held since the foundation of the State in 1948. The first census was carried out at the end of 1948, and then four other population enumerations followed, held in 1961, 1972, 1983 and 1995, respectively. The present paper draws data from all of these censuses, attempting to obtain a clear picture of the current patterns of interregional inequalities in Israel and the change in these patterns over time.

The underlying assumption of this study is that notwithstanding the presence of regional disparities resulting from historical reasons, culture, ecology etc., the effects of location may explain much of the difference in development rates among different regions. It will be shown that in spite of specific local peculiarities, such as differences in the socio-economic profile that reflected government policy in the direction of successive waves of immigrants to peripheral areas, regional location may explain, in most cases, the processes that have occurred in the ensuing years. Consequently, valuable policy recommendations may be made that do not require detailed analysis of unique local conditions, but that are based on an understanding of the overall effects of location on the general patterns of disparities in regional development.

The paper starts with a brief overview of general theories of interregional inequalities. This overview is followed by a discussion of inequality indicators commonly used in socio-economic and regional studies. The most recent patterns of interregional inequalities in Israel are then investigated, followed by a study of temporal changes observed in them. The aim of the latter analysis is to determine whether interregional inequalities in Israel tend to converge or to diverge over time, both at the level of the country as a whole and across its individual regions.

Throughout, it is assumed that different measures of interregional inequalities, such as education, income, ethnic composition, etc. may result in different evaluations

of the spatial and temporal changes in the inequality patterns. To test this assumption, we attempt to determine general (or underlying) patterns of interregional inequalities, using, to this end, the statistical technique of factor analysis. In the concluding section of the paper, the results of the analysis are summarized in brief, and a number of regional development strategies designed to reduce the extent of interregional inequalities are proposed.

2. Background Studies

In socio-economic studies, inequality is often defined as a mere "scalar representation of the interpersonal differences in income within a given population" [14, p.9]. However, in urban and regional studies, a broader definition of this term is commonly used: "interregional inequalities" are assumed to reflect not only disparities in income but also in population growth, service provision, productivity of labor, education and wealth [2,6,15-18].

In this section, we shall deal in brief with two separate aspects of interregional inequalities, viz. explanatory concepts, and measurements. In a separate subsection, we shall also discuss briefly previous studies of interregional inequalities in Israel.

2.1. Explanatory approaches to interregional inequalities

A "non-spatial" approach to regional development emphasizes the importance of the "needs-based," rather than growth-oriented economic systems [47]. This approach is largely based on the ecological theory of the Chicago School [48-49] and related theories (see, for example, [50]). According to these theories, people differ in respect to occupation, income and education, and these differences increase as the local and regional economy grows. As people of similar ethnic background, income and environmental preferences seek areas with similar social and environmental characteristics, spatial inequality may emerge.

The "ecological approach" of the Chicago School has been severely criticized by both "functionalists," who emphasized the role of spatial factors in regional development [19, 22, 25] and so called "behaviourists" [51-52]. The latter criticized the "human ecology" approach for a lack of attention to the individual's perceptions and con-

straints determined by limited resources (financial, social, political, etc.) of individuals.

Alternative approach to the explanation of the nature and underlying causes of interregional inequality is based on the "spatial paradigm" of regional development. According to this approach, interregional development differentials are mainly due to *regional location,* which is a function of a region's remoteness from major population centers, availability of natural resources, etc. Although a low level of population welfare observed in a particular region may seem to be solely due to the ethnic makeup of the local population, the region's location disadvantages, according to this approach, may be the underlying cause.

As Myrdal [19] suggests, a process of " cumulative causation" is the main cause of interregional disparities: once disparities occur at a local level, they tend to become cumulative and self-perpetuating, leading to a growth of differentials among geographic areas According to this concept, a single socio-economic event may trigger a wide range of consequences affecting further development of a region or community as a whole. For example, a decline in one sector of a regional economy may have direct effects on the incomes and demand of population employed in this sector, as well as indirect effects on the performance of other sectors that provide services to the local population.

According to another, neoclassical approach, which emphasizes the role of labor supply, capital stock and technical progress in the process of regional growth, market forces work to distribute resources efficiently. In this framework, regional disparities are attributed to the gains accruing from the allocation of resources towards their optimal level [13,20].

According to the "export-base approach," a region's export potential is the main generator of its growth: Regions having a high export capacity are likely to be more successful in interregional competition [21-22].

Perroux [23] applied his concept of "propelling-propelled" industries to regional development. According to this concept, growth of a propelling industry or region may generate a "propulsion" effect on other industries or areas. This interesting concept gave rise to a completely new direction of regional studies, commonly referred to as the "growth pole theory." In the 1960s-1970s, this theory was widely embraced by regional planners in an attempt to accelerate development of peripheral regions. How-

ever, little evidence has been found to date to support the claim that the creation of a regional growth pole actually boosts the development of its hinterland [24-25].

The development of interregional inequalities is also treated in the framework of the core-periphery dichotomy. This dichotomy emphasizes the role of urban centers and innovation in the formation of economically advanced geographic areas [26-27]. According to this concept, development originates in a relatively small number of centers located at the points of highest potential interaction, defined as the core. Major centers of innovative change are located at this core, which dominates a periphery that is dependent upon it and upon institutions found in it.

A similar location-oriented approach to interregional disparities is suggested in another study [28]. According to this concept, the skewed concentration of regional development is expressed in the framework of a distance-decay model that describes the decline of development potential of a region as a function of increasing distance from the country's major population centers. In addition to socio-economic factors of regional growth (population, employment, etc.), this model includes a number of location-dependent components – availability of land, the cost of commuting, and climatic harshness of geographic areas, making it a useful tool for explaining spatial differences in regional development.

2.2. Indicators of spatial inequality

Though individual studies of interregional disparities may deal with separate development indicators – population growth, wages, welfare, etc. - the use of an integrated indicator is often essential, particularly if a comparative analysis is required.

In order to measure the extent of disparities, various indices of *inequality* are used. These indices may be classified into two separate groups:

a) *Measures of deprivation* (Atkinson index, Theil redundancy index, Demand & Reserve coefficient, Kullback-Leibler redundancy index, Hoover and Coulter coefficients, and Gini index);
b) *Measures* of *variation*, such as the coefficient of variation and Williamson's index.

However, the use of many of these indices in regional studies is restricted by the fact that they are designed primarily for use with population groups and geographic areas of equal population size [14-15]. This condition cannot normally be met in re-

gional analysis, in which the actual population size of individual districts may vary considerably.

Williamson [6] suggests adjusting the coefficient of variation, so as to make it applicable to geographic areas of varying population size. Accordingly, the nominator of the "original" coefficient of variation, obtained by dividing the standard deviation of a given inequality measure (y) by its mean ($\bar{y}$), is transformed to include the proportional share of a district's population (A_i) in the total population (A_{tot}):

$$WI = \frac{1}{\bar{y}}\left[\sum_{i=1}^{n}(y_i - \bar{y})^2 \frac{A_i}{A_{tot}}\right]^{1/2}$$

The lower limit of this indicator is zero, which corresponds to absolute equality; its upper limit is not restricted and may increase (theoretically) indefinitely as the variation of the observations around the mean increases.

Accounting for varying population size of regions is a major advantage of this index. This advantage justifies its use in the present study, in which regions of contrastingly different population sizes will be compared. It is also important that WI is a dimensionless measure. Since in the calculation of this index, the actual variation of a variable is normalized by its mean, this makes it possible to compare the extent of disparity for variables with distinctively different ranges of values, such as income, population density, etc.

2.3. Interregional inequalities in Israel: background studies

Since the foundation of the State of Israel in 1948, numerous attempts have been made to evaluate changes in interregional inequalities, and the effects of development policies on various aspects of the country's regional development [16,18,29-38]. These studies have been focused on two distinctive aspects of interregional disparities: a) population distribution and b) regional economic development.

Drabkin-Darin [29] analyzed changes in the geographic distribution of the country's population between 1948 and 1955. Based on this analysis, he concluded that the country's population appeared to shift towards the periphery, particularly to the south, where the population increased between 1948-55 by 1,130% (though from a very low base of some 21,000 residents). During the same period, the population of the core districts of the country (Haifa, Tel Aviv and Jerusalem) increased, according to his

findings, by less than twofold. Based on these data, the author of this survey concluded that substantial convergence in the population distribution had been achieved.

In another study of the trends of interregional distribution of population in Israel carried out 20 years later, Soen [34] reached a similar conclusion. In this study, Soen analyzed the location of the center of the gravity of the Jewish population. He concluded that between 1948 and 1967, the center of gravity shifted some 11 km southwards. He attributed this change to the establishment of new towns and villages in the periphery, and interpreted it as a clear sign of ongoing population dispersal.

Shefer [30], however, questioned whether any substantial redistribution of population and development had actually been achieved in Israel. In particular, he argued that though the percentage of those residing in the core Tel Aviv district fell sharply from 1948 to 1983 (from 37.7 to 24.8%), the combined percentage of those in Tel Aviv and in the adjacent Central district decreased only marginally, from 49% in 1948 to 45.4% in 1983. He also pointed out that since Greater Tel Aviv was gradually expanding in area, even this marginal decrease of population within the static boundaries of the Tel Aviv district might have been misleading.

Shachar and Lipshitz [16] carried out a thorough analysis of regional inequalities in Israel during 1962-1976, using two measures of population welfare: motorization rates, and personal income levels. This analysis indicated that regional inequalities tended to increase over time, a trend that the authors of this study attributed to the backwash effects that occurred in the country's major metropolitan areas.[1]

In a later study, Lipshitz [36], using the same indicators, came, somewhat surprisingly, to the opposite conclusion. According to his analysis of data for 1983-1995, inequalities in the rate of motorization and income per employee tended to diminish over time. The values of these two indicators were plotted using a spatial cross-section of sub-regions, lined up from the Hula Basin in the north to the Southern Arava in the south. This representation allowed the author of the analysis to conclude that the spatial patterns of economic development in Israel resemble an inverted V-function, often observed in empirical social studies: The highest development level

[1] In his book on *"Economic Theory and Underdeveloped Regions,"* Myrdal [19] singles out two simultaneous effects than may occur in regional development – backwash and spread. The backwash effect is a centripetal force through which developed regions develop even further at the expense of less developed areas; the spread effect is its opposite, centrifugal force, which leads to expansion from growing centers towards other areas, through increased demand for labor and services.

was observed in the Tel Aviv region, declining with distance to the north, south, and east.

Gradus and Krakover's [32] study of the effect of government policy on the spatial structure of manufacturing and employment indicates the opposite: changes in the location quotient of the peripheral districts of Israel in the 1960s – early 1970s clearly showed a more even distribution of manufacturing employment across the country's various geographic areas.

Substantial differences among these findings may have three possible explanations:

- *First,* convergence and divergence in interregional inequalities may have alternated over time in Israel, as in various other developed countries (see ***inter alia*** [6,9]). However, this does not resolve the apparent contradictions among studies dealing with similar time-periods.
- *Second,* the discrepancies among findings may be attributed to the use of different indicators for assessing interregional disparities (population distribution, unemployment, wealth, etc.), and to the diversity of quantitative indices employed - absolute change, percent share, Williamson coefficients, etc. It is possible, for instance, that different indicators may highlight different trends, even when the same time periods are considered. For instance, a concentration of population may be accompanied by a decrease in interregional disparity in personal income.
- *Third,* a reduction in interregional inequalities among various regions may be accompanied by simultaneous intra-regional polarization, i.e. a growth of disparities within regional boundaries. In other words, regional changes in Israel may not occur simultaneously, in the same direction and in all areas, as argued by some scholars [39]. This hypothesis may help to explain the sensitivity of research results to the selection of the units for the analysis – districts, subdistricts, urban areas, etc.

In the following sections, these suppositions will be tested using the data available in five subsequent censuses of population and housing (1948, 1961, 1972, 1983, and 1995). This empirical testing will be preceded by the introduction of an explanatory model of interregional disparities.

3. Formation of interregional inequalities – an explanatory model

The simplified model we propose (Fig. 1) emphasizes the role of *regional location* on the formation of interregional inequalities and may serve as an explanatory tool for analyzing the spatial distribution of different income groups across geographic areas. The model includes five major components: each of them, starting with #2 (Accessibility), is measured as a portion of the overall income.

a) *Average family income* is subdivided into three levels: High Income (HI), Medium Income (MI) and Low Income (LI). These income levels are plotted in Fig. 1A as a sequence of parallel lines.

b) *Accessibility* (A). Impeded access to a major population center, where a large number of jobs and services are concentrated, increases expenses associated with commuting, i.e. directly through the cost of travel, and indirectly due to the time spent traveling rather than engaged in a more productive activity. This trend-line may have two inflection points: Point #1 limits a range practicable for daily commuting, while Point #2 represents the extreme limit beyond which frequent commuting to a major population center becomes rather uncommon. (It is assumed that people living beyond Point #2, regardless of how much further away from the urban center they live, commute only within the local region, traveling to the major urban center only periodically).

c) *Housing costs (H).* These are outlays associated with housing, either rent or mortgage. In Fig. 1A, such outlays are plotted as an L-shaped trend-line: the cost of housing may be relatively high in and around a major population center, with relatively low values to occur elsewhere. Since the price of housing is affected by the cost and availability of undeveloped land, it is expected to decline with increasing distance from densely populated metropolitan centers, until land resources for development become virtually unrestricted (Point #3 in Fig. 1A). No further substantial increase in the availability of land may be expected beyond this point.[2]

[2] In remote areas, the actual cost of building may often be higher, compared to centrally located places, due to higher transport outlays, unavailability of skilled labor and other local factors [18] However, these supply-related factors may not necessarily increase the market price of housing due to lower demand.

d) *Other outlays* (O). These include mandatory payments, such as utilities, taxes, health insurance, education, etc. These expenses are assumed to be smaller in peripheral areas, as reflected by the oblique O-line in the diagram. (For different income groups, the composition and size of this component will be quite different. However, this difference does not reflect spatial considerations to any great extent. Therefore, for the sake of simplicity, our model assumes that this factor is uniform for persons of all incomes. This simplifying assumption can be removed safely upon further elaboration of the model).

e) *Total expenses* (T) is a sum of the above-mentioned outlays, viz. commuting, housing cost and other outlays: T=A+H+O, and is represented by a single bold line in the diagram.

<<<<<<FIGURE 1 ABOUT HERE>>>>>>

The proposed model includes a "plan" representation (Fig. 1B), in which the bold dotted arrow marks the cross-section that appears in Fig. 1A.

The question we shall try to answer is as follows: *Given the above assumptions, where would different income groups tend to settle?*

The proposed model suggests a fairly straightforward answer to this question: Inhabitants belonging to a particular income group will tend to settle in those parts of the region where total expenses (T) do not exceed their overall income - HI, MI and LI, respectively. For LI residents, for instance, the spatial boundaries of such an area will rather be restricted. In particular, these boundaries are unlikely to extend towards the major population center, left of Point #4 in the diagram. For the MI group, the geographic boundaries of the affordable area may be less restrictive. In particular, such an area may extend towards the central city, left of Point #5 in the diagram. The limit for members of the HI group is even more "elastic": Theoretically, such an area may cover the entire region, from its core to the periphery (Fig. 1A).

It is, however, unlikely that HI and MI residents may opt for the areas occupied by LI residents. Instead, these income groups may prefer to settle elsewhere, in areas that are generally out of reach of members of the LI group. In a country with a number of major population centers, this may result in the formation of partially overlap-

ping "belts" where there is a predominant concentration of a particular income group, similar to that shown in the "plan" representation of the proposed model (Fig. 1B).[3]

4. Inequality variables and data sources

The 1995 Israel Census of Population and Housing, which forms the core of the present evaluation, is a rich database, which may provide great opportunities for socio-economic analysis. For the present study of interregional inequalities, it is, however, important to select the most informative criteria and to determine a geographic unit of aggregation most suitable for the analysis. The criteria for accomplishing these tasks are discussed in this section.

4.1. Data selection

Three main criteria were established for selecting indicators of interregional inequalities for the present analysis:

- *Relevance to regional studies.* Not all the variables available in the census are directly relevant to regional analysis. Thus, for instance, marital status and additional sources of income may have great relevance to socio-economic planning. However, their value for a study of regional disparities in development seems to be limited;
- *Sensitivity.* If a measure does not vary considerably across geographic areas, it may not have much value for the analysis. Thus, for instance, nearly all households in Israel appear to have a telephone and a TV set. Therefore, the spatial variation of these indicators may not be very useful in gaining in-depth insights as to the nature and underlying patterns of interregional disparities;
- *Comparability*. In order to allow comparison among censuses, indicators that appear in consequent population counts are the most desirable. In the case of Is-

[3] The proposed model is region-oriented. Therefore, it may not explain intra-urban phenomena, such as, for instance, the concentration of different income groups within a given urban area, attributed to a number of the localized factors, such as intra-urban variation of housing cost, lock-in effect, etc. These factors are far beyond the scope of the present analysis and may represent a legitimate subject for a separate study.

rael, such indicators include the distribution of population, income and education that appear in nearly all censuses.

Using these criteria, twelve indicators were selected for the subsequent analysis from the pool of available census data. The indicators selected for the analysis cover most major aspects of regional socio-economic development, ranging from population distribution, to employment, demographic composition and welfare:

- POPDENS: Population density [persons per km^2 of land area];
- HDENSITY: Housing density [persons per room].
- HOWNER: Homeownership level [%];
- CAROWN: Car ownership level [private cars per 1,000 residents];
- PCOWN: Ownership of personal computers [%];
- INCOME: Average household income and income per employee [$US];
- LFORCE: Participation in labor force [%];
- HIGHED: Percentage with academic degrees;
- UNSKILLED: Percentage of unskilled workers.
- YSTUDY: Average years of schooling;
- MAKEUP: Per cent of Asia and Africa born [1^{st} generation);
- HSIZE: Average household size [persons].

The per cent of Asia and Africa born (MAKEUP) is a measure that is specific to Israel, and deserves some explanation. After the establishment of the State of Israel in 1948, the country absorbed a large number of Jewish immigrants from countries in North Africa and the Middle East, more than doubling the total population in less than a decade. Most of these immigrants found it difficult to become accustomed to life in the Western society established by the founders of modern Israel. Consequently, they comprised a disproportionate part of the under-privileged socio-economic strata [29,42]. Geographically, the distribution of this category of immigrants was, from the outset, uneven. The matter is that in the late 1940s – 1950s, many new immigrants were directed *en masse* towards peripheral development areas of Israel, in line with the national goal of population dispersal [46]. Since the early 1970's, government policy evolved to include various incentives designed to encourage the growth of the so called "development towns" indirectly. These included government loan guarantees, tax exemptions, and the provision of public housing [36,42]. The subsequent changes

in the ethnic composition of various geographic areas of the country may thus become a source of valuable information concerning the trends of spatial redistribution of these groups of immigrants and their integration into Israeli society.

Some of the above indicators are used in the analysis as they appear in the census database, viz. homeownership, years of schooling, taxable income, etc., while others were derived by calculation. For instance, housing density was calculated by dividing the average number of rooms in the household by the household size; car ownership level [per 1,000 residents] was calculated using two inputs - the average number of cars per family(C), and family size (F): (C/F)*1000. Population density [persons per km^2] was estimated using overall population size of a region and its total land area.

4.2. Spatial units for the analysis

Most previous studies of interregional inequalities in Israel are restricted to administrative districts and sub-districts of the country [30-37]. In part, such a high level of spatial aggregation is attributed to the availability of the results of the population counts in the official publications of the Israel Central Bureau of Statistics: Statistical Abstract of Israel; Census of Population and Housing, etc. In these publications, many essential data are provided only at the levels of administrative districts and sub-districts. In contrast, the present analysis deals with a finer spatial grain – natural regions.[4] As of 1995, there are 51 such regions (Fig. 2; Appendix 1), which are aggregated in 17 sub-districts and 8 administrative districts of the country.

<<<<<<FIGURE 2 ABOUT HERE>>>>>>

4.3. Time-related changes of inequality patterns

Temporal changes in the patterns of interregional inequalities are studied using data from different censuses. In particular, the data from the 1995 Census are compared with corresponding indices of interregional inequalities calculated from data provided in the previous censuses: 1948, 1961, 1972, and 1983. However, the inter-censual comparison cannot be fully inclusive since the pre-1983 population counts do

[4] *Natural regions* - NRs – are the term used by the Israel Central Bureau of Statistics when referring to the smallest statistical divisions of the country for which comparable inter-census data are available. The term does not necessarily imply geographic cohesion or well-defined topographic borders.

not report all of the socio-economic indicators found in later counts at the spatial level of natural regions. For instance, the 1948 Census was restricted to general indicators of population distribution only (population size and density). Though in the subsequent population censuses, the number of the reported socio-economic measures increased, only a limited number of indicators are reported in all the population counts held since 1961. These include average household size, average years of schooling, overall population density, and participation in the labor force. Due to this restriction on the availability of data, only a partial analysis of the respective time-related trends is possible. Finally, two indicators - ownership of personal computers and ownership of air conditioners - are reported only in the 1995 Census of Population and Housing. These indicators may thus be used for illustrating once-of patterns only, assuming that data from forthcoming population counts will be needed to analyze trends in their spatial distribution.

4.4. Underlying patterns of interregional inequalities

An analysis of the spatial distribution of different variables (average income, car ownership level, education, etc.), carried out in isolation, may often provide little useful information, or may even be misleading. For instance, if four indicators analyzed separately show convergence among regions, while two others indicate divergence, one may be tempted to conclude that the differences among regions are decreasing. However, if the first four indicators are closely interrelated, while the latter two measures have little in common, the initial conclusion about convergence of inequalities may be misleading. To clarify the underlying patterns of interregional inequalities, the simple use of descriptive statistics is insufficient. More sophisticated statistical techniques of data reduction such as, for instance, factor analysis, may be required. This multivariate technique makes it possible to reduce and summarize data and to analyze interrelationships among variables, explaining them in terms of their underlying dimensions (i.e. factors). In the following analysis, this task is performed using inequality variables reported in three subsequent censuses for which a sufficient number of comparable indicators are available – 1972, 1983 and 1995.

5. Recent patterns of interregional disparities

The weighted means[5] and Williamson coefficients calculated for the individual measures of inequality are given in Table 1. (The indices in question are estimated for the country as a whole based on the data drawn from the 1995 Census for 51 individual NRs). The spatial patterns of some of these measures, generated in the GIS ArcView software, are represented in Figs. 3-6. In the following subsections, each of four groups of inequality measures included in the analysis is considered separately – population distribution; housing and wealth; employment and wages; and education and ethnic makeup.

<<<<<<TABLE 1 & FIGURES 3-6 ABOUT HERE>>>>>>

5.1. Population distribution

Two separate measures of population distribution – population density (POPDENS) and housing density (HDENSITY) – have been analyzed.

As Table 1 shows, population density appears at the top of the list of inequality measures ranked according to the values of their Williamson index (WI). The value of the WI for this variable is equal to 1.148 (1995) and is thus far greater than that for any other measure of inequality covered by the analysis.[6] This outcome is hardly surprising, since population density varies across the country's natural regions (NRs) within a wide range: from 8,700 people per km^2 for the Ramat Gan NR to less than 2 people per km^2 for the Dead Sea NR (see Fig. 3 and Appendix 1).

The spatial pattern of density distribution is relatively simple: it has three distinct peaks – around Tel Aviv, Haifa and Jerusalem. Outside these clearly emphasized spatial concentrations of population, population densities decrease gradually towards peripheral areas, towards both the north and south (Fig. 3; left diagram). Between these urban centers, average densities also drop, reaching their lowest values in mainly ag-

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[5] In this study, the weighted mean is calculated as follows: $\overline{V} = \sum_{i=1}^{N} P_i \times V_i \; / \sum_{i=1}^{N} P_i$, where $V_{i(1\ldots N)}$ is the observed value of a particular variable in a region *i*, and P_i is the population of the region. The weighting thus makes it possible to avoid a potential bias towards small regions.

[6] The values of WI may range from 0 to ∞, with higher values indicating a higher extent of interregional inequalities.

ricultural regions on the Mediterranean plain – the Carmel Coast, Zikhron Ya'akov and Judean Foothills NR (see Fig. 3 and Appendix 1).

At first glance, the pattern of *housing densities* is clearly distinct from that of population distribution (see Fig. 3). Indeed, when measured by the former index, the overall extent of interregional inequalities is relatively small (WI=0.191 for housing density (1995) vs. WI=1.148 for population density (1995); see Table 1). This indicates that, compared to population distribution, the country's regional development appears to be considerably more even when patterns of housing occupancy are considered. In part, this may be attributed to the fact that this variable relates to two factors: family size and household welfare (i.e. the ability to purchase an appropriate accommodation). However, a closer look at the spatial pattern of housing densities shows that it is clearly related to that of population densities. In fact, these two distributions are nearly inverse patterns of each other. Indeed, with the exception of the Jerusalem district, geographic areas with high population densities (Tel Aviv, Haifa and the Central districts) appear to have relatively low housing densities (see Fig. 3). In contrast, most peripheral regions, which have low overall population densities, also have relatively high housing densities. Thus, for instance, average housing density in the Tel Aviv District is only 0.56 persons per room, while in the peripheral Northern district it is 0.71 persons per room - 25 per cent higher.

This relationship may be attributed partly to the predominant concentration of new housing construction (particularly private construction) in the more densely populated areas of the country, in which overall demand is greater and the average purchasing power of the local population tends to be higher [18]. Another possible cause of this "population density-housing density" relation is disparities in the ethnic makeup among different regions of the country. Israel has geographic regions with a disproportionably high concentration of ethnic minorities. In many cases, these minority groups have much larger families and a substantially lower income than the national average. For instance, average housing densities tend to be considerably higher in mostly Arab-populated NRs. Such NRs include the Shefar'am and Eastern Lower Galilee NRs (see Fig. 3 and Appendix 1). In these NRs, housing densities reach 0.94 and 0.91 persons per room, respectively, compared to the national average of 0.64 persons per room.

5.2 Housing and wealth

Interregional differences in housing and wealth may be illustrated by two different indices: homeownership level (HOWNER) and ownership of personal computers (PCOWN) (see Fig. 4).

Somewhat surprisingly, the spatial pattern of ***homeownership*** (Fig. 4; right diagram) appears to be quite similar to that of housing density (Fig. 3; right diagram). This distribution has two extremes: Relatively low levels of homeownership are observed in the most centrally located NRs (Judean Mountains, Tel Aviv, Haifa and Carmel Coast) and in predominantly Jewish-populated peripheral areas (Ashqelon, Gerar, Besor, Northern Negev Mountains NRs etc.). Concurrently, high levels of homeownership are observed in mostly Arab-populated NRs (Alexander Mountain, Shefar'am region and Eastern Lower Galilee). The high level of homeownership in the latter group of NRs is hardly surprising since public housing, which is often available to Jewish families and, particularly to new immigrants, is generally unavailable to Israeli Arabs.

The ***ownership of personal computers*** is especially high in Judea, Samaria and the Gaza Area and adjacent to major metropolitan centers of the country – Rishon LeZiyyon and Southern Sharon NRs near Tel Aviv, and Yoqne'am and Zikhon Ya'akov NRs near Haifa (see Fig. 2 & 4, and Appendix 1). The relatively high levels of PC ownership in these regions reflect clearly the generally high level of education of the local residents – 12-13 years of schooling, as opposed to some 11.0 years on average for the country as a whole.

5.3 Employment and wages

Surprisingly, the ***income variable*** (INCOME) occupies only the 6^{th} place from the top of the list of inequality measures, ranked according to the values of their WIs (Table 1). This indicates that, contrary to popular belief, inequalities of income among regions do not seem to be the most acute indicator of inter-regional disparities. Differences with respect to this variable are, nevertheless, substantial. Excluding Judea and Samaria, many of whose residents earn their income outside of their communities, the highest levels of income per employee are observed around the two major population centers of the country – Tel Aviv and Haifa. In particular, the average incomes are especially high in the suburban fringes of these population centers – the Southern

Sharon NR, north-east of Tel Aviv (1,750$US), and in the Zikhron Ya'akov NR, south of Haifa (1,600 $US). After peaking in these suburban areas, the average levels of income decline steadily towards more remote peripheral regions. This trend is thus fully in line with that predicted by the proposed "zonal" model of regional development (see Fig. 1B).

The spatial pattern of the *labor force* variable (Fig. 5; right diagram) resembles that of average income (Fig. 5; left diagram) relatively closely. This implies that the concentration of high-paying jobs and the availability of employment are spatially interlinked. By the same token, regions of scarce employment are generally characterised by relatively low wages, a well-known phenomenon reported in many studies [13-40].

Relatively low participation in the labor force is also found in most peripheral regions of the country (see Fig. 5; right diagram). For instance, in the Eastern Lower Galilee NR and in the Besor NR, average participation in the labor force is only some 39-42 per cent, i.e. 12-15 per cent below the national average. Such low participation may be explained by both a large average family size and a general lack of employment opportunities in these regions.

5.4 Education and population makeup

The *average number of years of schooling* (Fig. 6; left diagram) is not only a general indicator of the current state of regional development; it is also an important indicator of a region's growth potential. In a modern, high-tech oriented economy, the presence of a highly educated and skilled labor force is essential for sustained regional growth [41].

The spatial pattern of the indicator in question (Fig. 6) appears to be similar to those observed for two other measures of interregional inequalities: income per employee, and participation in the labor force (see Fig. 5). Again, as in the case with latter measures, a higher proportion of highly educated people is concentrated around Tel Aviv and Haifa, in Eilat (the Arava NR), and in the Judea, Samaria and Gaza area. Concurrently, a relatively low level of education is found outside the commuting rings of the aforementioned population centers (the Lod, Eastern Sharon, and Hadera NRs) and in mostly Arab-populated NRs of the Galilee and Golan - the Akko, Hermon, Shefar'am and Eastern Lower Galilee NRs (see Fig. 6).

Notably, in the southern periphery of the country (the Be'er Sheva, Besor and Northern Negev Mountains NRs), the average level of education is relatively high (see Fig. 6; Appendix 1). This is attributed to the fact that these regions absorbed many highly skilled new immigrants, who arrived to the country in the wake of mass immigration from the former Soviet Union in 1989-1991 [42].

Some 45 years after the bulk of new immigrants from the Middle East and Northern Africa were directed to the transient camps in the Negev and in the north (see Subsection 4.1 of this paper), the effect of this policy of population dispersal is still reflected in the patterns of ethnic makeup across individual NRs. As Fig. 6 shows, in the peripheral areas of the country, the percent of this group of immigrants (Asia and Africa born) is disproportionably higher than elsewhere. In part, this may be attributed to the phenomenon commonly known in migration studies as the 'selectivity of migration.' According to it, the educated and young have more of a tendency to migrate, while the least educated and elderly tend to be less mobile [43-44].

6. Time-related changes of interregional disparities

In order to clarify temporal changes in the patterns of interregional inequalities, the weighted means and the values of Williamson's inequality coefficients were calculated using data available in different censuses, starting with 1948. These coefficients are reported in Table 1. In addition, selected inequality measures are plotted in Fig. 7, in order to facilitate comprehension of the most characteristic temporal trends.

The changes in the values of the Williamson index (WI) indicate that since 1948, the distribution of population across individual NRs has tended to become more uneven. Thus, as Table 1 shows, the value of WI for the *population density* variable (POPDENS) increased from 0.943 in 1948 to 1.148 in 1995.[7] This 20-per cent increase indicates a clear *divergence* of population density over time.

<<<<<<FIGURE 7 ABOUT HERE>>>>>>

Other important measures of interregional inequalities – *participation in the labor force, population makeup,* and *average income* (LFORCE, MAKEUP and

[7] An increase in the value of WI implies that disparities among individual geographic areas grow.

INCOME) - also indicate that interregional disparities in Israel tended to grow (see Table 1 and Fig. 7). Thus, for instance, the value of WI for the *income* variable increased from 0.139 in 1972 to 0.144 in 1983 and to 0.214 in 1995, implying that the average income across individual NRs appeared to diverge over time.

Participation in the labor force (LFORCE) in individual NRs also appears to have diverged regionally since the 1972 Census count. The value of the WI for this variable decreased between the 1961 and 1972 Censuses from 0.097 to 0.085, indicating a trend of convergence. However, since 1972, its WI grew continuously. By 1983, its WI increased to 0.092, and, consequently, to 0.136 in 1995. This implies that participation in the labor force increased in some NRs and decreased in other geographic areas. A similar trend of divergence is also exhibited by the *ethnic makeup* (MAKEUP), estimated by the percentage of Asia and Asia born in the total population. The values of the WI for this variable increased by nearly 16 per cent since the early 1960s, from 0.393 in 1961 to 0.454 in 1995 (Table 1).

However, *not all* measures of inequality included in the analysis suggest an increase in regional disparities. The following four indicators show a trend of *reduced regional inequality:* the average number of years of study (YSTUDY), housing density (HDENS), per cent with higher education (HIGHED), and motorization level (CAROWN). For instance, the WIs for the latter variable (CAROWN) decreased from 0.414 in 1972 to 0.146 in 1995, indicating that over time, motorization levels converged considerably across individual NRs (see Table 1).

The apparently contradictory trends highlighted by different indicators warrant some discussion. The mean values of nearly all the indicators, which showed that regional inequality tended to decrease over time, seem to approach certain quantitative thresholds beyond which further increase is highly unlikely. For instance, the mean value of the YSTUD variable reached 11.08 years in 1995. Theoretically, this value may grow to 16-17 years (12 years of primary and high school plus 4-5 years of college education). However, it is unlikely that the entire population of the country will opt for such a long period of study. Likewise, the mean value of the housing density variable (HDENS) stood in 1995 at the level of 0.64 persons per room. This means that about one and a half rooms are available for an "average resident" of the country. Though the average housing density may decrease even further, in line with growing standards of living, it is likely to reach some quantitative threshold eventually. In contrast, many measures showing increasing inequality between regions, such as popula-

tion density, average income, etc. do not have a natural limit. For instance, personal income may grow almost indefinitely as long as the overall wealth of the country increases, regardless of polarization between rich and poor.

7. Intra-regional disparities

Do temporal changes in the extent of interregional inequalities occur simultaneously and in the same direction in all of the geographic areas of the country? In an attempt to answer this important question, indicators of intra-regional inequalities in three geographic regions of the country – the Center, North and South - were analyzed separately. Each of these geographic regions has a sufficient number of internal subdivisions into natural regions (NRs), allowing a statistically robust analysis:

- The *Center* is composed of the Tel Aviv and Central districts and includes a total of 10 NRs;
- The North is formed by the Northern district, which is composed of 21 NRs;
- The South is formed by the Southern district and includes 13 NRs (see Fig. 2).

The results of the analysis are plotted in Figs. 8-10 and discussed the in the following subsections.

<<<<<<FIGURES 8-10 ABOUT HERE>>>>>>

7.1. The center

At first glance, temporal changes in the extent of intra-regional inequalities in this part of the country appear to be a microcosm of the country as a whole (see Figs. 7-8).

For instance, the intra-regional disparities in the level of motorization (CAROWN) in the central part of the country are nearly identical to those recorded for the country as a whole. While at the national level, the WI for the car ownership dropped between 1972 and 1995 by some 65 per cent, from 0.414 to 0.146, in the central part of the country, this decrease was about 70 per cent, from WI=0.277 to WI=0.079 (see Figs. 7 and 8).

Convergence of intra-regional disparities in education levels (average years of study and per cent with higher education) is also similar to those of the country as a whole, albeit a little slower. The WI for the proportion of residents with higher educa-

tion decreased in the central part of the country between 1972 and 1995 by less than 8 per cent - from 0.277 to 0.255, respectively (Fig. 8). At the same time, at the national level, interregional disparities in respect to this development datum appeared to converge more substantially: from 0.498 in 1972 to 0.348 in 1995, i.e. by more than 30 per cent.

This difference in the rates of convergence of educational levels may be explained by the fact that the proportion of the population of the Central region with academic qualifications is close to its potential maximum. Indeed, the percent with higher education in the centrally located NRs of the country is considerably higher than elsewhere – 16-20 per cent vs. 8-12 per cent in the periphery.

The only exception to the general similarity between the Central region and the country as a whole lies in the data describing personal income, which appears to diverge in the central part of the country somewhat faster than in the country as a whole. While at the national level, the WI for average income increased between the 1972 and 1995 Census by about 50 percent, from 0.139 to 0.214 (see Fig. 7), in the central part of the country the increase in the WI was more than twofold, from 0.061 in 1972 to 0.155 in 1995 (see Fig. 8).

7.2. The north

Whereas in the central part of the country, the temporal changes in the extent of intra-regional disparities are more or less similar to those observed in the country as a whole, the northern part of the country exhibits a very different pattern (Fig. 9). In particular, most inequality indices included in the analysis - average income, housing density, percent with higher education, etc.- appear to indicate that intra-regional inequalities in the country's northern periphery have increased with time:

- The values of WI for ***higher education*** grew from 0.451 in 1972 to 0.464 in 1995, indicating growing inequality within the region. In contrast, the values of the index in question dropped at both the national level and in the country's core - from 0.498 to 0.348 (Fig. 7), and from 0.277 to 0.252 (Fig. 8), respectively.
- The values of the WI for the ***housing density*** variable indicate rapidly growing inequality, especially since the 1983 Census (see Fig. 9).
- Intra-regional disparities in the ***average level of income*** have also grown somewhat faster in the north than at the national level as a whole. While, at the na-

tional level, the WI for the development datum in question grew by some 54 per cent, from 0.139 in 1972 to 0.214 in 1995 (see Fig. 7), the value of this index for the northern periphery of the country increased during the same period by about 64 per cent, from 0.135 to 0.221 (see Fig. 9).

The divergence of intra-regional disparities in the north is also reflected in the values of other development data – car ownership, participation in the labor force, and average years of study. For all these measures, the WIs tended to grow, particularly in recent years. (As we may recall, at the national level, interregional inequalities with respect to this data tended either to decline or to stabilize).

7.3. The south

The situation is even more peculiar in the south. In this part of the country, only three inequality measures included in the study area (higher education, income and car ownership), appear to show clear trends of temporal change. Other measures - years of study, participation in the labor force and housing density – appear to fluctuate only slightly over time and do not show any clear trend, either downward or upward (Fig. 10).

The greatest changes in intra-regional disparities within the Southern region occurred in levels of income, which diverged substantially over time, from 0.152 in 1972 to 0.359 in 1995, i.e. by more than 135 per cent, compared to an increase of only 54 per cent for the country as a whole and to 64 per cent for the Northern district (see Figs. 7 & 9).

Characteristically, intra-regional disparities in the level of car ownership grew in the South between 1983 and 1995 (see Fig. 10), whereas in the country's core, intra-regional inequalities as reflected by the indicator in question declined continuously (Fig. 8).

The above differences in long-term trends within various geographic regions of the country require an explanation. The interregional disparities may be attributed to the following factors:

- *First,* these differences may be due to interregional differences in the ethnic makeup of the local population. In the central regions of Israel, particularly the Tel Aviv and Central districts, the proportion of ethnic minorities in the population total is relatively small. In the Tel Aviv region, for instance, the proportion

of Arabs and other non-Jewish residents does not exceed 3 per cent. In contrast, the proportion of ethnic minorities is relatively large in the north and south, where it is up to 80-85 per cent in some NRs. The proportion of new immigrants, who constitute another economically weak stratum of the Israeli society, is also higher in the country's peripheral areas [45].

- *Second*, dissimilarities between northern and southern peripheries may be attributed to their uneven access to resources. The Negev has several mineral processing plants in the Dead Sea area, which contribute relatively little to the local economy. In terms of agriculture, the Negev is also a resource-poor area. Agricultural production in this region is hindered by a hash desert climate and a lack of fresh water for irrigation. In contrast, in the sub-humid Galilee and the north, agricultural production has achieved impressive yields. As a result, as economic base was created for later development of light industry, particularly in the kibbutz communal settlements. On the other hand, from the early years of the statehood, the Negev was assigned the highest development priority and has received considerable government grants and infrastructure investment, not least in the wake of the 1989-1991 mass immigration from the former Soviet Union [32, 35, 36, 42, 46]. However, the levels of services and population welfare in the region remain lower than those of other parts of the country.
- *Lastly*, interregional differences in patterns of inequality may stem from the different maturity of urban settlement in various geographic areas of the country. In the country's central regions, the pattern of urban settlement is both dense and diverse. In the Southern district, however, a large share of the local population is concentrated in a single major urban center, consisting of the city of Be'er-Sheva and its suburbs. This region, with its incomplete hierarchy of urban places, is thus more polarized and exhibits greater inequality than the country's central regions, which form a dense, complex and resilient pattern of settlement.

8. Underlying patters of interregional inequalities

A total of *eleven* variables were considered in the factor analysis of the 1995 Census data. These variables covered all of the inequality measures introduced in Subsection 4.1, excluding two: ownership of personal computers (PCOWN) and own-

ership of air conditioners (AIROWN). The latter measures were omitted from the analysis in order to enhance the comparability of results with those obtained from the analysis of previous population counts covered by the study – 1983 and 1972, - in which these variables are not reported. The same number of variables (11) was used for the analysis of the 1983 Census data. However, in the analysis of the 1972 Census, only ten variables were considered. One variable, homeownership level (HOWNER), was omitted from the analysis because data were not available at the required level of spatial aggregation (see Tables 2-4).

<<<<<<TABLES 2-4 ABOUT HERE>>>>>>

8.1. 1995 Census

As Table 2 shows, the model appears to describe the variation of the observed (input) variables relatively well. This is indicated by the statistical significance of the results of two separate tests: Kaiser-Meyer-Olkin (KMO) test of sampling adequacy (KMO=0.725) and Barlett's test of sphericity (P<0.0001).

Two principal components are identified (see Table 2). Together, these components account for about 72 per cent of the total variance of the input variables, with 41 per cent attributed to the first factor (Comp. 1) and another 31 per cent explained by the second component (Comp. 2).

Analysis of the rotated component matrix makes it possible to define each of these factors (components). In assigning such definitions, the following properties of the principle components are especially important:

- *Component 1* has a strong positive correlation with four input variables: average income (r=0.750), years of study (0.848), participation in the labor force (0.824), and the proportion of residents with higher education (0.866). This component also correlates negatively with the proportion of unskilled workers (r=-0.809; see Table 2). The definition of the component in question is thus more or less clear: It reflects interregional differentials in education and income, and can thus be defined as the "income-education" component of interregional disparities;
- *Component 2* is strongly correlated with household size (0.766), percentage of homeownership (0.906), and housing density (0.661). Concurrently, it has a strong negative correlation with ethnic makeup (-0.868), which is estimated as

the percentage of Jewish immigrants of Asian and African descent in the total population. We shall thus describe this component as the "housing conditions and ethnic makeup of the area."

In sum, the underlying patterns of interregional inequalities in Israel, as reflected in the 1995 Census data, appear to be of two basic types: a) inequalities in education and income (Comp. 1), and b) inequalities in the ethnic makeup of the population and in housing conditions in a region (Comp. 2).

8.2. 1983 Census

Though factor analysis of the 1983 Census data also results in two principle components of interregional inequalities (Tables 2-3), the definitions of these components appear to be quite different from those of the 1995 census:

- *Component 1* has a strong positive correlation with the level of homeownership (r=0.927), housing density (0.810), and household size (0.683); it is inversely related to ethnic make up (-0.897), participation in the labor force (-0.732) and average years of study (-0.677; see Table 15 – Rotated Component Matrix). In total, this component accounts for 43 per cent of the variation of the observed (input) variables;
- *Component 2* correlates positively with the proportion of residents with a higher education (0.858); average years of study (0.695), and average income (0.643), but is negatively related to the level of car ownership (-0.905) and to household size (-0.604; see Table 15 – Rotated Component Matrix). Altogether, the factor in question accounts for about 37 per cent of the variance of the observed (input) variables (Table 14).

Therefore, in the early 1980s, the underlying patterns of interregional inequalities in Israel were substantially different from those indicated by the analysis of the 1995 Census. In particular, the main component of interregional inequalities in the early 1980s appeared to be related to housing conditions (housing density, household size and ethnic composition). The factor influenced by education and income occupies only the second position in the factors' hierarchy. The same factors appear to be in the reverse order in the analysis of the 1995 Census data, in which inequalities in educa-

tion and income came first, while inequalities in housing and ethnic makeup were ranked second.

This reversal of the relative positions of the principle components between the population counts under consideration may be attributed, at least in part, to dramatic improvements of housing conditions in Israel in the years following the 1983 Census of Population and Housing. For example, the average housing density dropped during this period from 1.19 persons per room in 1983 to 0.64 in 1995 (see Table 1). This considerable change may have contributed to the declining importance of housing as an indicator of interregional disparities. On the other hand, the transition of Israel's economy from traditional industries (textile, chemicals, etc.) to high-tech production (electronics, optics, medical equipment, and internet technology), which is concentrated in the central part of the country and near Haifa, is probably the reason for the increased importance of the "education-income" component in the factor hierarchy determining regional inequalities.

8.3. 1972 Census

The results of the analysis of the 1972 Census data appear to be quite similar to those obtained from the analysis of the 1995 Census data. In particular, two principle components of interregional inequalities emerged from the factor analysis of the 1972 Census data (Table 4):

- *Component 1* explains about 43 per cent of the variation of the input variables and correlates strongly with average income (0.881) and car ownership (0.846). Concurrently, it has a significant negative correlation with household size (-0.974) and household density (-0.901). In other words, the highest values of this component are observed in regions with an affluent population, small families and good housing conditions. The factor in question may thus be defined as a general "indicator of welfare and housing."
- *Component 2* explains about 28 per cent of variance of the observed (input) variables and correlates positively with the following two variables: the average years of study (0.905), and participation in the labor force (0.787). It correlates negatively with the proportion of unskilled workers in a region (r=-0.760). This factor thus reflects mainly educational and employment disparities among geographic areas.

Since the former factor (welfare and housing) has a considerably higher explanatory power (about 43 per cent of the total variance vs. 28 percent for the second component), it implies that the patterns of interregional inequalities in 1972 were mainly attributed to interregional income and welfare differentials (Comp. 1), while educational differentials (Comp. 2) played only a secondary role.

The differences in the nature of interregional inequalities between 1972 and 1983, as reflected by the analysis of the Census data, are fairly clear: inequality in 1972 was mostly due to differences in welfare differentials, but by 1983 the difference between regions was mostly due to housing differentials. At least in part, this difference may be attributed to the structural changes in the Israeli economy during the period in question: Between the late 1960s and early 1980s, the country's economy underwent a sharp transition from high annual rates of growth following Israel's success in the 1967 War to a general economic slowdown in the late 1970s-mid-1980s. This transition was characterized by hyperinflation and low rates of housing construction, especially in the public sector [45]. Reduced rates of housing construction were directly responsible for a rapid growth of interregional differentials in housing provision and thus might have caused the emergence of the "housing-related" factor as the prime component of interregional inequalities in 1983.

The similarity in the nature of interregional disparities, indicated by the 1972 and 1995 Censuses, is also unsurprising. This reversal of the relative positions of the principle components between the 1983 and 1995 Censuses may be attributed, at least in part, to a roll-back of the 'welfare state' in the middle 1980s. The economic crisis of 1983-85 and subsequent economic reforms, which included privatisation of many publicly held assets and a dramatic reduction of the state's subsidies, caused further economic polarization of Israeli society and growing disparities of income in the 1990s. This reversal of inequality components is illustrated by a decrease in the extent of interregional disparities for most measures from 1972 to 1983, followed by an increase in inequality from 1983 to 1995 (see Fig. 9-10).

9. Conclusions and policy applications

Interregional inequality is a multifaceted phenomenon, which has a variety of manifestations. Once created, these inequalities may become persistent and self-perpetuating, thus leading to serious social divisions [1,2-4,7,11,17,25]. The present

analysis of interregional inequality in Israel and its temporal dynamic makes it possible to gain certain insights into this complex phenomenon and its manifestations:

- The extent of interregional disparities in Israel (as indicated by the most recent Census of Population and Housing, in 1995) appears to differ when different measures of inequality are considered. Thus, population density, ownership of personal computers, ethnic makeup and the percentage of unskilled workers in the population indicate the highest degree of interregional disparities. Concurrently, there are smaller spatial variations when indicators of education, and motorization levels are considered. In general, the patterns of interregional inequalities observed in Israel appear to fit reasonably well those predicted by the proposed "zonal" model of regional development. According to this model, housing and commuting patterns results in the formation of partially overlapping "belts" with a predominant concentration of different income groups, expanding from major population centers of the country towards its periphery.
- Temporal trends are complex: there appears to be *no universal, countrywide tendency for interregional disparities to either converge or diverge.* Population distribution, average income, participation in the labor force, and ethnic makeup have tended to diverge, reflecting greater interregional inequality. Other measures, mostly related to education and housing - average length of study, housing density, and proportion with higher education - reflect a general tendency to converge. As suggested, the mean values of nearly all the factors, which indicate convergence between regions (housing density, average years of schooling, etc.), seem to approach certain quantitative thresholds beyond which no considerable increase may be expected. Other measures, indicating an increase in interregional disparities (population density, average income, etc.) are unlikely to reach any quantitative threshold in a near future. For instance, population density may grow almost indefinitely as long as the overall population of the country increases and land resources diminish.
- Time-related changes in patterns of inequality within various geographic regions of the country appear to be clearly dissimilar. Development in the central part of the country has become more even over time, whereas the peripheral regions have moved towards further intra-regional polarization of their socio-economic

development. These differences are clearly attributed to inter-area differentials in population composition and different maturity of settlement patterns.

- The underlying patterns of interregional inequalities in Israel tend to change over time. While differentials in income and welfare were the main indicators of interregional disparities in the early 1970s, differences in housing were the predominant characteristic of interregional inequalities in the early 1980s. By 1995, education and income emerged as the predominant factors of interregional disparities. These changes are probably related to macro-economic processes in the national economy in the past decades. These include a drastic reduction of public involvement in housing construction in the late 1970s-early 1980, and the transition of the national economy from traditional low-tech industries to high-tech production in the late 1980s-early 1990s. While the former process resulted in the considerable growth of housing differentials among geographic areas, the latter trend resulted in the strengthening of the educational component as the major feature of interregional disparities.

Can regional development policy in Israel reduce spatial inequality in the future, or at least prevent further growth in disparities between the national core and periphery? Though the phenomenon in question is extremely complex, some general development strategies may nevertheless be proposed, based on a counter-balanced approach to regional development suggested in [46]. According to this model, a major reason for the failure of regional policy to reduce polarization between core and periphery is the compensatory method of applying development incentives. Aiming for population dispersal, regional policy in Israel attempted to *compensate* for the relative disadvantages of the country's peripheral regions, such as a lack of urban development, limited employment opportunities and less advanced infrastructure and communication networks, by constructing affordable public housing, providing tax benefits, etc. As the present analysis shows, these measures appeared to have had only a limited success.

We suggest that for regional policy to be more effective, relative disadvantages of peripheral regions should be *counter-balanced* rather than compensated for by indirect means. For instance, lack of urban development in a peripheral region can be reduced by creating dense urban clusters in which small urban settlements share some essential urban functions, such as employment, educational, cultural and recreational

services and facilities, which cannot be sustained individually by each of the small localities (for more details on this strategy, see [28]).

In order to diversify the employment base of peripheral areas, a strategy of redirecting priorities can be employed [18]. This strategy proposes that development resources should be concentrated primarily on a limited number of selected urban communities in the periphery, rather than spread out evenly across all of them. This should be done until they become more attractive to migrants as well as to private developers. Concentrated public support can then be redirected sequentially to other adjacent settlements. Carrying out this policy may, however, be fraught with political difficulties, since equally "deserving" peripheral communities may, at various times, be eligible for differing amounts of government support. It should therefore be carried out while continuing to apply several traditional compensatory policy measures (provision of public housing, tax incentives, etc.), which maintain a substantial differential between all peripheral communities and towns in the core areas. The focused measures should also be part of a clearly defined long-term regional development plan that establishes the sequence in which support is transferred from specific towns to other, and the conditions upon which such transfer of priorities may occur.

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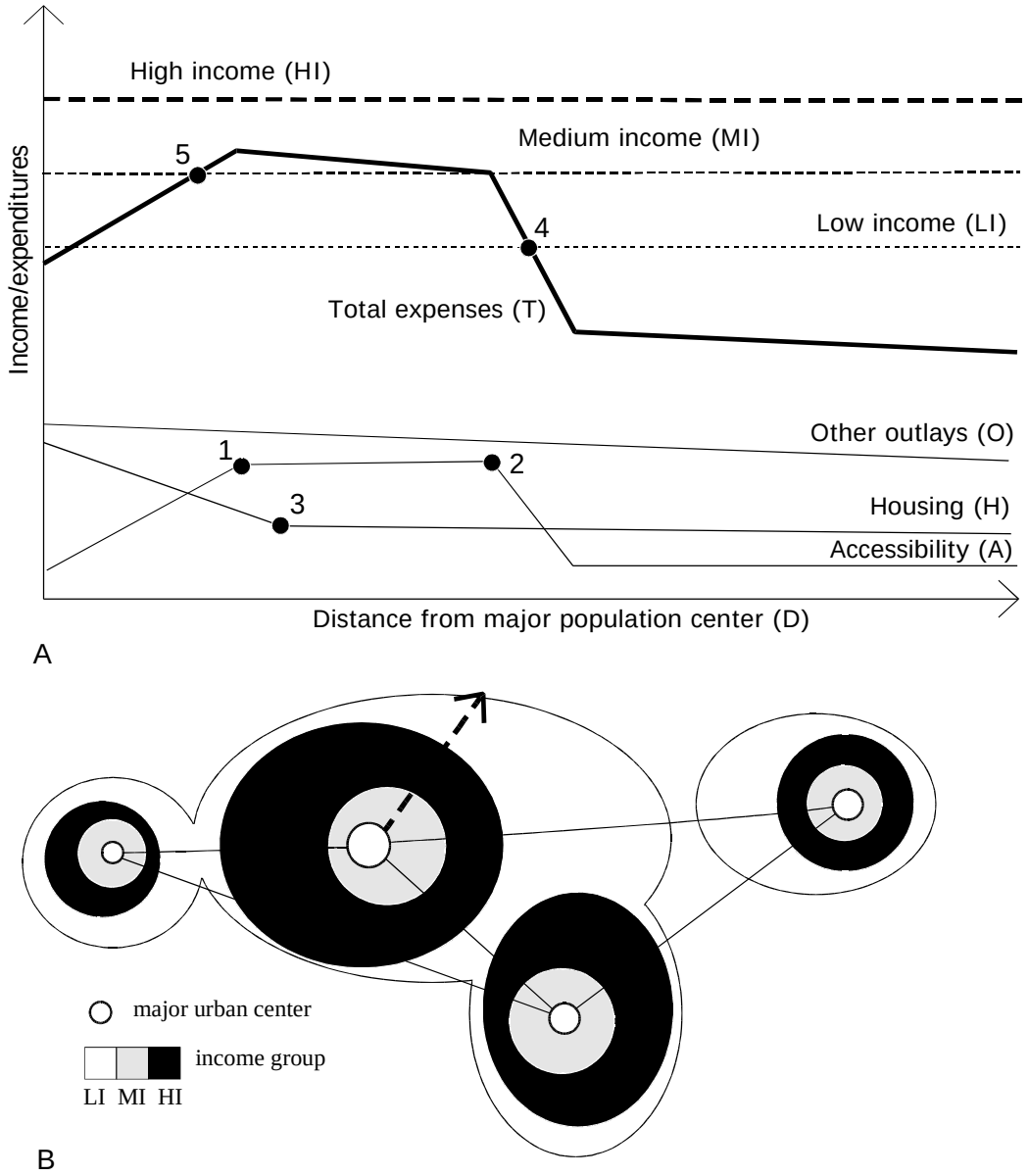

Fig. 1. Concentration of different income groups within a region – explanatory model

The concentration of different income groups within a region is represented as a function of four major determinants – the level of income, housing, commuting and other outlays. In this framework, the location of population with a particular level of income is determined by the geographic extent of the area within which its overall income does not exceed overall expenses on housing, commuting, etc.

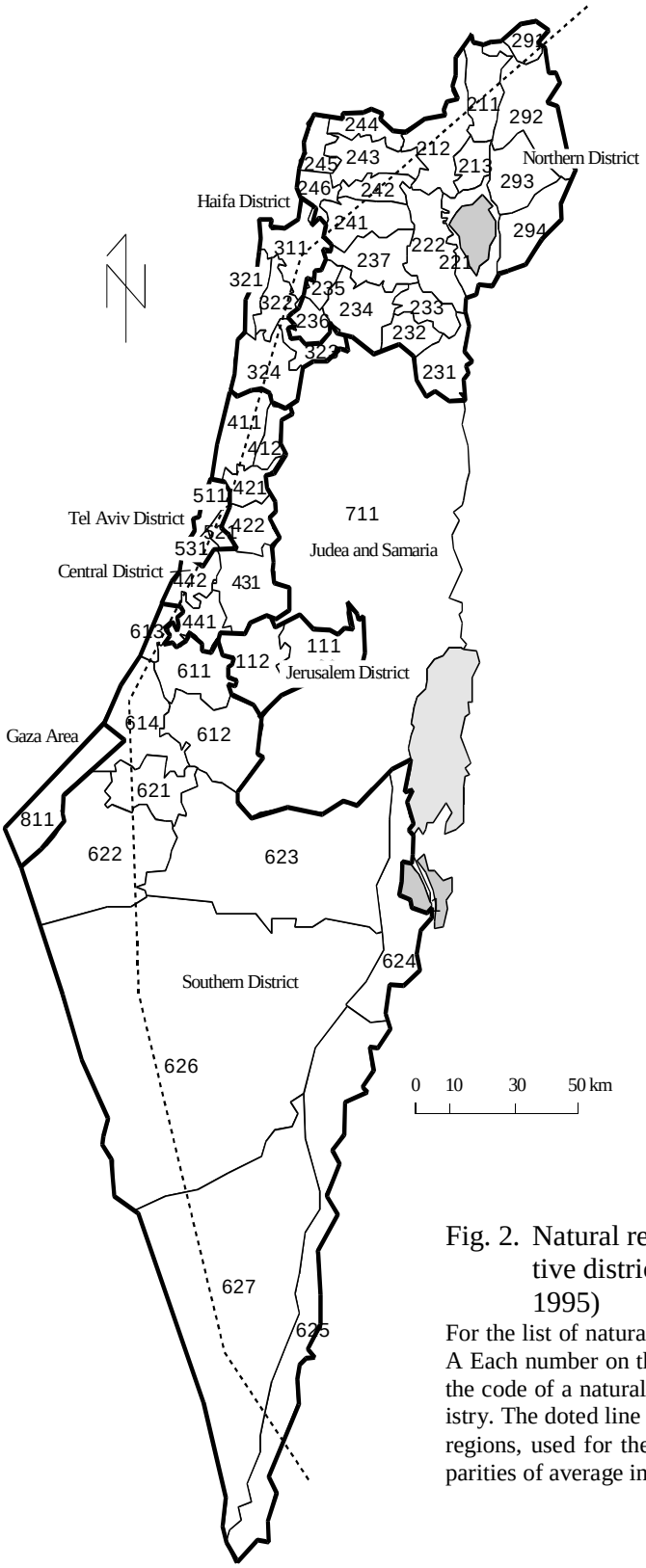

Fig. 2. Natural regions and administrative districts of Israel (as of 1995)

For the list of natural regions, see Appendix 1. A Each number on the diagram corresponds to the code of a natural region in the Census registry. The doted line marks the cross-section of regions, used for the study of geographic disparities of average income.

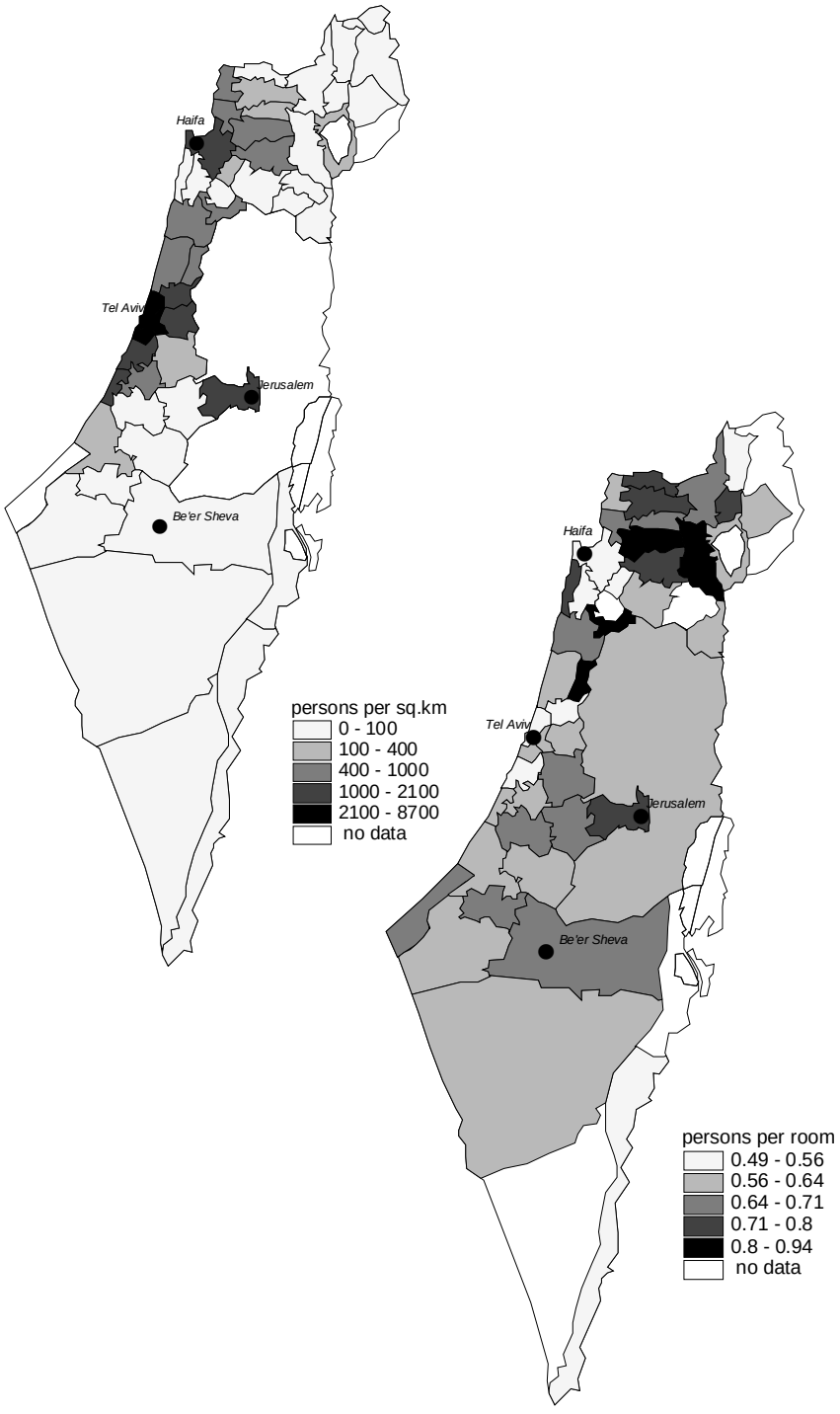

Fig. 3. 1995 Census: indicators of population distribution – population density (left) and housing density (right)

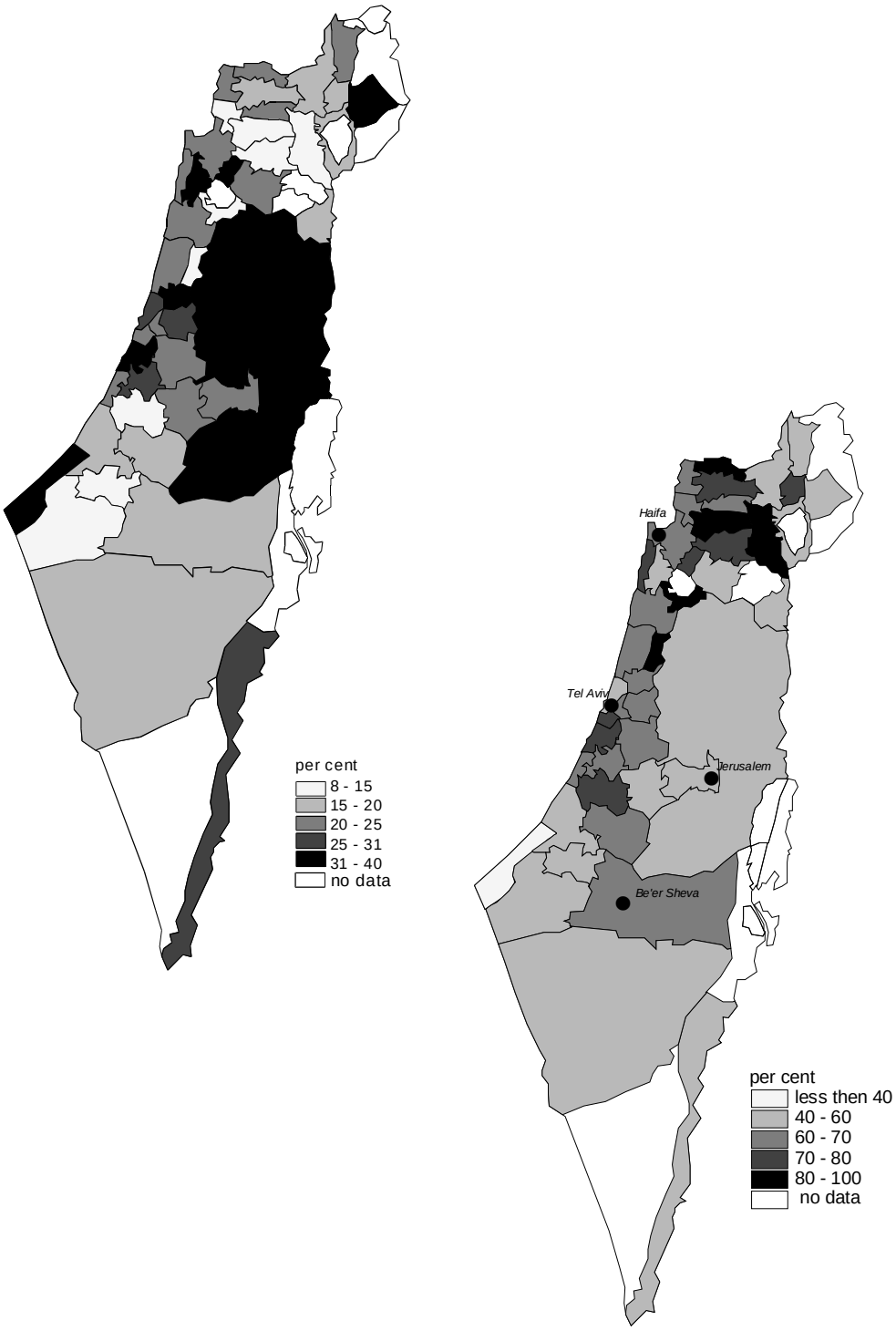

Fig. 4. 1995 Census: indicators of wealth and housing – ownership of personal computers (left) and homeownership level (right)

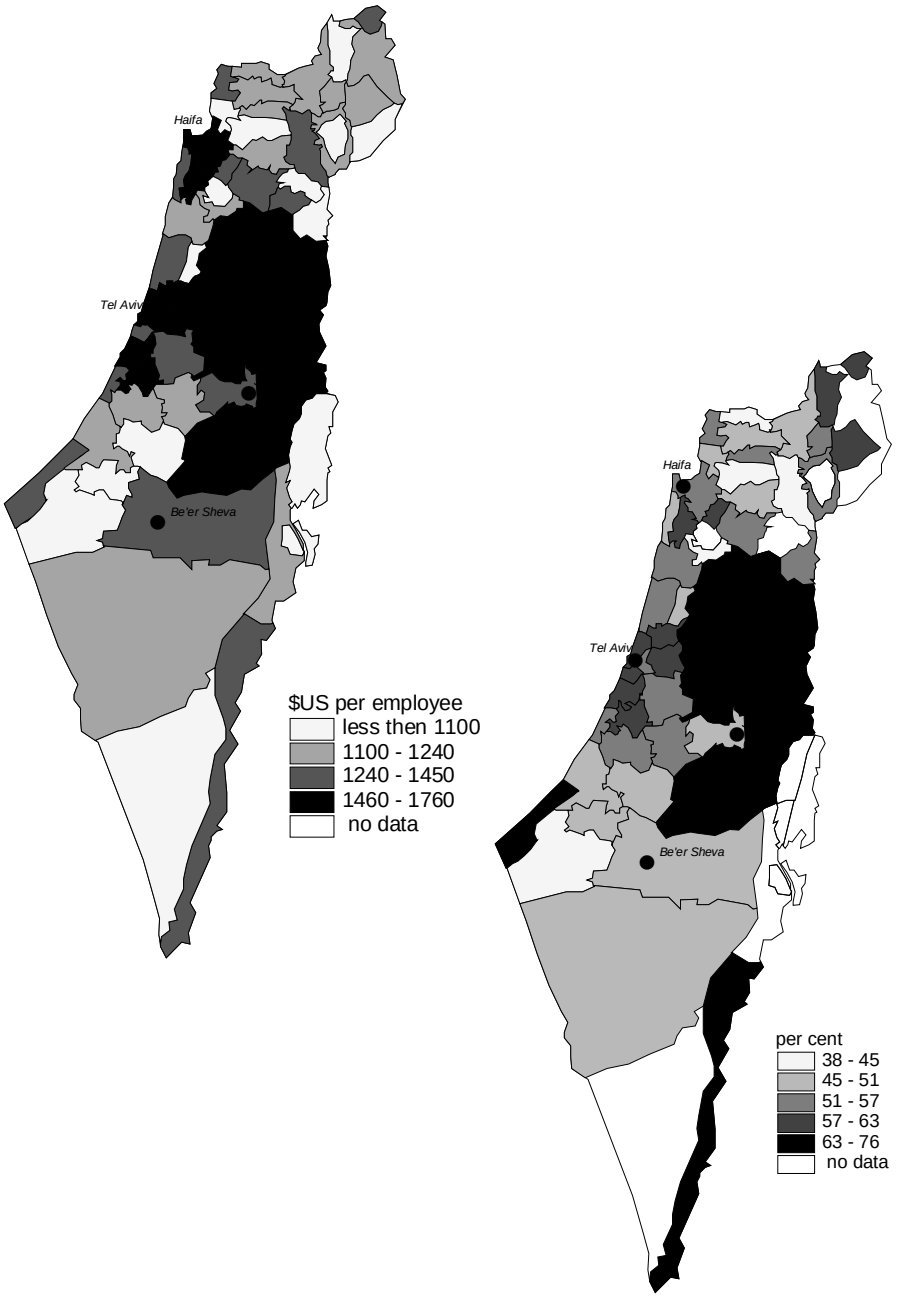

Fig.5. 1995 Census: indicators of employment and wages – monthly income per employee (left) and participation in the labor force (right)

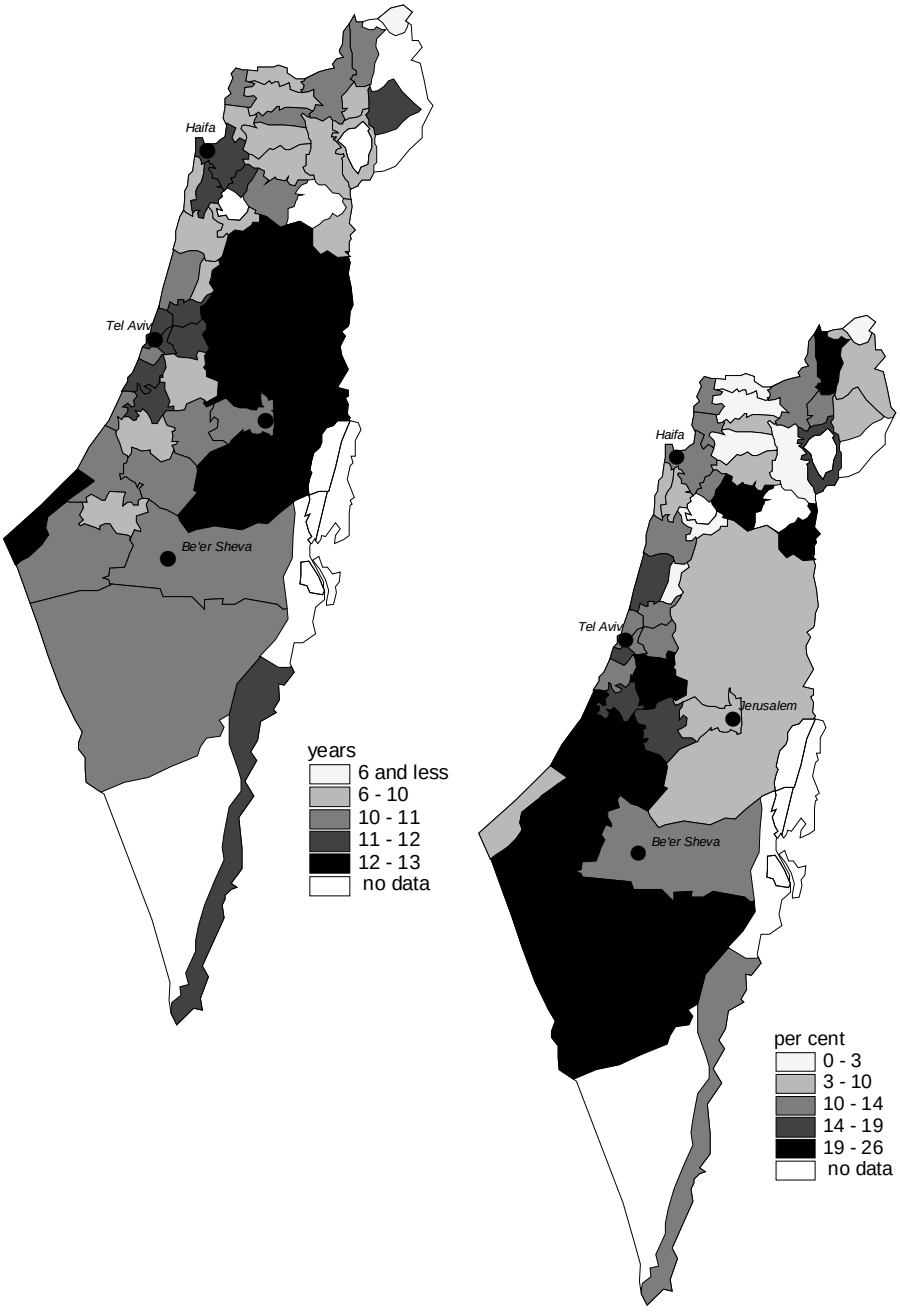

Fig. 6. 1995 Census: indicators of education and ethnic makeup – average years of schooling (left) and percentage of residents who had immigrated from Asia and Africa born – 1st generation (right)

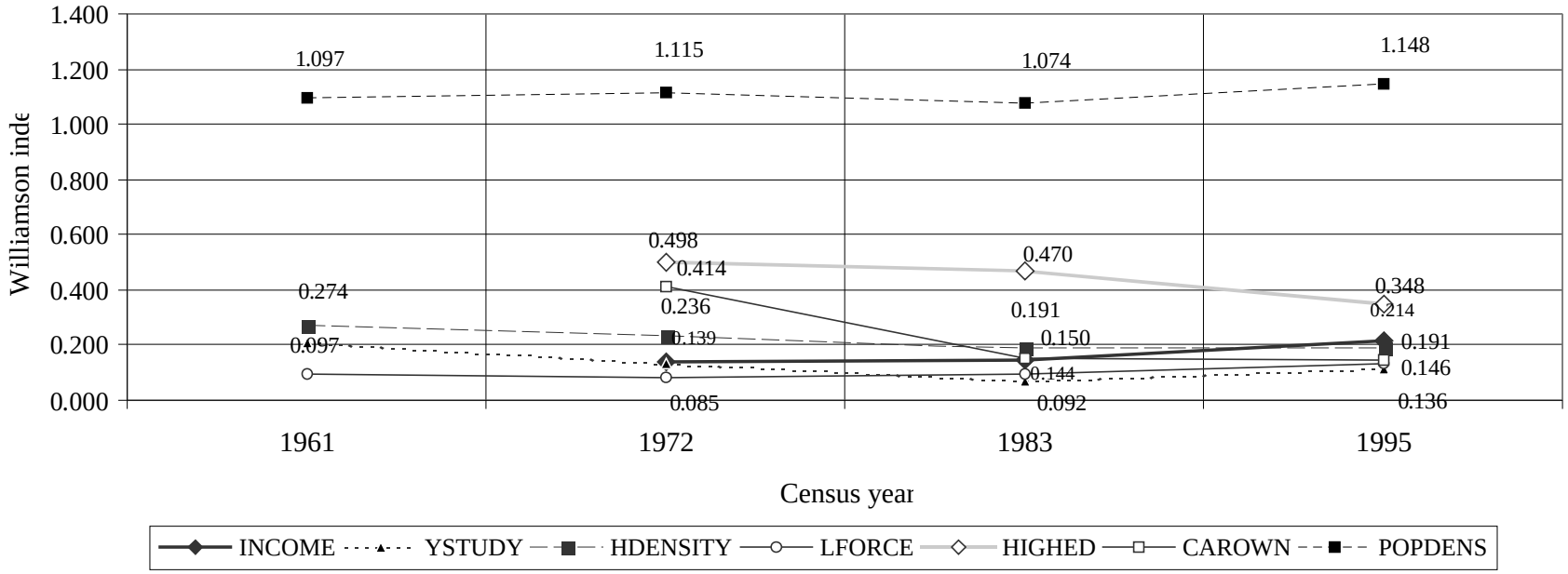

Fig. 7. Changes in selected indicators of interregional inequalities over the whole country (1961-1995 Census data)

Two opposite trends seem to be clear. The indicators of housing conditions and education (housing density, average years of schooling, and percentage of residents with a higher education) show a reduction in interregional inequalities over time, i.e. they *converge*. Indicators related to welfare (excluding car ownership) such as income and participation in the labour force, indicate an opposite trend, i.e. *divergence* of inter-regional disparities with the passage of time.

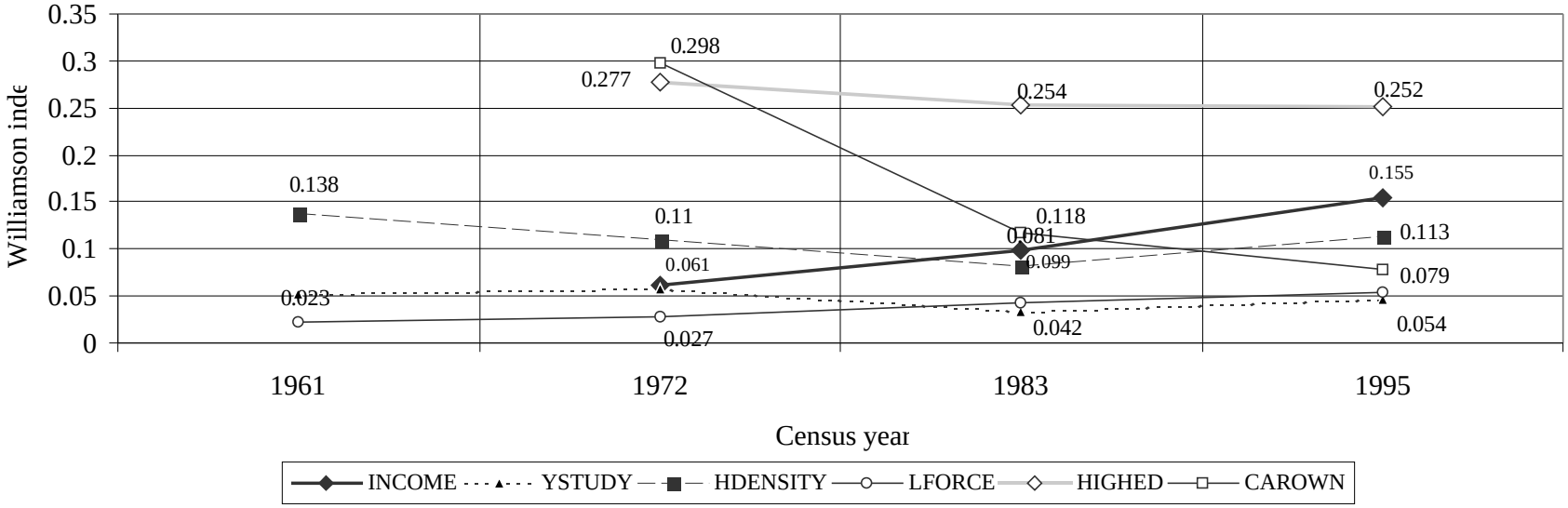

Fig. 8. Changes in selected indicators of intra-regional inequalities – Tel Aviv and Central districts

In the core areas, temporal changes in the extent of interregional inequalities appear to be quite similar to those in the country as a whole.

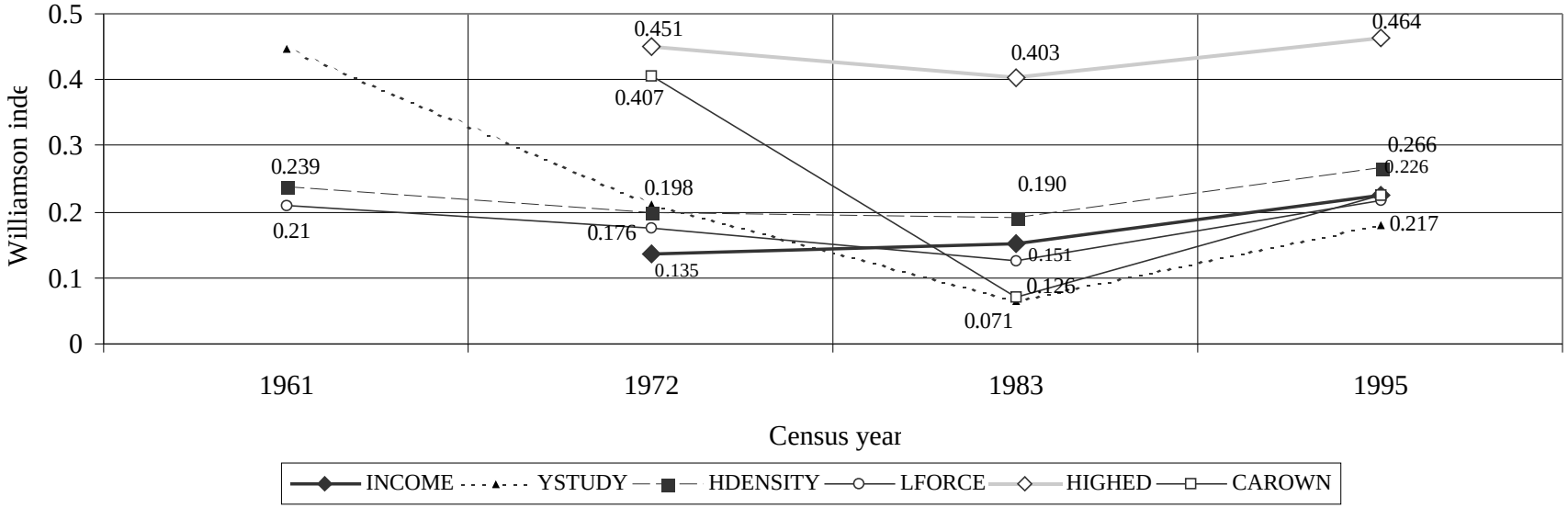

Fig. 9. Changes in selected indicatiors of intra-regional inequalities – Northern district

As in the southern periphery of the country, intra-regional inequalities in the Northern district have also tended to increase over time, especially since the early 1980s. An interesting trend is an obvious convergence of intra-regional inequalities between the 1960 and the early 1980s. This process is less apparent in other geographic areas of the country. Since the early 1980s, however, there has been a reversal of this trend, resulting in increasing intra-regional disparities. This may be attributed to worsening economic conditions in the country as a whole during the mid-1980s (hyperinflation, mass unemployment, etc.), which took a heavy toll on the country's peripheral areas.

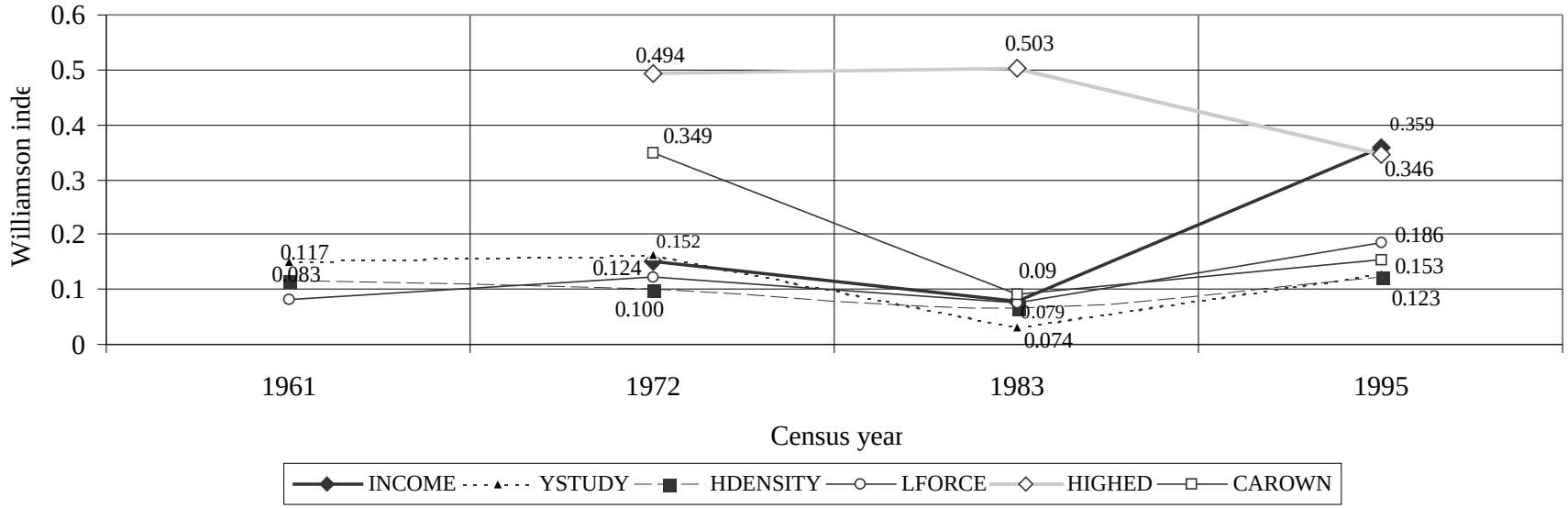

Fig. 10. Changes in selected indicators of intra-regional inequalities – Southern district

In the southern periphery of the country, temporal changes in the extent of interregional inequalities appear to be quite different from those noted in the core and those characteristics of the country as a whole. Excluding the percentage of population with higher education, all measures of inequality have a slight tendency to diverge, especially since the early 1980s.

TABLE 1

Indicators of interregional inequalities according to 1948, 1961, 1972, 1983 and 1995 population counts

Variable	1948	1961	1972	1983	1995
			Weighted mean		
INCOME	-	-	494.50	632.78	2429.03
HSIZE	-	3.90	3.94	3.53	3.24
YSTUDY	-	7.95	9.24	10.89	11.08
HOWNER	-	-	-	72.23	66.95
HDENSITY	-	1.66	1.60	1.19	0.64
LFORCE	-	52.90	48.13	51.76	54.09
MAKEUP	-	44.82	-	36.84	12.51
UNSKILLED	-	-	4.18	4.73	9.36
HIGHED	-	-	5.86	8.73	14.29
POPDENS	43.10	107.60	154.80	186.70	252.80
CAROWN	-	-	59.32	57.41	73.57
PCOWN	-	-	-	-	23.56
			Williamson's index		
INCOME	-	-	0.139	0.144	0.214
HSIZE	-	0.154	0.204	0.183	0.183
YSTUDY	-	0.211	0.131	0.071	0.112
HOWNER	-	-	-	0.149	0.171
HDENSITY	-	0.274	0.236	0.191	0.191
LFORCE	-	0.097	0.085	0.092	0.136
MAKEUP	-	0.393	-	0.408	0.454
UNSKILLED	-	-	0.387	0.867	0.330
HIGHED	-	-	0.498	0.470	0.348
POPDENS	0.943	1.097	1.115	1.074	1.148
CAROWN	-	-	0.414	0.150	0.146
PCOWN	-	-	-	-	0.305

"-" Data are not available.

TABLE 2

1995 Census: factor analysis – total variance explained

Component	Initial eigenvalues			Rotation sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.215	56.499	56.499	4.471	40.650	40.650
2	1.909	17.356	73.855	3.491	31.740	72.390
3	0.865	7.862	81.717			
4	0.765	6.955	88.672			
5	0.411	3.739	92.411			
6	0.322	2.929	95.340			
7	0.170	1.541	96.881			
8	0.153	1.388	98.270			
9	0.119	1.084	99.353			
10	0.050	0.452	99.806			
11	0.021	0.194	100.000			

No of observations	50
Kaiser-Meyer-Olkin measure of sampling adequacy	0.725
Bartlett's test of sphericity – approx. Chi-Square	459.444[a]

Principle component matrix[a]

Variable	Extraction	Component Matrix		Rotated Component Matrix	
		Comp. 1	Comp. 2	Comp. 1	Comp. 2
INCOME	0.820	0.739	0.524	0.750	0.417
HSIZE	0.874	-0.921	0.160	-0.575	0.766
YSTUDY	0.894	0.938	0.123	0.848	-0.429
HOWNER	0.835	-0.641	0.650	-0.113	0.906
HDENSITY	0.868	-0.908	0.209	-0.646	0.661
LFORCE	0.625	0.790	-0.018	0.824	-0.293
MAKEUP	0.852	0.483	-0.786	-0.037	-0.868
UNSKILLED	0.756	-0.796	-0.349	-0.809	0.237
HIGHED	0.822	0.844	0.331	0.866	-0.287
POPDENS	0.392	0.376	0.500	0.453	-0.044
CAROWN	0.387	-0.600	0.165	-0.373	0.555

[a] Extraction method: principal component analysis; rotation method: varimax with Kaiser normalization.

TABLE 3

1983 Census: factor analysis – total variance explained

Component	Initial eigenvalues			Rotation sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.522	59.289	59.289	4.701	42.732	42.732
2	2.149	19.534	78.823	4.041	36.738	79.470
3	0.864	7.851	86.673			
4	0.657	5.975	92.649			
5	0.286	2.604	95.253			
6	0.250	2.274	97.527			
7	0.137	1.245	98.772			
8	0.064	0.567	99.339			
9	0.037	0.339	99.677			
10	0.025	0.230	99.908			
11	0.010	0.092	100.000			

No of observations	40
Kaiser-Meyer-Olkin measure of sampling adequacy	0.761
Bartlett's test of sphericity – approx. Chi-Square	565.513[a]

Principle component matrix[a]

Variable	Extraction	Component Matrix		Rotated Component Matrix	
		Comp. 1	Comp. 2	Comp. 1	Comp. 2
INCOME	0.636	0.781	0.163	-0.472	0.643
HSIZE	0.831	-0.911	0.001	0.683	-0.604
YSTUDY	0.942	0.968	0.064	-0.677	0.695
HOWNER	0.899	-0.556	0.768	0.927	0.200
HDENSITY	0.915	-0.943	0.162	0.810	-0.510
LFORCE	0.792	0.883	-0.112	-0.732	0.506
MAKEUP	0.820	0.585	-0.691	-0.897	-0.124
UNSKILLED	0.755	-0.864	0.089	0.702	-0.512
HIGHED	0.764	0.698	0.526	-0.167	0.858
POPDENS	0.482	0.322	0.615	0.171	0.673
CAROWN	0.835	-0.698	-0.590	0.125	-0.905

[a] Extraction method: principal component analysis; rotation method: varimax with Kaiser normalization.

TABLE 4

1972 Census: factor analysis – total variance explained

Component	Initial eigenvalues			Rotation sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.921	49.208	49.208	4.308	43.079	43.079
2	2.213	22.128	71.336	2.826	28.257	71.336
3	1.137	11.371	82.707			
4	0.576	5.759	88.466			
5	0.474	4.740	93.206			
6	0.272	2.721	95.927			
7	0.192	1.921	97.848			
8	0.105	1.046	98.894			
9	0.082	0.820	99.714			
10	0.029	0.286	100.000			
1	4.921	49.208	49.208			

No of observations	39
Kaiser-Meyer-Olkin measure of sampling adequacy	0.732
Bartlett's test of sphericity – approx. Chi-Square	339.925[a]

Principle component matrix[a]

Variable	Extraction	Component Matrix		Rotated Component Matrix	
		Comp. 1	Comp. 2	Comp. 1	Comp. 2
INCOME	0.779	0.765	0.441	0.881	-0.058
HSIZE	0.970	-0.940	-0.295	-0.974	-0.150
YSTUDY	0.958	0.734	-0.648	0.373	0.905
HDENSITY	0.900	-0.940	-0.130	-0.901	-0.298
LFORCE	0.624	0.409	-0.676	0.069	0.787
MAKEUP	0.248	-0.211	0.451	0.010	-0.498
UNSKILLED	0.588	-0.430	0.635	-0.105	-0.760
HIGHED	0.432	0.657	0.024	0.600	0.268
POPDENS	0.209	0.399	0.223	0.456	-0.024
CAROWN	0.744	0.834	0.222	0.846	0.168

[a] Extraction method: principal component analysis; rotation method: varimax with Kaiser normalization.

APPENDIX 1

Districts and Natural Regions of Israel (as in 1995 census)

Code	District	Natural region	Code	District	Natural region
111	Jerusalem	Judean Mountains	323	Haifa	Alexander Mountains
112	"	Judean Foothills	324	"	Hadera Region
211	Northern	Hula Basin	411	Central	Western Sharon
212	"	Eastern Upper Galilee	412	"	Eastern Sharon
213	"	Hazor Region	421	"	Southern Sharon
221	"	Kinerot	422	"	Petah Tiqwa Region
222	"	Eastern Lower Galilee	431	"	Lod Region
231	"	Bet She'an Basin	441	"	Rehovot Region
232	"	Harod Valley	442	"	Rishon LeZiyyon Region
233	"	Kokhav Plateau	511	Tel Aviv	Tel Aviv Region
234	"	Yizre'el Basin	521	"	Ramat Gan Region
235	"	Yoqne'am Region	531	"	Holon Region
236	"	Menashe Plateau	611	Southern	Mal'akhi Region
237	"	Nazareth-Tir'an Mountains	612	"	Lakhish Region
241	"	Shefar'am Region	613	"	Ashdod Region
242	"	Karmi'el Region	614	"	Ashqelon Region
243	"	Yehi'am Region	621	"	Gerar Region
244	"	Elon Region	622	"	Besor Region
245	"	Nahariyya Region	623	"	Be'er Sheva Region
246	"	Akko Region	624	"	Dead Sea Region
291	"	Hermon Region	625	"	Arava Region
292	"	Northern Golan	626	"	Northern Negev Mountain
293	"	Middle Golan	627	"	Southern Negev Mountains
311	Haifa	Haifa Region	711	Judea and Samaria	Judea and Samaria
321	"	Karmel Coast			
322	"	Zikhron Ya'akov Region	811	Gaza	Gaza Area