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Metropolitan Growth and Population Development at a National Level

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METROPOLITAN GROWTH AND POPULATION DEVELOPMENT AT A NATIONAL LEVEL

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FOREWORD

Roughly 1.8 billion people, 42 percent of the world's population, live in urban areas today. At the beginning of the last century, the urban population of the world totaled only 25 million. According to recent United Nations estimates, about 3.1 billion people, twice today's urban population, will be living in urban areas by the year 2000.

Scholars and policy makers often disagree when it comes to evaluating the desirability of current rapid rates of urban growth and urbanization in many parts of the globe. Some see this trend as fostering national processes of socioeconomic development, particularly in the poorer and rapidly urbanizing countries of the Third World; whereas others believe the consequences to be largely undesirable and argue that such urban growth should be slowed down.

This paper focuses on heterogeneity in the population totals designated as urban in normal projections of urbanization. It demonstrates convincingly that patterns of population dynamics in large metropolitan areas differ significantly from those exhibited by smaller urban centers. The authors therefore conclude that urbanization scenarios cannot be adequately modeled without a prior specification of the spatial pattern of urbanization that is expected to evolve.

A list of the papers in the Population, Resources, and Growth Series appears at the end of this paper.

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ABSTRACT

This paper demonstrates the importance of treating urban populations as heterogenous when making national population projections. Large metropolitan areas are shown to exhibit specific patterns of migration, age composition, and fertility when compared with urban areas as a whole. It is argued that the path of demographic change at a national scale is not independent of the urbanization scenario selected, i.e., one emphasizing the expansion of large cities or, alternatively, a balanced settlement hierarchy.

CONTENTS

METROPOLITAN GROWTH AND POPULATION DEVELOPMENT AT A NATIONAL LEVEL

INTRODUCTION

The interdependence of economic development, population change, and urbanization has attracted the attention of a large number of scholars and institutions during recent years (see, for example, United Nations 1981; IIASA Reports 1980). Yet research results have so far had a limited impact on ways and means in which national and international projections of population development are made. The country of Bangladesh may serve as a case in point. Its total population of 80 million (1975) has typically been projected to reach the figure of some 160 million in the year 2000. One should note that a population of that size in Bangladesh would imply an average density of 1100 inhabitants per sq.km., almost four times the present density of Japan, and only one fourth of the present density of Hongkong. If the population of Bangladesh were to reach that figure, it would have to become at least 60 percent urban (instead of 20 percent as it was in 1975) in which case its fertility would probably decline much faster than assumed in the projection. Admittedly no one has considered an economic development scenario which would allow for a five-fold increase in the urban population over the span of 25 years.

A major recent study claims (wrongly, one may hope) that "the internal migration will not likely affect world population growth beyond the low and high growth rate projections that surround the medium-growth series" (The Global 2000 Report, 1980, p. 38). Nevertheless, assuming the dwindling opportunities for international migrations (at least in relative terms) and ruling out mortality increases, one can look at urbanization as the only acceptable way of relieving the growing population pressure on agricultural land, a mounting problem for many less developed countries. Although fertility decline on a national scale can not be attributed to urbanization per se, the latter tends to be strongly associated with the former's "primary" factors which, according to Keyfitz (1981) include changing marital patterns, health and education status, and family-planning programs.

This paper demonstrates the importance of treating urban populations as heterogeneous when making national population projections. It hypothesizes that large metropolitan areas exhibit specific patterns of migration, age composition, and fertility when compared with urban areas as a whole. In particular, such areas are characterized by relatively low levels of reproduction of the population. Hence, it is argued that the path of demographic change at a national scale is not independent of the urbanization scenario selected, i.e., one emphasizing the expansion of large cities or, alternatively, a balanced settlement hierarchy.

The next section briefly reviews selected literature concerning urban-rural population projections. In the following section, the demographic structure of large metropolitan areas in highly urbanized countries is confronted with that of their total urban population. Subsequently, a case of a less developed country is introduced and simulations of its alternative patterns of urban development examined. The final section discusses issues concerning policies of urbanization and population redistribution.

APPROACHES TO URBAN-RURAL POPULATION PROJECTIONS

The disaggregation of population by rural and urban residence has consistently been used in the United Nations statistics as well as analytical studies.[1] The U.N. Demographic Yearbook, 1972 edition included a special section on "statistical definitions of urban population and their uses in applied demography". A manual was produced called *Methods for Projections of Urban and Rural Population* (United Nations 1974), and the methods were subsequently applied to the analysis of the world's population growth during 1950-2000 (United Nations 1980).

The procedure followed in the latter study involves extrapolating into the future the recently observed urban-rural growth differences, using weights for subsequent projection periods (five-year intervals). The weights are derived by regressing observed differences on the initial proportion of urban population for 110 countries. The method captures a regularity, according to which differences (always greater than zero) between the rate of growth of urban and rural areas decline as the proportion of the total population living in urban areas increases. However, as it deals with redistribution of an *a priori* projected total national population, the procedure does not allow one to trace any effects that urbanization may have on overall population dynamics in a country or group of countries. It also implies that urban population would eventually equal the total when projected far enough into the future.[2]

Those limitations are avoidable, at the cost of greater data requirements, by means of using multistate demographic models. First, Rogers (1977) showed how different assumptions concerning fertility and migration change within a hypothetical country interact to produce alternative patterns of growth of national, urban, and rural populations. Later, Rogers and Philipov (1979) produced a detailed account of computational biases arising from decomposition of a national population into its urban and rural parts, the aggregation across age groups, and the inclusion of net rather than gross migration flows between rural and urban areas. They also identified ways of using multistate models in order to trace various population subcategories (such as stayers, aliens, and returnees) within urban and rural categories over time.

More recently, Rogers (1981) generated a number of projections of urban and rural population using a gross disaggregation by age groups and deriving assumptions on rural-urban migration patterns from the concept of mobility revolution. He assumed a bell-shaped curve to describe cross outmigration from rural areas, i.e., rates evolving from a level initially below that of the urban rate and achieving a maximum during a later stage of the country's industrialization. Outmigration rates from urban areas were kept constant and the effects of rural-urban differentials in fertility and mortality on the urbanization level were not considered in that series of population projections.

The next step in building urban-rural projections is pointed out by Keyfitz (1982:8-9):

> It can be shown mathematically that if subgroups are projected separately on geometric increase, and the results added, that additive total will be greater than the simple total obtained by projecting the whole at a rate of increase equal to the weighted average of the initial rates of increase of the subgroups... But this general effect, which for short-time intervals and moderate differential rate of increase is small, is overwhelmed by a quite different effect in the case of a decomposition into rural and urban parts. In most places and times the urban birth rate is lower than the rural, and if one allows for a shift of population from rural to urban, as it is taking place in the less developed countries of the world today, the projection to future times would on this account come out lower. Work is now underway ... to improve the calculation by a multiregional approach within each country.

If one follows this concept of looking at urbanization as an agent of demographic transition (and, for the time being putting aside social and economic forces that bring urbanization about), a question arises pertaining to the correspondence between population disaggregation as used in the projection studies and observed variations of demographic characteristics within national population aggregates. In other words, are variations within both urban and rural populations sufficiently great to warrant the use of alternative, more detailed disaggregations? One such scheme, extensively tested in IIASA's Migration and Settlement study is the regional division. Regional disaggregations however are specific to individual countries and results thus obtained do not easily yield to international comparisons (see Rees and Willekens 1981). An alternative decomposition of the urban population by city-size categories is beset with both practical (lack of data) and conceptual difficulties. Although ample evidence exists (see, for example, Jagielski 1975) showing that urban places situated at each end of a city rank-size distribution differ in terms of fertility and migration patterns, it is not clear whether corresponding variations should also be matched with intermediate levels of the urban-size hierarchy. This scepticism is reinforced if an analogy is drawn to measures of economic performance as applied to city-size distribution concepts (for a recent attempt, see Sheppard 1982).

Resorting to simpler aggregations again, various doubts have been expressed with respect to accuracy of "biregional" decompositions into rural and urban populations. These limitations are aptly summarized in the U.N. Report on World Population Trends and Policies:

> First of all, in almost every country different criteria are used to distinguish "urban" from "rural" localities. The diversity of definitions partly reflects the fact that, under the greatly varying national conditions, what may appear as comparatively "urban" in one country can still appear to be rather "rural" from the viewpoint of another country ...[3]. Secondly, it is questionable whether the simple two-fold distinction between "urban" and "rural" localities is significant enough, given the fact that the way of life in big cities sometimes differs more from that in small towns than the latter may differ from villages. In the third place, in heavily urbanized countries a further differentiation has been emerging, owing to an increased geographical dispersal of populations in regions under the more or less direct influence of urban centers giving rise to a new type of environment that is no longer adequately covered by either of the two traditional concepts of "urban" and

> "rural". For these reasons, the comparability and sufficiency of international compilations of "urban" and "rural" population are no longer all that one might wish (United Nations 1979:111-112).

Indeed, the distinction between metropolitan areas and remaining areas, both urban and rural, may be considered as a viable alternative to the urban-rural division of the population. The former dichotomy was emphasized by classical sociological concepts of urbanization (Wirth 1938). Nevertheless, definitional problems, including the lower limit of population size and urban boundaries, are similar in both cases.

In the present paper a threefold disaggregation of a national population into rural, metropolitan, and remaining urban parts, is tested. Operationally, such a division seems parsimonious enough in terms of data requirements. On the policy side, it allows one to tackle some basic questions pertaining to relationships between urbanization strategies and population development. A large-city population generates specific demands for housing and services and its labor force exhibits some very particular characteristics when compared with a small-town population. Conceptually, the threefold disaggregation is oriented to a few hypotheses on patterns of urban change in highly urbanized countries, focusing on relationships between the decrease of net migration towards large urban agglomerations and the declining fraction of the rural population within the country as a whole, as well as on a reorientation of hierarchical urban-to-urban migrations (Alonso 1978; Korcelli 1981a).

Since population projections based on different disaggregations yield different results, one should aim at a disaggregation that is most meaningful in the sense that it does not average out important variations found in the system. Using this criterion, the proposed disaggregation of comparative national population projections should be regarded as a compromise solution. Assuming relevant data exist, more detailed decompositions may be justified, such as division of metropolitan areas into cores and rings—areas characterized by distinct patterns of population composition and change, and strongly interacting by means of commuting and residential relocation (Frey, forthcoming).

THE POPULATION OF METROPOLITAN AREAS: THE URBANIZED COUNTRIES

If one accepts the three-tier disaggregation on conceptual grounds, it still remains to be demonstrated that the observed demographic differences between large metropolitan areas and other urban areas are somehow systematic while their magnitude is comparable to that of urban-rural differentials. Furthermore, if effects of metropolitan-urban differentials in the course of national demographic transition are to be found persistent and of a long-range nature, they should be identifiable at various transition stages. Hence, empirical evidence to be discussed in this section involves some highly urbanized countries and those characterized by intermediate levels of urbanization.

The data referred to describe intra-national patterns of population mobility, age-composition, and fertility and is borrowed from IIASA's Comparative Study on Migration and Settlement. Rogers and Castro (1981) and Korcelli (1981b) used that material to derive some generalizations concerning migrations in and out of major metropolitan areas, vis-à-vis other regions (both urban and rural). They found, among other things, that: (a) the population of large metropolitan areas is characterized by lower outmigration rates when compared with rural and non-metropolitan populations; (b) the age-profile for outmigration from metropolitan areas is less dominated by its "labor components" than are other interregional migration profiles; (c) migrations between pairs of urban regions within a country are such that the destination-specific outmigration rates are higher for regions with a smaller population size (and with smaller urban centers).

So far as in- and net migration patterns were concerned, the differences between those urban regions which are dominated by large cities and all other regions (both urbanized and predominantly rural) were also noticeable, although they were assuming either positive or negative values depending on overall population dynamics and urbanization at the national level (Korcelli 1981b).

General features of the age composition of metropolitan populations as compared with total urban and total national populations will be analyzed in this paper for seven countries: the Netherlands, Sweden, the FRG, Poland, Hungary, Bulgaria, and Japan (see Figure 1-3).[4] Three of these countries are 50-58 percent urban, while the other four have between 72 and 84 percent of their total population living in urban areas. As anticipated, the major metropolitan areas within these countries all reveal a higher concentration of their population in early labor-force ages (in particular the 25-29 category), than does either the total or total urban population. Secondly, these areas have typically a low proportion of their population in the childhood and teen-age years (5-19 years). Thirdly, the population in ages 55 and above is distinctly "overrepresented" in the metropolitan areas of four out of the seven countries (the Netherlands, the FRG, Poland, and Hungary), whereas it is strongly "underrepresented" in the remaining three (Sweden, Bulgaria, and Japan). In the other age categories the pattern is less clear; for example the relative proportions accounted for by the 0-4 age category largely depend upon the magnitude of difference with respect to the highest fertility groups of 25-29 or 20-24 years. Similarly, the ascendency of the metropolitan areas in the age categories of 30-34 and 35-39 years occurs typically in those cases where the proportion of the metropolitan population in the post-labor force ages is low relative to corresponding national and urban totals.

Within these rather general patterns of age distribution, each of the countries examined presents some more specific characteristics which may be traced back to fertility differentials and past migration patterns. For example, the profiles for the Netherlands may be interpreted as reflecting, compared with other countries, low levels of net migrations and small differences in birth rates between rural, urban, and metropolitan areas. In the FRG the dominance of Hamburg in the 30-34 age

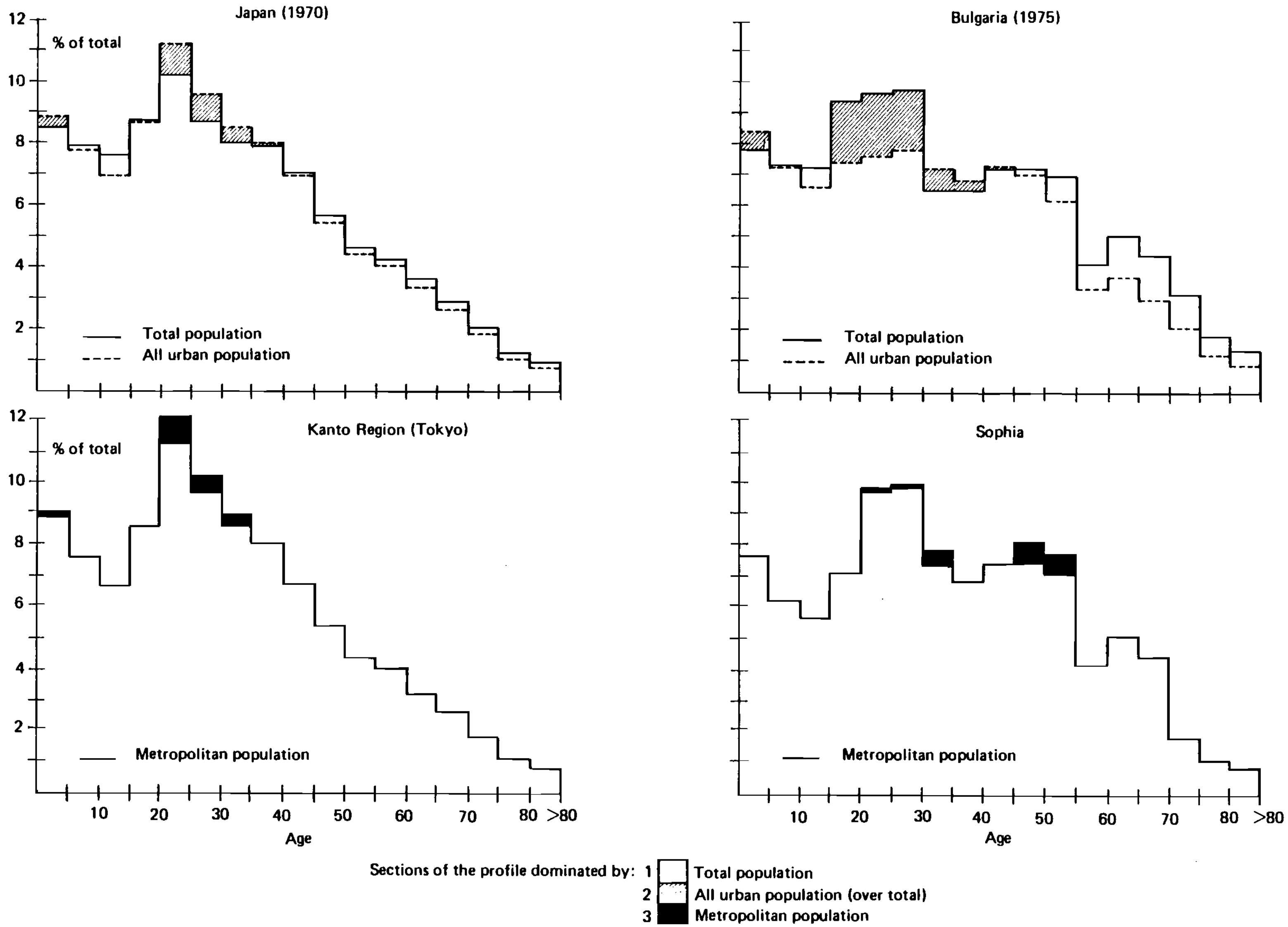

Figure 1. Age profiles of the total, all urban, and metropolitan populations: Japan and Bulgaria.

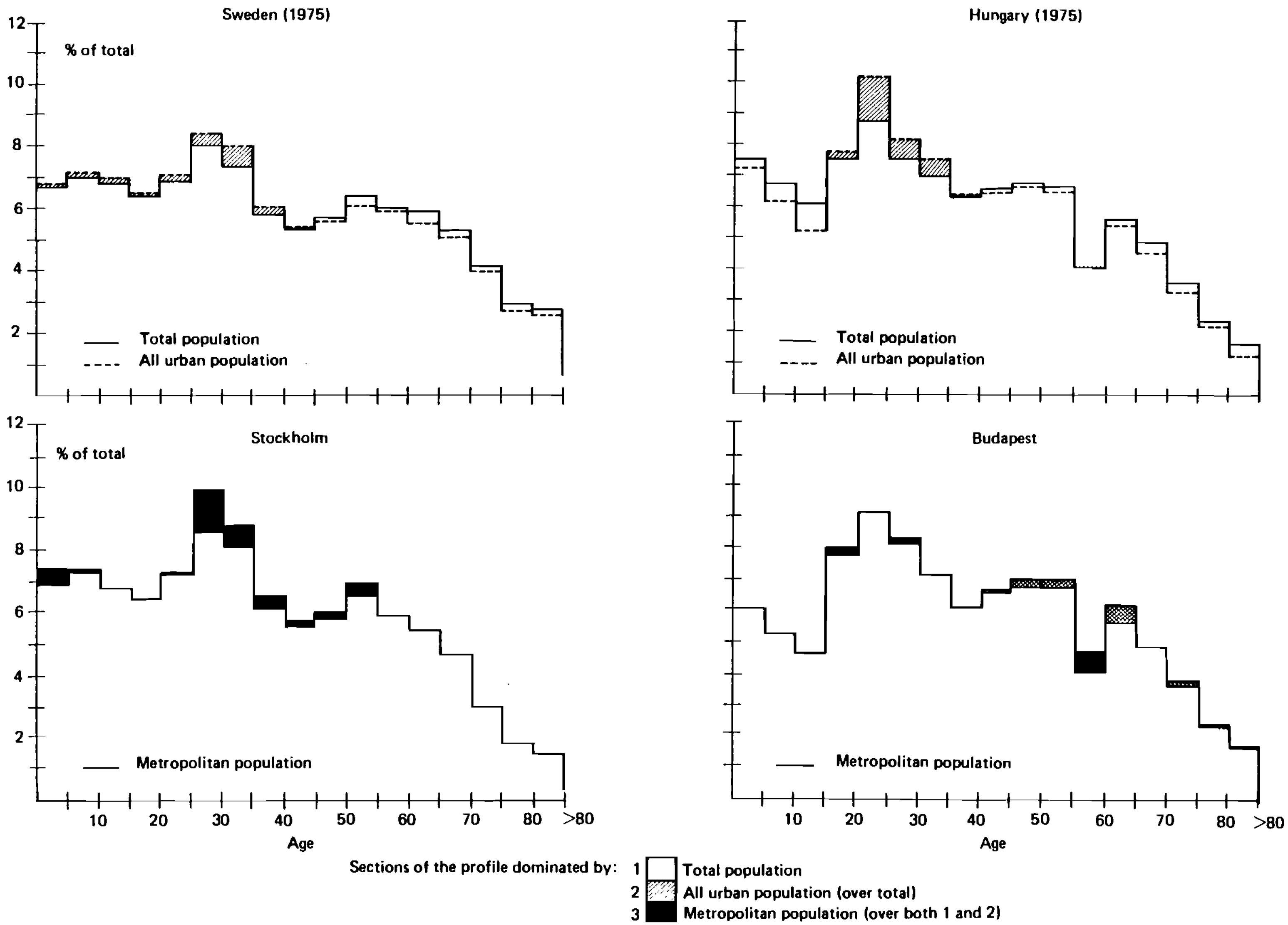

Figure 2. Age profiles of the total, all urban, and metropolitan populations: Sweden and Hungary.

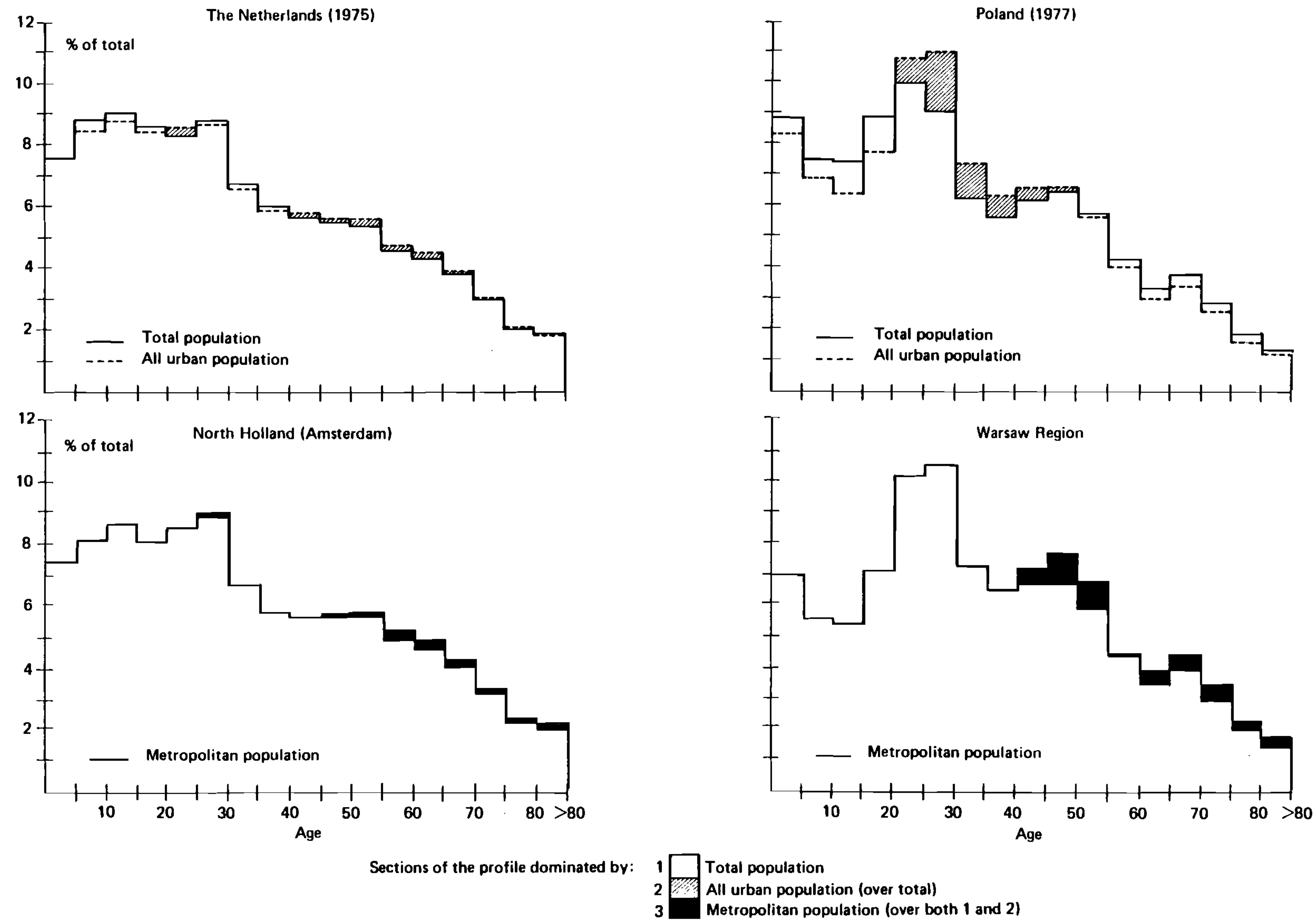

Figure 3. Age profiles of the total, all urban, and metropolitan populations: the Netherlands and Poland.

group (rather than the 20-24 and 25-29 categories) is attributable to intensive inmigration during the 1960s and its subsequent decrease since then. The relatively "young" population of Stockholm within an otherwise demographically stabilized society may reflect the housing policies catering to families with small children (relative concentration occurs both in the 25-35 and in 0-4 ages). Migration policies are clearly reflected in the age structure of the urban agglomerations in Poland, in particular in the case of Warsaw. It is the middle-sized rather than the largest cities that have the highest proportion of their total population falling in the 20-29 age categories. On the other hand, the metropolitan areas show a strong population concentration in ages 40-49 and over 60. Similar patterns prevail in Hungary where migrations from rural areas to middle-sized cities have predominated. The capital region of Budapest maintains its ascendency mainly in the 40-65 age categories.

Sophia's strong dominance in the 45-55 age groups indicates its vigorous expansion during the 1950s. Even now, Bulgaria's capital region keeps pace, in terms of inmigration flows, with other urban areas of that country whose urbanization is a rather recent phenomenon. The urban birth rates are higher than the rural ones since so much of the population in the reproductive ages live in urban areas. The rural areas house most of the aged. Even more distinctive differentiation (along the same lines as in Bulgaria) is found between the metropolitan, all urban, and the total population of Japan.

One conclusion is that differences in the age composition between the metropolitan and all urban populations are unquestionable in all the seven countries examined, although such differences show more than one pattern. Secondly, and more significantly, in terms of the proportion of the population falling into individual age-categories, the metropolitan areas are typically characterized by extreme values when compared with the two alternative aggregations (see Table 1). Only in 11 out of 119 cases (7 countries times 17 age groups) does the proportion for metropolitan areas fall between those for the total and all urban areas. The dominant cases are those in which the percentage share of the metropolitan population within a given age group assumes extreme (highest or lowest) values, when compared with the respective shares for the total population and all the urban population. As Figures 1-3 and Table 1 indicate, the age structure of the total urban population is transitional between the respective distributions for the total and the metropolitan populations.

Table 1. Order of percentages of the total (t), total urban (u) and metropolitan (m) population within individual 5-year age categories.

Relative Values			Number of members in the class
Highest	Intermediate	Lowest	
u	t	m	13
m	t	u	22
t	u	m	37
m	u	t	31
t	m	u	4
u	m	t	7

Note: Data in Figure 1-3 correspond to Noord Holland in the Netherlands, Warsaw region in Poland, and Kanto region in Japan.

Differences in fertility patterns between the total urban and metropolitan populations are also of a systematic character. Gross birth rates are consistently lower for the metropolitan areas and age-fertility schedules more flat than for the total urban areas. This was found for each of the seven countries and is illustrated for some of them (Figure 4). Due to the age composition effect, metropolitan crude birth rates for the Sophia and Kanto regions are actually higher than those for either the total or total urban population in the respective countries.

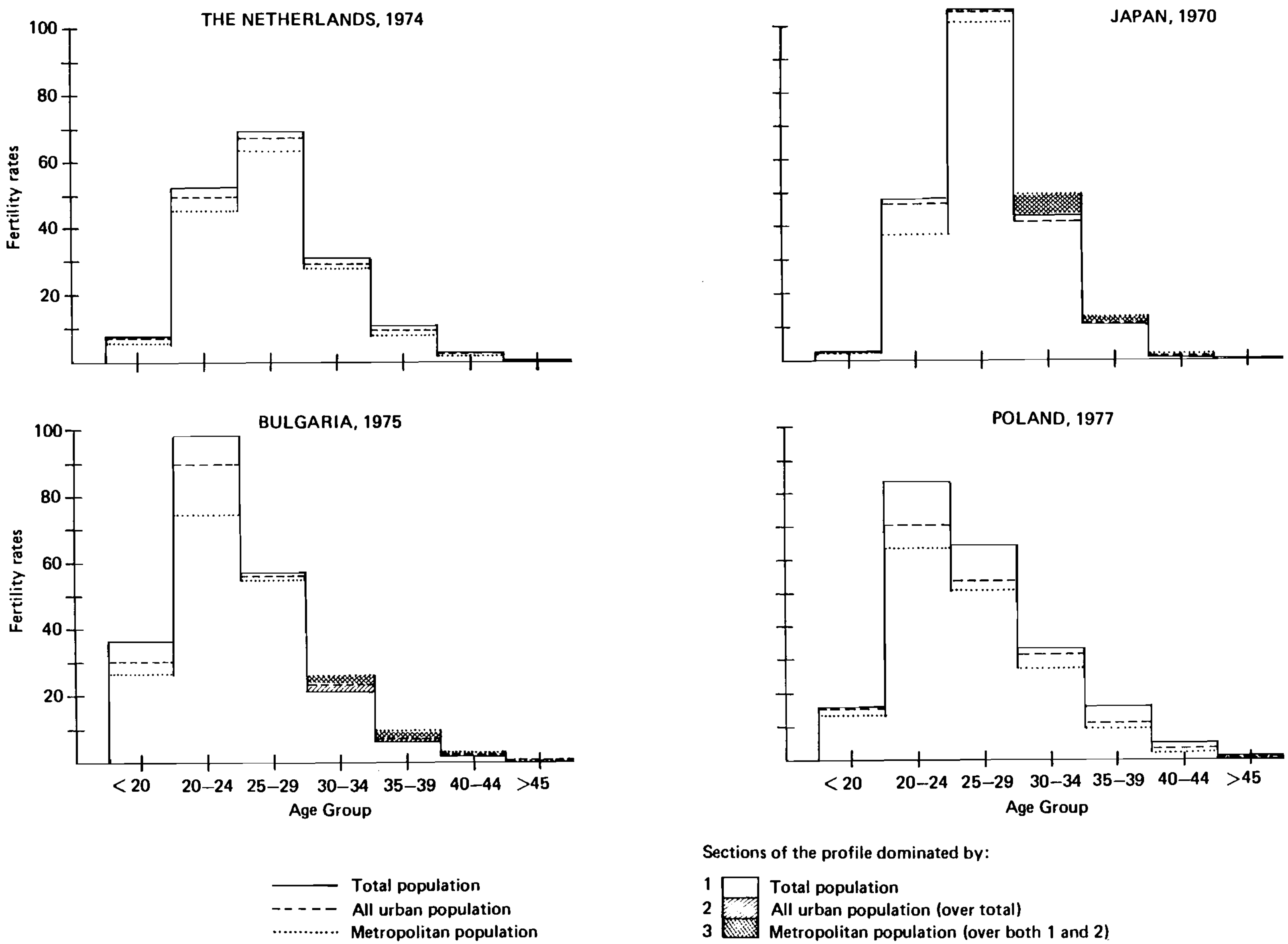

Figure 4. Age-specific fertility rates for selected countries.

Still, the gross fertility rates in metropolitan areas are consistently lower than those for all urban areas, and the respective differences are comparable to total versus all urban population differentials. Such differences have pronounced effects on the age composition; for example, on size-relationships between the 25-29 (or 20-24) and 0-4 age categories. As data in Table 2 show, the generational replacement, incomplete for all countries and aggregations, is most pronouncedly negative in the metropolitan areas.

To summarize, the metropolitan areas are characterized by specific patterns of migration, fertility, and age composition when compared with urban areas as a whole. Due to higher inmigration rates the metropolitan population reveals a strong overrepresentation of young adults. However, owing to a flattened age schedule of fertility rates the relative concentration of the population in the reproductive ages does not necessarily result in higher birth rates in the large metropolitan areas.

POPULATION IN METROPOLITAN AREAS OF LESS DEVELOPED COUNTRIES: THE CASE OF SOUTH KOREA

As discussion in the previous section suggests, the differences in basic demographic patterns between major metropolitan areas and other urban areas within individual countries tend to be bigger at intermediate than at high levels of urbanization. By extending this relationship one may expect this heterogeneity to be even greater in the less developed countries, as a consequence of apparently wider differentiation in living conditions between large cities and smaller local towns.

The economic, social, and ecological milieu prevailing in the large cities of the Third World is particularly conducive to the decline in rates of reproduction, the trend generally characteristic of the later stages of the demographic transition. Distorted sex balances and unemployment lead to lower family formation rates[5], while crowding accompanied by higher female labor activity and generally higher socioeconomic expectations are among the factors leading to smaller family sizes within

Table 2. Differences in percentage shares of selected age groups between the total, all urban, and metropolitan populations.

	Percentage Share for Age Groups								
	Total		All Urban		Metropolitan[a]		Differences (B - A)		
Country	0-4	25-29 (20-24)	0-4	25-29 (20-24)	0-4	25-29 (20-24)	Total	All Urban	Metropolitan
The Netherlands	7.52	8.79	7.53	8.67	7.39	9.00	1.27	1.14	1.61
FRG	5.78	6.52	5.54	6.15	4.25	6.73	0.74	0.61	2.48
		(6.82)		(6.81)		(6.11)	(1.04)	(1.27)	(1.86)
Sweden	6.72	8.09	6.82	8.45	7.41	9.93	1.37	1.63	2.52
Poland	8.86	9.19	8.35	11.04	6.90	10.45	0.33	2.69	3.55
		(10.02)		(10.82)		(10.12)	(1.16)	(2.48)	(3.22)
Hungary	7.50	7.52	7.20	8.22	6.17	8.31	0.02	1.02	2.14
		(8.75)		(10.20)		(9.22)	(1.25)	(3.00)	(3.05)
Bulgaria	7.76	7.81	8.40	9.69	7.54	9.89	0.05	1.29	2.45
Japan	8.51	8.74	8.88	9.58	9.12	10.26	0.23	0.70	1.13
							(1.74)	(2.22)	(2.97)

[a]Noord Holland (the Amsterdam region) in the Netherlands, Hamburg in the FRG, Stockholm region in Sweden, Warsaw region in Poland, Central region (Budapest) in Hungary, Sophia region in Bulgaria, and Kanto region in Japan.

SOURCE: Data for the total and all urban populations are taken from U.N. Demographic Yearbooks, and those for the metropolitan population from IIASA's Migration and Settlement Study (Rogers and Castro 1981).

large cities as contrasted with smaller towns and rural areas. Such phenomena are by no means contradictory to the observed expansion of the Third World metropolises (often exceeding 3 percent of growth per annum) as the decline in fertility is more than offset by rapid inmigration and, hence, the high concentration of the large-city population in the reproductive ages.[6] On the other hand, the cityward flows of large numbers of predominantly young people contribute to the relative stabilization of population numbers in rural and small urban areas.

The lack of reliable statistical information for the less developed countries precludes many efforts to study the interdependence between the evolution of settlement and population development on a comparative international scale (for some of such attempts see: Richardson 1981; United Nations 1980). Thus, the following analysis will focus on one country case, namely South Korea, for which reasonably good data relating to population composition, distribution, and change are available. South Korea represents a suitable object for study not only because of the existence of a data base. Since the early 1960s that country has experienced (a largely foreign-trade driven) economic change accompanied by a very rapid growth of its largest cities of Seoul and Pusan. After 1970 trends have been noted towards a reversal of earlier polarization of regional development as well as a considerable decline in population reproduction rates. These developments have attracted a number of now classical studies on South Korea focusing on interaction between population growth and economic development (Adelman and Robinson 1978), and between economic development and interregional balance (Mera 1978). The availability of such studies, and of several population projection analyses (ESCAP 1975; Kwon et al. 1975), allows one to limit the description of past urbanization and population trends in South Korea in the present paper, and also provides a foundation for some of the assumptions concerning future development patterns. It should be emphasized, however, that in this analysis, the data for South Korea are used for illustrative purposes only.

Between 1955 and 1975 the population of South Korea increased by 61.3 percent, from 21.5 to 34.7 million. Its urban population grew more than threefold, from 5.3 to 16.8 million. Consequently, the level of urbanization increased from 24.8 to 48.5 percent, one of the highest observed increases during a 20-year interval.[7] The two largest cities, Seoul and Pusan, experienced even higher growth rates: their combined population size changed from 2.6 to 9.3 million during 1955-1975, and their proportion of the national population, from 12.18 to 26.92 (see Figure 5). The average annual rates of growth for Seoul, over intercensal five-year periods varied from 7.85 to 9.86 percent between 1955-1970 before they declined to 4.50 percent during the 1970-1975 period. The corresponding rates of growth for the total urban population were 5.36 - 7.23 and 6.02. The overall pace of urbanization, as well as of large-city expansion was accelerating until 1970, but it slowed down considerably afterwards. Still, the population of the capital continued to grow twice as fast as the total population (ESCAP 1975, pp. 21-24).

The number of migrants moving between the 11 provinces of the country increased from 1,442,000 during 1961-1966 to 2,458,000 in 1966-1970. During the former period the city of Seoul received 46.8 percent of all interprovincial moves, and the city of Pusan another 13.0 percent, but they jointly accounted for as little as 17.5 percent of all outmigration. The corresponding figures during the 1966-1970 period were very similar to those of the previous period: 48.1, 12.6, and 16.0 percent (ESCAP 1975, pp. 145-148).

The rapid urbanization in South Korea was accompanied by a marked decline in fertility rates. According to Tai Hwang Kwon et al. (1975), the peak in crude birth rates (45 per thousand) and in the total fertility rate (7 per thousand) was reached in the late fifties. Since then deliberate birth control became widespread in cities, particularly among women in later reproductive ages. A rise in the age of marriage also contributed to the reduction of fertility at early reproductive ages (15-24 years). As a result, the crude birth rate and the total fertility rate (TFR) during 1960-1965 declined to 42 and 6.0, respectively.

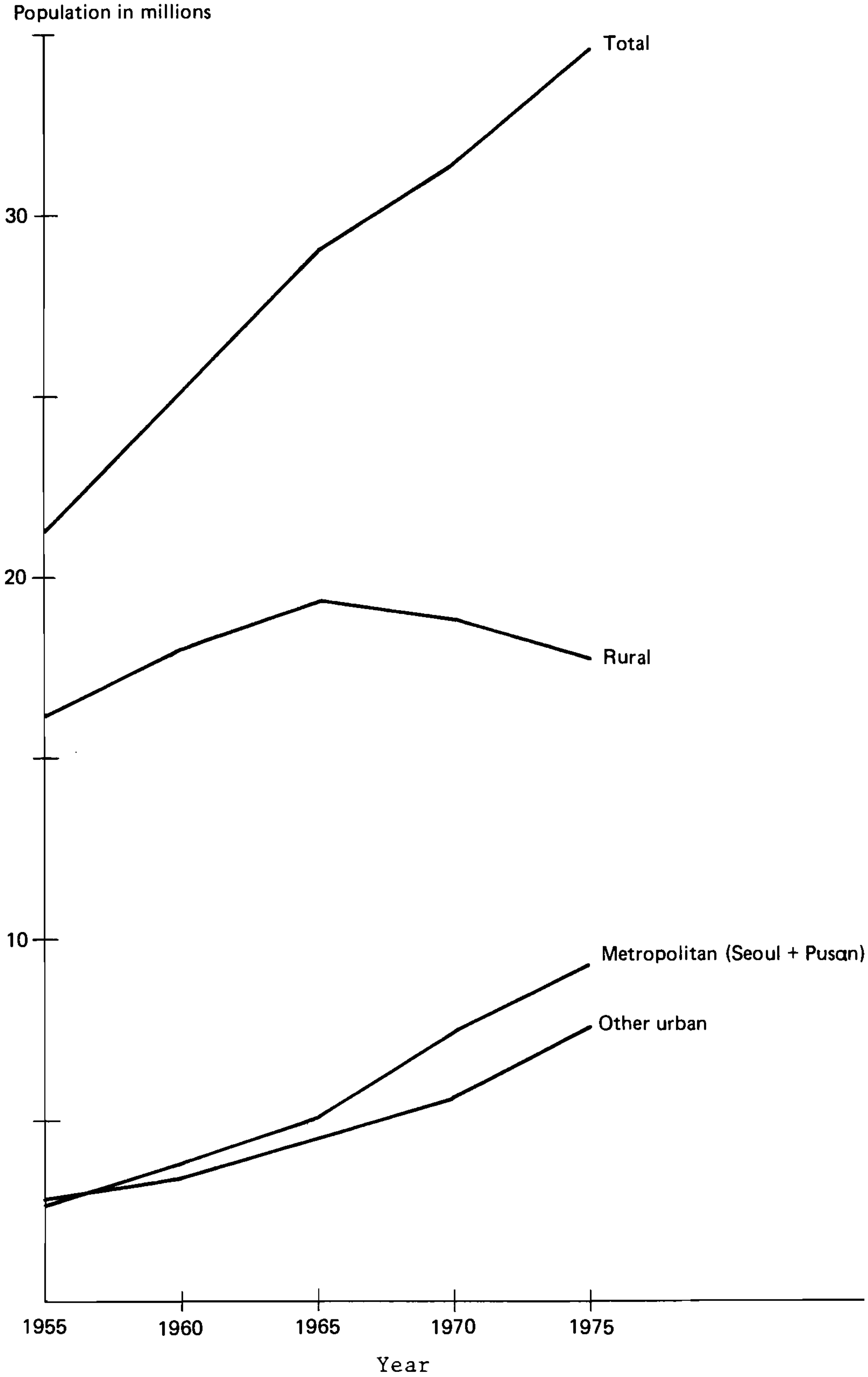

Figure 5. Population growth in South Korea, 1955-1975.

During the late 1960s fertility underwent a more drastic decline, and by 1970 the crude birth rate was reduced to about 30, and the TFR to 4.6. The reduction was most pronounced in large urban areas; in Seoul the TFR declined from 5.4 in 1955-1960 to 3.0 in 1966-1970. The rural fertility began to decline rapidly only since about 1968, but the urban-rural gap has remained significant (Kwon 1975, pp. 13-19).

ASSUMPTIONS AND INTERPRETATION OF SIMULATIONS

Implications of various urbanization strategies (and of a lack thereof) for demographic development at a national level can be explored by projecting into the future the observed and expected growth patterns of, and interdependence between, the rural, metropolitan, and nonmetropolitan urban population. Such projections may be based on some general concepts, including the hypotheses of the mobility transition and of hierarchical migrations, and they may also involve the "borrowing" of data from countries and regions characterized by more advanced stages of the demographic transition.[8] In this study the fertility and migration patterns for Tokyo (Kanto region), as well as mortality schedules for the whole of Japan were treated as models at particular phases of the projection runs. These projections serve as means to analyze the impact of both observed and hypothetical patterns, including two trajectories of fertility change, one trajectory of mortality decline and two migration patterns between rural, metropolitan, and other urban areas.

The initial data largely originate from the 1970 census and include some estimates. The total population for each of the three "regions", by 16 five-year age categories (0-4 and 75+) was taken from Kwon et al. (1975) and from the U.N. Demographic Yearbook (1977). The metropolitan population was assumed to correspond to that of two provinces: Seoul and Pusan. In statistical and administrative terms these provinces are identical with South Korea's two largest cities which had 5,525,000 and 1,876,000 inhabitants, respectively, living at average densities of 9,013 and 5,029 persons per sq.km. (in the remaining nine provinces the densities varied between 111-332 inhabitants per sq.km.), i.e., approximately twice as high as average densities in large European cities.

Such high density values clearly indicate that the future growth of the metropolitan population can no longer be contained within boundaries of the two city-provinces.[9] Growth will mainly occur via territorial expansion of the largest urban agglomerations and via graduation of other cities into the metropolitan category, the lower size limit for which was arbitrarily set at 1 million inhabitants. (Three cities: Daegu, Gwangju, and Inchon had each between 0.5 and 1 million population in 1970.) Thus any comparisons of the results of projection runs with observed population distributions (from 1980 on), should be based on spatial units more detailed than provinces. Also, the graduation of urban areas into metropolitan areas once they reach the given population threshold will result in a discontinuity, or a step-wise increase of the metropolitan population.

The question of spatial allocation of population change has been bypassed in the present analysis; the three "regions" are interpreted more like demographic aggregates, or "sectors", in a way analogous to more conventional divisions into rural and urban populations. In fact, the problems of how to account for territorial expansion and graduation of urban units are also encountered in rural-urban population projections, although the introduction of a "metropolitan" category makes such problems even more acute. Since data on territorial annexation and changes in the legal status of individual spatial units are collected in a number of countries, the contribution of these changes to the overall urbanization process is often measured (see, for example, Economic Commission for Europe 1979). However, annexation and graduation are still to be accounted for in the demographic models of urbanization which focus on the role of natural increase and migration as factors of urban population growth (Keyfitz 1980; Ledent 1980; Rogers 1982).

Referring to the initial data set for South Korea again, the number and allocation of births were calculated by applying age-specific fertility rates available for rural and urban areas

(ESCAP 1975:195), but not for individual provinces. Tai Hwang Kwon (1975) gave the ratio of total fertility for Seoul to that of rural areas as 79:116, and the corresponding ratio for crude birth rates as 102:99. The metropolitan fertility rate was hence estimated to be 3.34 (as compared with 4.07 for the whole country, 4.46 for rural, and 3.55 for all urban areas) and distributed over ages by interpolating between the schedules for South Korea's all urban areas and the 1970 schedule for the Kanto region (Tokyo metropolitan region) of Japan.

The 1970 census data on mortality clearly reflects incomplete registration (the reported crude death rate was 4.9). For the initial data set the total number of deaths has been inflated by 85.9 percent to correspond with the annual rate of population change estimated on the basis of observed increase between 1970-1975, and taking into account the number of births as well as external migrations. Age-specific mortality schedules (ESCAP 1975:171) for the total male and female population were used to distribute the number of deaths in each of the three "regions". Therefore, except for an adjusted infant mortality rate, the differences in crude death rates between rural, urban, and metropolitan populations in the "observed" data are attributable to age structure differentials.

The data on internal migrations in South Korea are relatively abundant, but they are mostly available in the form of mobility rates and aggregate numbers of arrivals and departures for individual spatial units, such as provinces and cities, rather than as origin-destination flow data. Consequently, the net migration flows between the rural, urban, and metropolitan components were estimated as a residual by taking natural increase and external migrations as given. The figures obtained (Table 3) are lower than reported migrations during the 1966-1970 period, and closer to patterns prevailing during the previous five-year period. This may in fact be correct, since the second half of the 1960s is generally considered as one of exceptionally high population mobility in South Korea.

Table 3. Population accounts summary: South Korea, 1970.

Aggregation	Total population size	Births		Deaths		Net migration		Total change	
		Number	Rate	Number	Rate	Number	Rate	Number	Rate
Rural	18,506,430	495,648	26.78	174,972	9.45	-375,114	-20.26	- 54,438	-2.93
Metropolitan	7,401,653	228,108	30.81	45,333	6.12	168,804	22.81	351,579	47.50
Other Urban	5,527,169	169,010	30.57	37,610	6.80	206,310	37.33	337,710	61.10
Total	31,435,252	892,766	28.40	257,915	8.20	- 20,000	- 0.40	634,851	20.20

According to statistical evidence (ESCAP 1975:155), and following the concept of hierarchical migrations, the metropolitan areas were assumed to have a positive migration balance with other urban areas. This was achieved by directing the bulk (70 percent) of rural net migration outflow into "other urban" areas and reallocating the surplus of the latter to metropolitan areas. The gross flows (Table 4) were calculated by setting outmigration from rural areas at 1.4 of their net migration loss (in accordance with ESCAP 1975, p. 148) and consequently adjusting the remaining flows. The same ratio was applied to estimate outmigration from metropolitan areas to other urban areas. For the "other urban" population the ratio of total inmigration to net migration gain came to as high as 1.9 which is logical considering the intermediate place those areas occupy in the eventual shifts of the population from rural to metropolitan areas.

The information on age-specific mobility rates in South Korea (ESCAP 1975:141-43) show substantial variations between individual time periods. In addition, no data exist on migration of young children (0-4 years). Therefore, for the purposes of the present study age-specific outmigration rates were derived from model migration schedules. Three such schedules were chosen from the comparative study by Rogers and Castro (1981).

Table 4. Estimated migration flows: South Korea, 1970.

To \ From	Rural	Metropolitan	Other Urban	Total
Rural		45,012	105,033	150,045
Metropolitan	157,547		78,776	236,326
Other Urban	367,612	22,507		390,119
Total	525,159	67,522	183,809	776,490

These schedules summarize flows into the Tokyo metropolitan area from the rest of Japan (I), flows out of Tokyo to the rest of Japan (II), and flows from Amsterdam (Noord Holland province) to the rest of the Netherlands (III). The first schedule was used to distribute over ages the rural-to-urban and rural-to-metropolitan migration, the second—urban-to-rural and metropolitan-to-rural flows, and the third—the flows between the two urban components. Schedule I is characterized by a higher concentration of migrants in the early labor-force ages than either schedule II or III.

Given the unitary migration schedules and the crude out-migration rate, the calculation of age-specific rates is straightforward. The crude rates are transformed into gross rates by taking the age composition of the population into account and then gross rates are used to adjust the level of the profile. The procedure is described by the following formula:

$$F(x) = M(x)\left[CMR \Big/ \sum_{x} c(x)M(x)\right] \qquad (1)$$

where F(x) are age-specific outmigration rates, M(x) is the unitary schedule with a gross rate of 1, and c(x) represents the age distribution of the population. CMR denotes the crude outmigration rate.

Based on the data described above, the "three-region" population projections were carried out following the methodology given by Willekens and Rogers (1978). In addition to a conventional constant-rate projection, several projection runs were made introducing rates that changed over time. The general formula for population projection with changing rates between t and t+n is:

$$\underline{K}^{t+n} = \prod_{i=n}^{1} \underset{\sim}{G}_i \underline{K}^t \qquad (2)$$

The vectors $\underline{K}$ describe the population disaggregated by age and region, while $\underset{\sim}{G}_i$ represents the multiregional growth matrix for the i-th step of the projection. To obtain the growth matrix for the subsequent projection period a multiregional life table has to be recalculated at each step.

The following assumptions were used in individual projection runs:

1. *Extrapolation of the 1970 patterns.* This was a constant rate projection using as input the observed data. These data characterize South Korea as a country undergoing rapid population growth and intensive urbanization, with a slight absolute decrease of the rural population. The initial pace of growth of smaller and middle-sized cities is actually somewhat higher than that of the largest metropolitan areas.

2. *Balanced urbanization.* The projection also starts with the observed 1970 data, but from 1975 on the mortality and fertility rates are changed. Following the ESCAP (1975) projections it was assumed that fertility and mortality in South Korea will decline following the regime earlier experienced by Japan. Consequently, the age-specific death rates for the year 2005 were set at levels observed in Japan in 1970. Gross fertility rates were assumed to drop to 1.5 in rural areas and to 1.0 in "other urban" areas, whereas in the metropolitan areas the 1.0 rate will have been achieved already in 1990. The migration rates were as in the first projection run. All the changes are linear over time.

One should distinguish between two ways of adjusting rates, i.e., changes in the level and changes in the schedule. The contraction of the fertility rates was performed by just diminishing the area under the curve while maintaining the shape of the profile constant. Mortality, on the other hand, was reduced by changing the schedule, as well as level, over time.

This scenario is conventional in the sense that it attempts to incorporate well-established and elsewhere documented trends, such as a gradual decline of birth and death rates, while retaining a time lag between the change occurring in metropolitan, urban, and rural areas. Since migration gains as estimated for 1970 (based on 1970-1975 trends) were in both absolute and relative terms higher for the "other urban" than for the metropolitan areas (although this was generally not the case during the 1950s and 1960s), these patterns may be interpreted as representing policies aimed at containment of metropolitan growth.

3. *Metropolitanization a.* This projection run was based on the same assumptions concerning the evolution of fertility and mortality as the previous scenario. However, it introduced a modified migration matrix, one in which population flows were increased and directed mainly toward metropolitan areas. Practically this was done by expanding the gross outmigration from rural areas by 50 percent and directing all the increment toward the metropolitan areas. As a result, the latters' crude inmigration rate becomes more or less equal to that of the "other urban" areas, while the net rate increases by some 30 percent. A comparison between the two migration patterns is shown in Table 5.

This projection run explores implications of the persistence of intensive population flows towards the metropolitan areas, with rural outmigration rates characteristic of the peak phase of the mobility transition (for comparable data see United Nations 1980, p. 28-29). Such migration patterns were in fact observed in South Korea during the mid-1960s. They are representative of many of the Third World countries where no actual policy measures are attempted with regard to the distribution of population and economic activity. An additional feature of this projection is that it allows one to capture the impact of migration change on the overall population development.

3. *Metropolitanization b.* This scenario consists of all the assumptions of projection 3a except for the pattern of fertility decline of the metropolitan population. Namely, its gross fertility drops below replacement level (to 0.85) by the year 1990. Again, the effects of this alteration can be identified as the other components are kept unchanged.

Table 5. Crude out- and inmigration rates as used in the projections.

To \ From	A: Projection runs 1 and 2				B: Projection runs 3a and 3b			
	Rural	Metro-politan	Other urban	Total inmigration	Rural	Metro-politan	Other urban	Total inmigration
Rural		6.08 / 2.43	19.00 / 5.68	8.11		16.21 / 6.48	19.00 / 5.68	12.16
Metro-politan	8.51 / 21.28		14.25 / 10.64	31.92	22.70 / 56.76		14.25 / 10.64	67.40
Other urban	19.86	3.04 / 4.07		70.58	19.86 / 66.51	3.04 / 4.07		70.57
Total outmigra-tion	28.37	9.12	33.25		42.56	19.25	33.25	

4. *Metropolitan transition.* While maintaining fertility and mortality characteristics of projection 3b, this scenario focused on the evolution of migration patterns, in accordance with the concept of mobility transition and following the earlier analysis by Rogers (1977, 1981). The assumed evolution is contained within the limits specified by patterns A and B in Table 5. Rural outmigration towards metropolitan areas increases sharply between 1970-1980, then stabilizes until the year 2000, after which it again decreases to reach the initial level by 2030. The reverse flow is maintained at the 1970 level which implies that return moves account for a diminishing portion of rural-to-metropolitan migration during the phase of its growth.

In order to keep the results relatively transparent the rates which describe flows of rural and metropolitan population to "other urban" areas are stable over time. On the other hand, the reverse moves undergo a change; it is assumed that outmigration from "other urban" towards metropolitan areas will increase in a linear fashion during the projection period, while outmigration to rural areas will decrease, so that the initial relation between the respective rates will ultimately become reversed.

Since projections are based on gross rather than crude migration rates, the latter were in fact somewhat different from values given in Table 5, as a result of the evolving age structure of the rural, metropolitan, and "other urban" populations. The gross migration rates are shown in Table 6, and a stylized evolution of crude rates in Figure 6.

Table 6. Evolution of gross migration rates according to projection 4.

Direction of flows	1970	1980	2000	2030
Rural to metropolitan	0.6175	1.6490	1.6490	0.6175
Rural to other urban	1.4428	1.4428	1.4428	1.4428
Metropolitan to rural	0.3766	0.3766	0.3766	0.3766
Metropolitan to other urban	0.1811	0.1811	0.1811	0.1811
Other urban to rural	1.2354	1.1474	1.0065	0.8833
Other urban to metropolitan	0.8833	0.9713	1.1122	1.2354

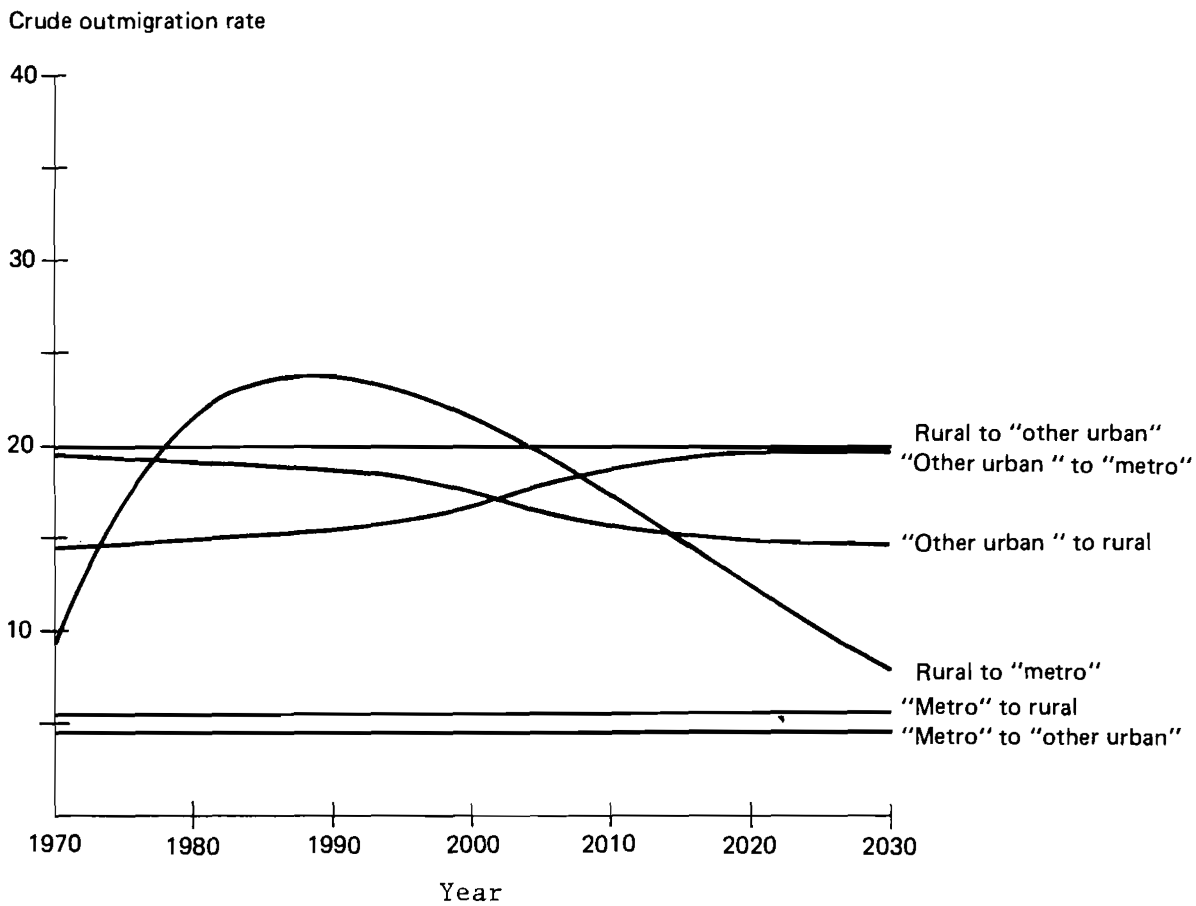

Figure 6. Evolution of crude outmigration rates (scenario 4).

One may note that the starting point of the projection corresponds roughly to the year 30 in the generalized scheme presented by Rogers (1981:16). At that point the combined rate of outmigration from rural to the two urban components is some 2.5 times higher than the latters' outmigration to rural areas. Initially, the bulk of rural migrants move to small towns and middle-sized cities at intermediate levels of the urban hierarchy. Migration to the largest cities gains momentum over the next few decades and then declines. Towards the end of the projection period the two rates assume initial values again, but the flows will differ much less in terms of absolute size as metropolitan areas account for an increasing and rural areas for a decreasing fraction of the total population.

The results of individual projection runs and their comparison with earlier projections by other authors, and with past trends, are summarized in Tables 7 and 8 (for more detailed information, see the Appendix). Not unexpectedly, a major difference exists between the first run (Figure 7) and the remaining projections which introduce more realistic assumptions concerning population reproduction and mortality (for example see Figure 8). The share of the "other urban" population is notably stable between the projections and over time periods. The increase and reallocation of migration flows in projections 3a (Figure 9) and 3b (Figure 10) have resulted in initially considerable but later less pronounced differentiation in the size of rural, as compared with metropolitan populations. At the same time, these changes have brought slower overall rates of demographic growth as more people were expected to move into areas characterized by relatively low fertility. A comparable effect was achieved by keeping migrations constant and forcing the metropolitan fertility rate further down (projection 3b).

Table 7. Total, rural, metropolitan, and other urban population of South Korea according to alternative projections (in thousands).

Projection	Population	1980	1990	2000	2010	2020	2030
1	Total	38,234	47,903	58,158	69,680	83,902	99,837
	%	46.1	37.7	33.5	30.6	28.4	27.3
	Rural	17,626	18,071	19,496	21,156	23,850	27,289
	%	30.3	35.6	39.4	42.6	45.1	46.8
	Metropolitan	11,565	17,074	22,892	29,710	37,880	46,786
	%	23.6	26.7	27.1	27.0	26.5	25.8
	Other Urban	9,043	12,758	15,769	18,814	22,252	25,763
2	Total	38,036	45,549	51,986	59,007	65,100	69,997
	%	46.2	38.5	34.7	32.1	30.4	29.4
	Rural	17,581	17,547	18,052	18,927	19,801	20,553
	%	30.2	35.2	38.9	42.1	44.5	46.2
	Metropolitan	11,476	16,016	20,240	24,864	28,985	32,373
	%	23.6	26.3	26.3	25.8	25.1	24.4
	Other Urban	8,979	11,986	13,695	15,218	16,314	17,071
3a	Total	37,977	45,161	51,156	57,646	63,012	67,083
	%	42.8	34.7	31.7	30.2	29.6	29.2
	Rural	16,253	15,683	16,206	17,392	18,632	19,642
	%	34.2	40.3	43.6	45.7	46.9	47.6
	Metropolitan	12,999	18,199	22,280	26,327	29,536	31,949
	%	23.0	25.0	24.8	24.2	23.5	23.1
	Other Urban	8,724	11,279	12,670	13,928	14,833	15,492
3b	Total	37,962	44,984	50,693	56,812	61,670	65,132
	%	42.8	34.8	31.9	30.4	29.9	29.6
	Rural	16,252	15,672	16,163	17,294	18,423	19,272
	%	34.2	40.1	43.2	45.1	46.2	46.9
	Metropolitan	12,986	18,036	21,874	25,635	28,517	30,558
	%	23.0	25.1	25.0	24.4	23.9	23.5
	Other Urban	8,724	11,276	12,656	13,883	14,729	15,302
4	Total	37,972	44,861	50,238	55,890	60,087	62,765
	%	42.9	31.2	25.4	22.3	21.0	20.9
	Rural	16,292	14,014	12,781	12,459	12,611	13,128
	%	33.9	43.8	50.3	54.7	57.2	58.0
	Metropolitan	12,858	19,630	25,271	30,587	34,366	36,459
	%	23.2	25.0	24.3	23.0	21.8	21.0
	Other Urban	8,823	11,217	12,185	12,844	13,110	13,178
Keyfitz (1981)	Total	39,057	46,310	51,800	57,251	61,648	64,843
Kwon (1975)	Total	37,517	43,575				
ESCAP (1975)							
High	Total	38,735	48,348	59,670			
Medium	Total	39,315	46,821	54,664			
Low	Total	39,679	46,358	52,751			
ESCAP (1975)							
I	Urban %	51.7	63.1	74.1			
II	Urban %	48.5	58.9	68.5			
III	Urban %	44.6	47.9	51.1			

Table 8. Observed population change in South Korea, 1960-1975 (in thousands).

Population	1960	1966	1970	1975
Total	24,994	29,160	31,435	34,679
Rural	17,990	19,379	18,506	17,906
%	72.0	66.5	58.9	53.7
Metropolitan	3,607	5,219	7,402	9,335
%	14.4	17.9	23.6	26.9
Other Urban	3,398	4,561	5,527	7,435
%	13.6	15.6	17.6	21.4

SOURCE: ESCAP (1975).

Out of alternative population projections for South Korea only the study by ESCAP (1975) includes disaggregation into rural and urban populations, but it is not consistent with their projections of the total population development. Keyfitz's (1982) projections are close to scenario 3b, while the more realistic (in ways migration flows are computed) scenario 4 produces even lower population totals. The assumption made by Keyfitz, according to which fertility in South Korea will decline so as to reach replacement level by the years 1990-1995 may not be an unrealistic one, but it is extremely general. In fact, scenario 4 (see Figure 11) demonstrates one pattern of disaggregated population growth and interaction which makes Keyfitz's projection feasible.

Out of five projection runs performed in this study scenario 4 generates the lowest total population figures while allocating their highest shares to metropolitan areas. Until the mid-term (the year 2010) the absolute size of the metropolitan population according to projection 4 is even greater than under the constant-rate regime. Characteristically, the most considerable reduction of growth rates for the total population is achieved by assuming an acceleration of the process of metropolitan growth. Under given fertility assumptions the increasing concentration of the population within metropolitan areas results in the speeding-up of the demographic transition.

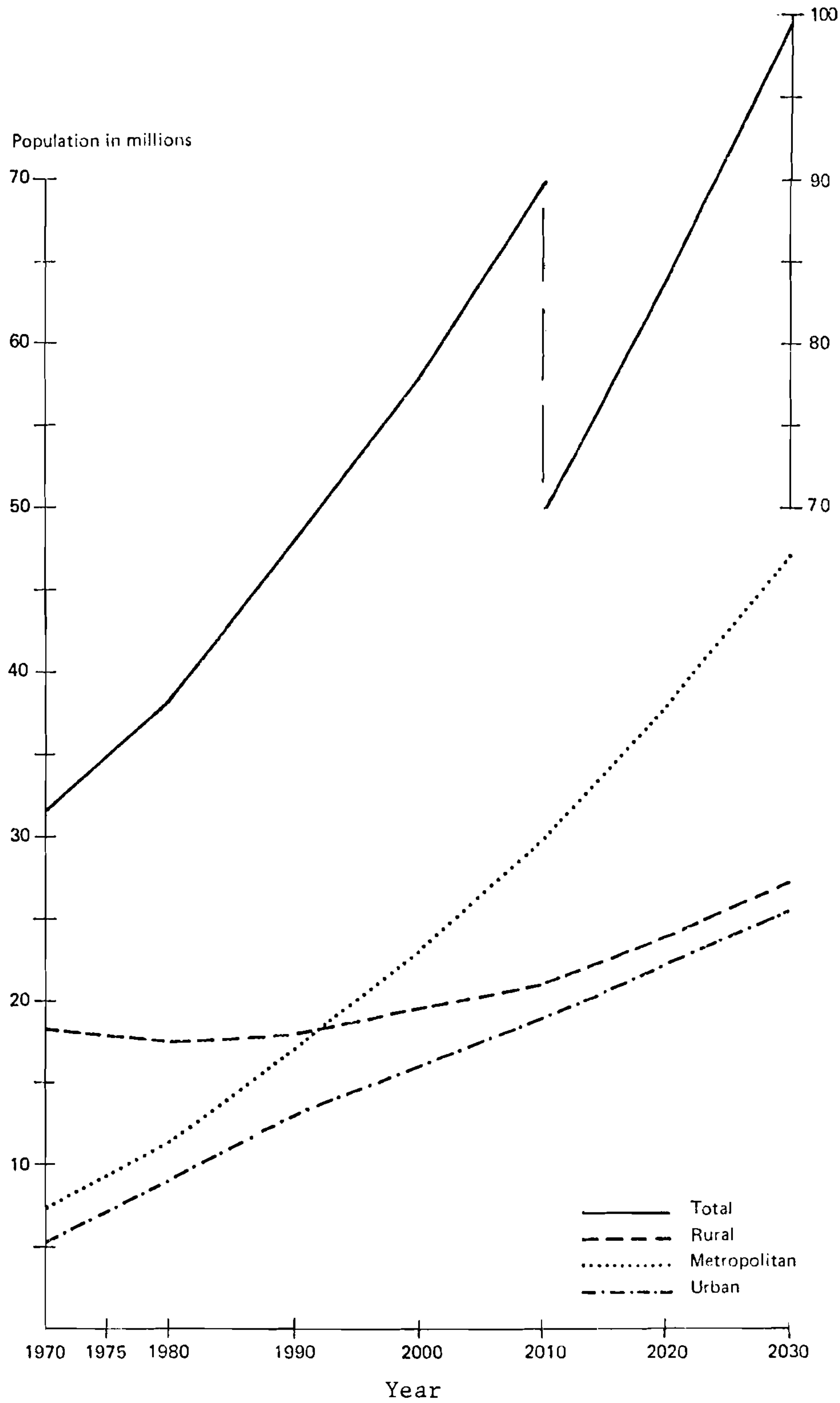

Figure 7. Projection 1.

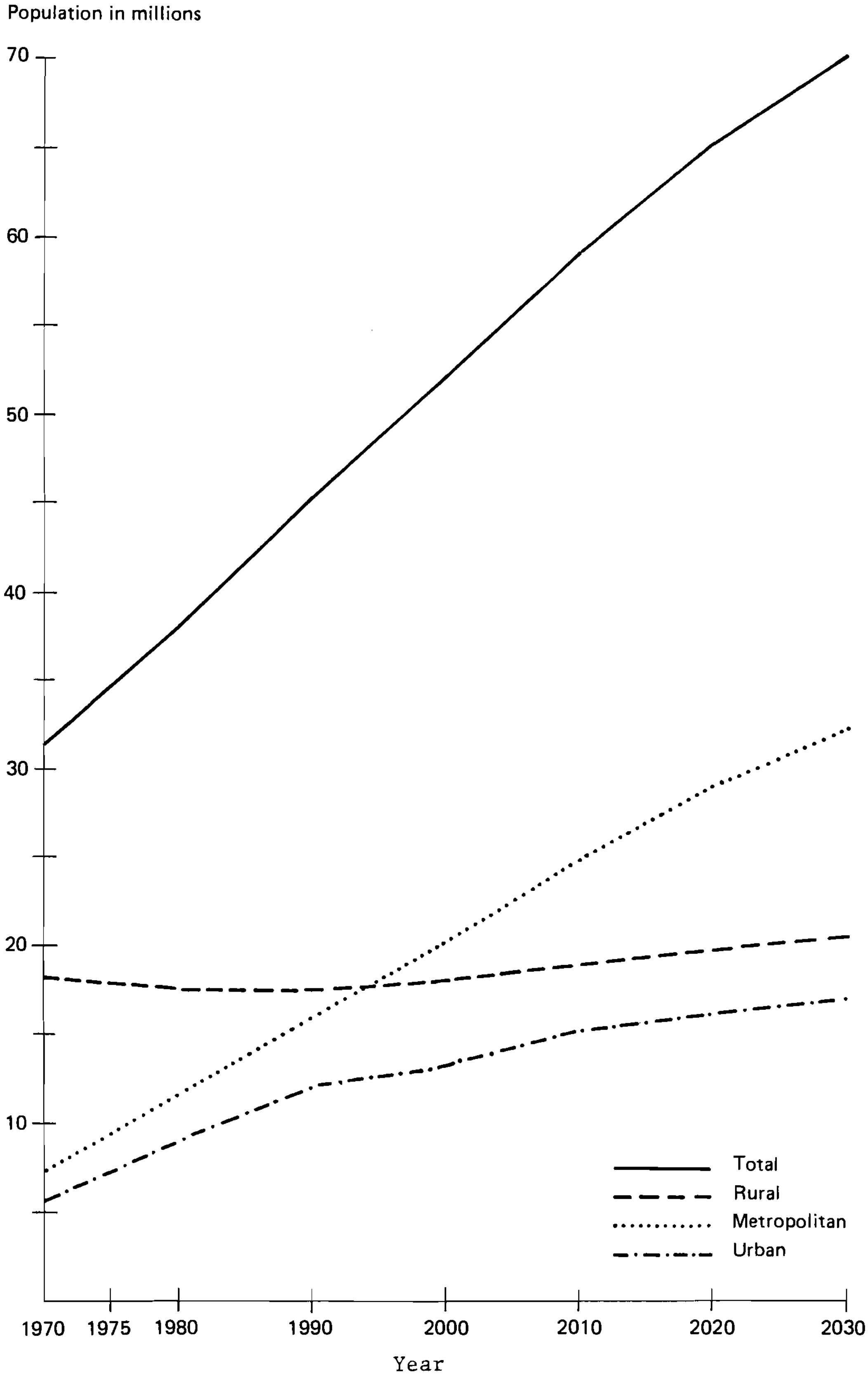

Figure 8. Projection 2.

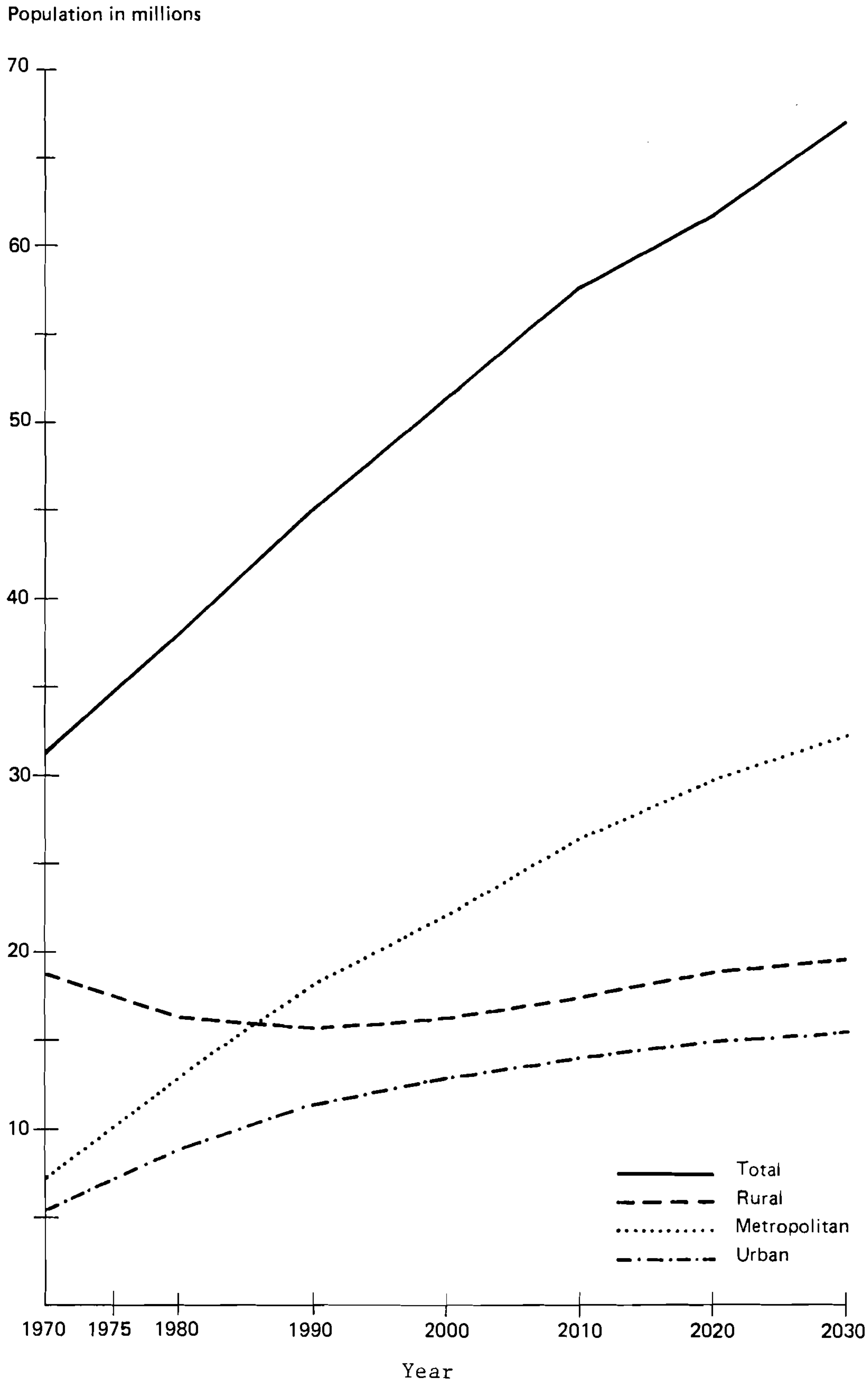

Figure 9. Projection 3a.

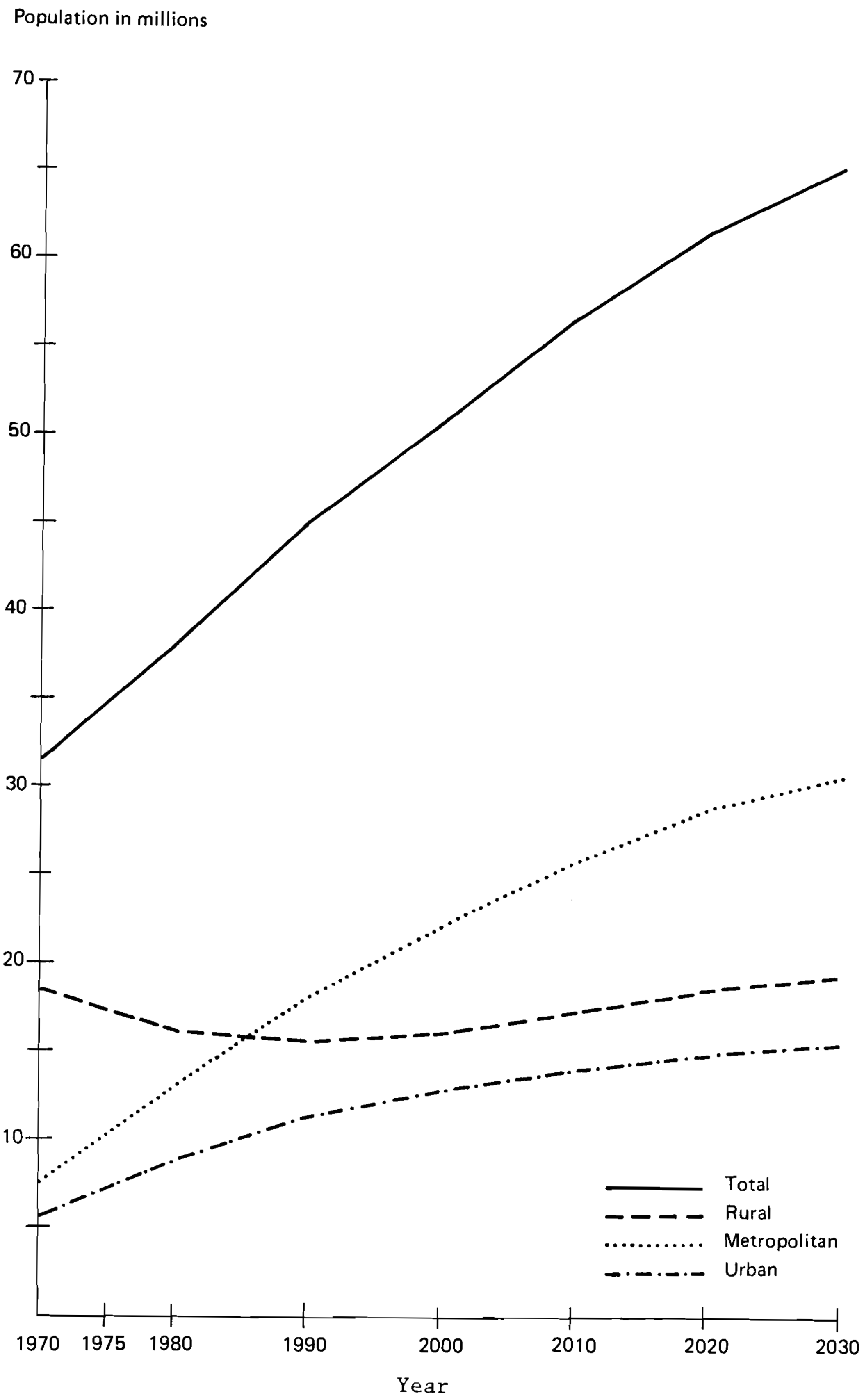

Figure 10. Projection 3b.

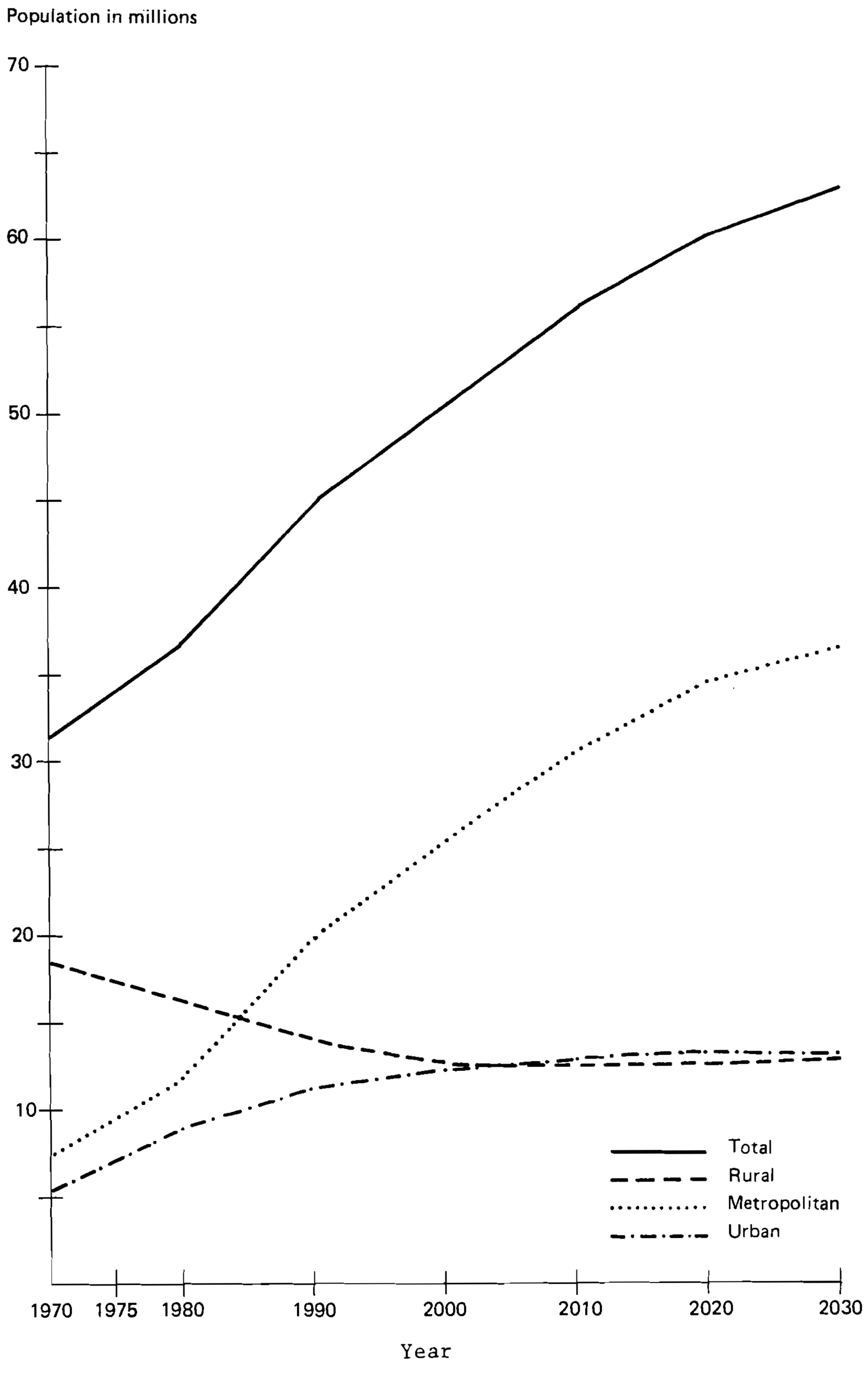

Figure 11. Projection 4.

A question that emerges here is whether similar results could not be produced using the conventional disaggregation into rural and urban population and assuming alternative migration and fertility patterns that, in the case of the total urban population, would represent weighted average values for the metropolitan and the other urban populations, as selected in the present study. Formally, the answer is affirmative. Except for small differences originating from computational procedures (Keyfitz 1982), such an approximation would indeed be feasible. However, its substantial viability is questionable. It is precisely the disaggregation of the urban population that permits one to introduce a broader spectrum of fertility rates and of migration patterns within a given spatial system. For example, if according to one development scenario the total urban population is assumed to experience a sharp decline in birth rates during the projection period, it is primarily because this population is expected to become increasingly concentrated in large metropolitan areas. This assumption is legitimate, since differences in demographic patterns between small and large cities are found universally, i.e., at both the less and more advanced economic development levels.

CONCLUSIONS: POPULATION REDISTRIBUTION POLICIES IN THE THIRD WORLD

The question of costs and benefits associated with alternative patterns of population distribution and settlement constitutes a perennial policy issue in the Third World and has polarized the community of scholars and planners concerned with national space. Some authors, such as Mera (1981) use the experience of the developed and the "new industrialized" countries to claim that economic growth and population concentration are mutually dependent during earlier development stages, and that trickle-down processes occur as a consequence of development. This approach therefore stresses the role of accommodationist policies of population distribution and urban growth management (Laquian 1981). Others (see: Mabogunje 1981; Stöhr 1981) base their counterarguments on a number of ecological, social, administrative, and political considerations. Still other experts point to inadequate conceptualization and measurement of the costs of urbanization (Linn 1982) and of the effectiveness of spatial policies (Richardson 1981).

This paper focuses on a related although somewhat less contested problem of interdependence between the patterns of urbanization and population development on a national scale (see Alonso 1980). It suggests that in looking at urbanization as an agent of the demographic transition the particular role of large cities should be taken into account. Consequently, the usefulness of treating the metropolitan population as a separate category in disaggregated population projections is emphasized.

The scenarios presented are tentative and their assumptions should be further expanded. For example, demographic mechanisms of the process of metropolitan contraction as it emerges at later development stages may be simulated and changes of policy goals over time introduced. More knowledge is required pertaining to observed relations between the patterns of urbanization and of population change in various countries. Far from attempting to evaluate the advantages and feasibility of alternative settlement patterns and policies, the paper looks at some positive aspects of metropolitan growth. This growth is in any case unavoidable as the number of urban dwellers in the less developed countries is expected to increase by over 1.2 billion (or 128 percent) during the next two decades (1980-2000) alone. One can therefore restate an earlier conclusion by Rogers (1977:69) who postulated an enlightened and improved management of the urbanization process aiming at the removal of inefficiencies and inequalities, and the adjustment of already growing cities to a very much larger increment of growth in the future.

FOOTNOTES

1. This aspect is omitted in a number of studies of the world's demographic development, such as by Keyfitz and Flieger (1971) and U.S. Bureau of the Census (1976).
2. The urbanization projections produced by United Nations (1980) were evaluated by Ledent and Rogers (1979) with the help of a component-of-change model. Taking those projections as given, the authors estimated the path of rural net outmigration rates and calculated alternative sets of "transparent" projections in which the components attributable to migration and natural increase were treated explicitly.
3. This factor fails to explain all the definitional differences among individual countries. For example, Denmark and the Netherlands, whose economic, cultural, and urbanization patterns are mutually comparable, have adopted as lower bounds for urban places, the population numbers of 2,000 and 20,000, respectively.
4. The data for the total and total urban population are taken from U.N. Demographic Yearbooks, and for the metropolitan areas—from IIASA's Comparative Study on Migration and Settlement.

5. For example, in 1965 the average age of marriage, for males, was 25.4 years in the city of Karachi, and 22.4 years in a typical rural district of Pakistan (Afzal 1974).
6. The total fertility rate in the state of São Paulo was 3.44 in 1970, as compared with 5.35 for the whole of Brazil. Yet São Paulo's annual rates of population growth during 1960-1970 amounted to 5.2 percent, as compared with 4.5 percent for all state capitals, and 2.91 for the whole country. The number of migrants entering São Paulo was estimated at 300,000 per annum during the 1970s (Azevedo 1979).
7. For the world as a whole the proportion of the population living in urban areas grew between 1950-1975 from 28.95 to 39.34, for all less developed countries—from 16.71 to 28.03, for Latin America from 41.18 to 61.21, and for East Asia from 16.72 to 30.70 (United Nations 1980, p. 16).
8. Rogers has convincingly demonstrated some analytical uses of such procedures.
9. In fact, by 1975 the city of Seoul had 6,884,000 inhabitants living at average density of 11,730 persons per sq.km., and the city of Pusan, 2,451 inhabitants with the corresponding density of 6,571 persons per sq.km.

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APPENDIX: SUMMARIES OF RESULTS FOR SCENARIOS 2, 3b, and 4: 1970-2030

Scenario 2	1970	1980	1990	2000	2010	2020	2030
Population (ooo)							
rural	18506	17581	17547	18052	18925	19801	20553
metro.	7402	11476	16016	20240	24864	28985	32373
urban	5527	8979	11986	13695	15218	16314	17071
e^o							
rural	58.257	59.191	63.357	68.271	72.697	72.697	72.697
metro.	59.939	60.769	64.410	68.742	72.697	72.697	72.697
urban	59.554	60.415	64.186	68.651	72.697	72.697	72.697
NRR							
rural	1.662	1.590	1.285	1.106	1.142	1.142	1.142
metro.	1.551	1.466	1.113	1.005	1.029	1.029	1.029
urban	1.673	1.591	1.250	1.051	1.078	1.078	1.078
Reg. share							
rural	58.87	46.22	38.52	34.72	32.07	30.42	29.36
metro.	23.55	30.17	35.16	38.93	42.14	44.52	46.25
urban	17.58	23.61	26.31	26.34	25.79	25.06	24.39
Mean age							
rural	24.40	26.58	28.47	30.62	32.78	33.94	35.49
metro.	23.43	24.40	26.58	29.62	32.16	34.16	35.95
urban	23.26	23.84	25.37	28.65	31.55	33.55	35.42
Annual growth rate							
rural	-	-0.0050	0.0016	0.0031	0.0053	0.0039	0.0033
metro.	-	0.0422	0.0297	0.0223	0.0198	0.0136	0.0104
urban	-	0.0435	0.0238	0.0114	0.0102	0.0057	0.0040

Scenario 3b	1970	1980	1990	2000	2010	2020	2030
Population (ooo)							
rural	18506	16252	15672	16163	17294	18423	18891
metro.	7402	12986	18036	21874	25635	28517	29614
urban	5527	8724	11276	12656	13883	14729	15042
e^o							
rural	58.257	59.208	63.364	68.272	72.697	72.697	72.697
metro.	59.929	60.763	64.414	68.751	72.697	72.697	72.697
urban	59.555	60.417	64.187	68.652	72.697	72.697	62.697
NRR							
rural	1.617	1.533	1.178	1.009	1.041	1.041	1.041
metro.	1.604	1.505	1.094	0.949	0.973	0.973	0.973
urban	1.669	1.580	1.205	1.000	1.026	1.026	1.026
Reg. share							
rural	58.87	42.81	34.84	31.88	30.44	29.87	29.73
metro.	23.55	34.21	40.09	43.15	45.12	46.24	46.60
urban	17.58	22.98	25.07	24.97	24.44	23.88	23.67
Mean age							
rural	24.40	27.00	29.24	31.49	33.60	34.94	35.84
metro.	23.43	24.13	26.54	29.99	32.98	35.32	36.41
urban	23.26	23.96	25.66	29.02	32.00	34.09	35.11
Annual growth rate							
rural	-	-0.0117	-0.0006	0.0040	0.0075	0.0055	0.0050
metro.	-	0.0495	0.0273	0.0180	0.0151	0.0090	0.0075
urban	-	0.0397	0.0209	0.0098	0.0089	0.0047	0.0042

Scenario 4	1970	1980	1990	2000	2010	2020	2030
Population (ooo)							
rural	18506	16292	14014	12781	12459	12611	13128
metro.	7402	12858	19630	25271	30587	34366	36459
urban	5527	8823	11217	12185	12844	13110	13178
e^o							
rural	58.237	59.178	63.333	68.249	72.697	72.697	72.697
metro.	59.939	60.759	64.396	68.732	72.697	72.697	72.697
urban	59.554	60.398	64.163	68.633	72.697	72.697	72.697
NRR							
rural	1.662	1.512	1.128	0.965	1.012	1.037	1.072
metro.	1.551	1.435	1.000	0.873	0.897	0.901	0.906
urban	1.673	1.553	1.156	0.954	0.979	0.981	0.990
Reg. share							
rural	58.87	42.90	31.24	25.44	22.29	20.99	20.92
metro.	23.55	33.86	43.76	50.30	54.73	57.19	58.09
urban	17.58	23.23	25.00	24.25	22.98	21.82	21.00
Mean age							
rural	24.40	26.97	29.93	32.74	34.90	35.57	36.63
metro.	23.43	24.17	26.41	29.85	32.99	35.69	38.24
urban	23.26	23.92	25.67	29.23	32.48	34.76	36.77
Annual growth rate							
rural	-	-0.0165	-0.0127	-0.0081	-0.0004	0.0013	0.0046
metro.	-	0.0576	0.0355	0.0234	0.0176	0.0095	0.0048
urban	-	0.0407	0.0186	0.0063	0.0049	0.0009	0.0003

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