URBAN CHANGE: AN OVERVIEW OF RESEARCH AND PLANNING ISSUES

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FOREWORD

Declining rates of national population growth, continuing differential levels of regional economic activity, and shifts in the migration patterns of people and jobs are characteristic empirical aspects of many developed countries. In some regions they have combined to bring about relative (and in some cases absolute) population decline of highly urbanized areas; in others they have brought about rapid metropolitan growth.

The objective of the Urban Change Task in IIASA's Human Settlements and Services Area is to bring together and synthesize available empirical and theoretical information on the principal determinants and consequences of such urban growth and decline.

This paper by Piotr Korcelli, the current leader of the Urban Change Task, outlines sets of policy issues relating to urban growth and decline, urban primacy, and intraurban spatial structure. Approaches for analyzing these are reviewed, and a research agenda for the Urban Change Task is set out.

A list of publications in the Urban Change Series appears at the end of this paper.

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ABSTRACT

Three sets of urban policy issues are identified in this paper. These relate to the growth and contraction of metropolitan areas, their changing role in the settlement systems, and their internal organization. Policy-oriented urban models are briefly reviewed. It is concluded that promising research approaches refer to: (a) innovation diffusion and urban growth cycles, (b) interurban migration and demographic change, and (c) spatial interaction within urban regions. These findings are then translated into a working agenda for the Urban Change Task at IIASA.

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URBAN CHANGE: AN OVERVIEW OF RESEARCH AND PLANNING ISSUES

I. BASIC PATTERNS OF URBAN CHANGE

Present-day urbanization trends are often described as being divergent. Variations in rates and patterns of urban development, as encountered between individual countries and among the world's major regions, have apparently widened during recent years producing a polarization of trends into: (a) accelerated urban growth and (b) metropolitan contraction.

This recent experience has called for a reassessment of existing urban and population models, as well as settlement policies at national and regional levels. Such a reevaluation is indeed timely, and it has been attempted by a number of authors. Most of the relevant contributions, however, pertain to individual concepts (such as the growth pole theory) and/or individual national settings, rather than to broader conceptual and spatial dimensions. As an outgrowth of such postulates, the present paper attempts: (a) to identify basic urban policy issues in a general perspective, (b) to review the state of those areas of urban research which are particularly relevant to those policy questions, and (c) to indicate possible ways of augmenting the knowledge necessary for the development and improvement of policy-oriented urban models.

In the case of the more developed countries, the data for Europe show a characteristic path of urban change over the last three decades. A comparison of urban versus total population growth rates for the 1950s, 1960s, and 1970s does not reveal substantial trend alternations, except for a marked decrease of variance. Over the whole period, mean annual urban growth rates have been roughly double the corresponding figures for the total population (see Figures 1, 2, and 3). Figure 4 shows, however, that although the overall level of urbanization was increasing by about the same number of percentage points for all groups of countries between 1950-1970, the early seventies have brought a flattening of the rank gradient. Also, for those countries with a population over 60 percent urban, the urbanization ratio has stabilized since 1970. As an increasing number of countries approach a state in which a minimum share of their population remains in the agricultural sector, the major population shifts become inevitably contained within the urban component of the settlement system.

Some of these shifts are represented in Figures 5 and 6. Although during the 1950s, the large cities grew faster than the total urban population, this pattern changed by the 1960s, when most of the cities in the 0.5 million and over category recorded growth rates below the corresponding figures for urban population as a whole. This trend is found irrespective of the share of large urban centers in the total population of a given country. Also, along with the declining natural growth rates, the urban areas have become increasingly dependent upon inmigration whose contribution amounted to as much as 75-95 percent of the total urban population growth by the late 1960s in many of the countries examined. Figure 6 shows relevant proportions for the 15-59 age group which basically correspond to the age of labor force. Actually, in all countries except one (Ireland) the inmigration share in urban areas was greater than that of natural increase for at least one or both of the male and female population components. It is likely however that, owing to the shrinking outmigration potential of rural areas, the urban population change will again depend mainly on natural growth during the 1980s.

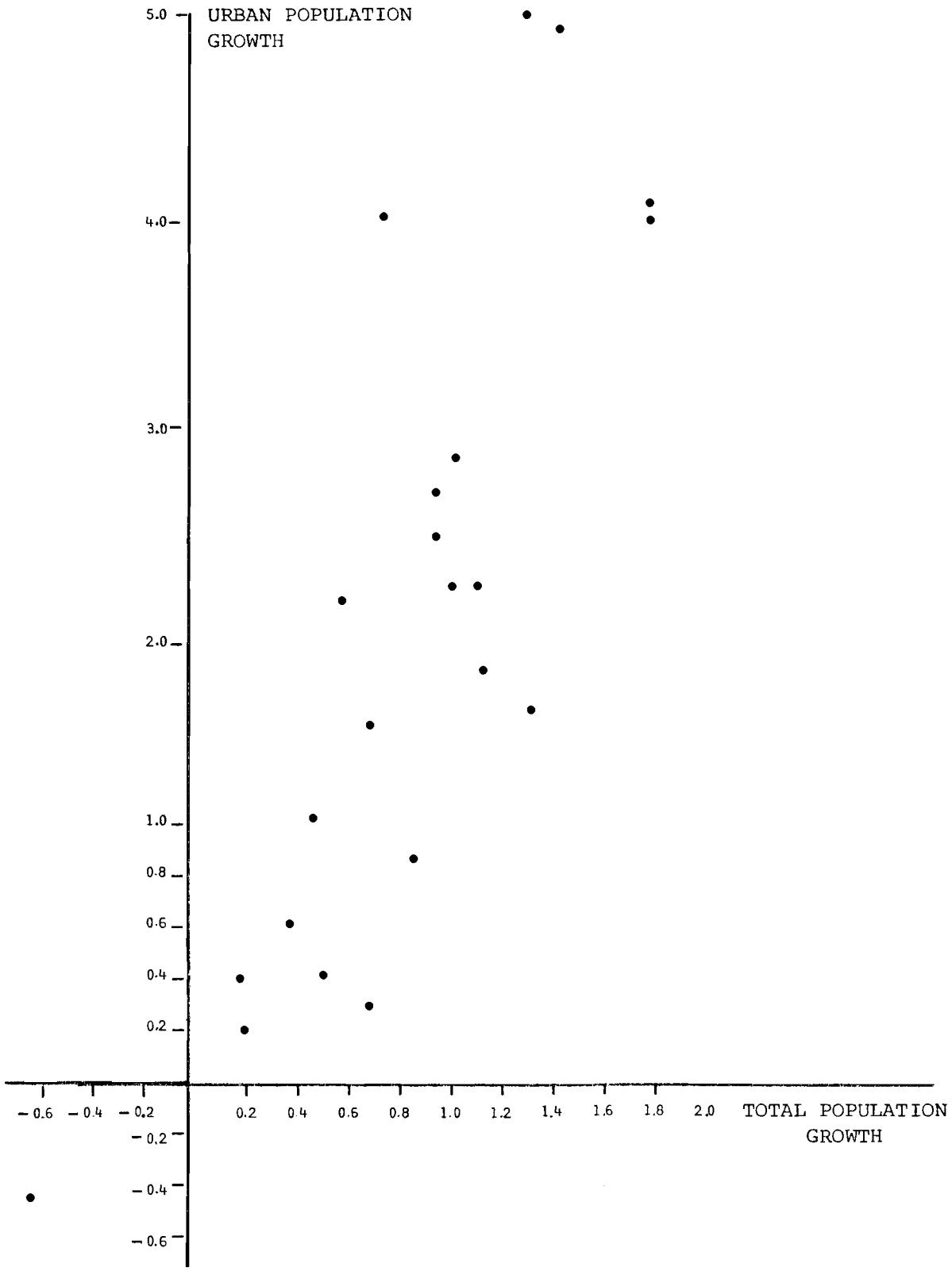


Figure 1. Mean Annual Population Growth Rates in European Countries during the 1950s.

Source: Economic Commission for Europe, 1979: Table IV.2:182.

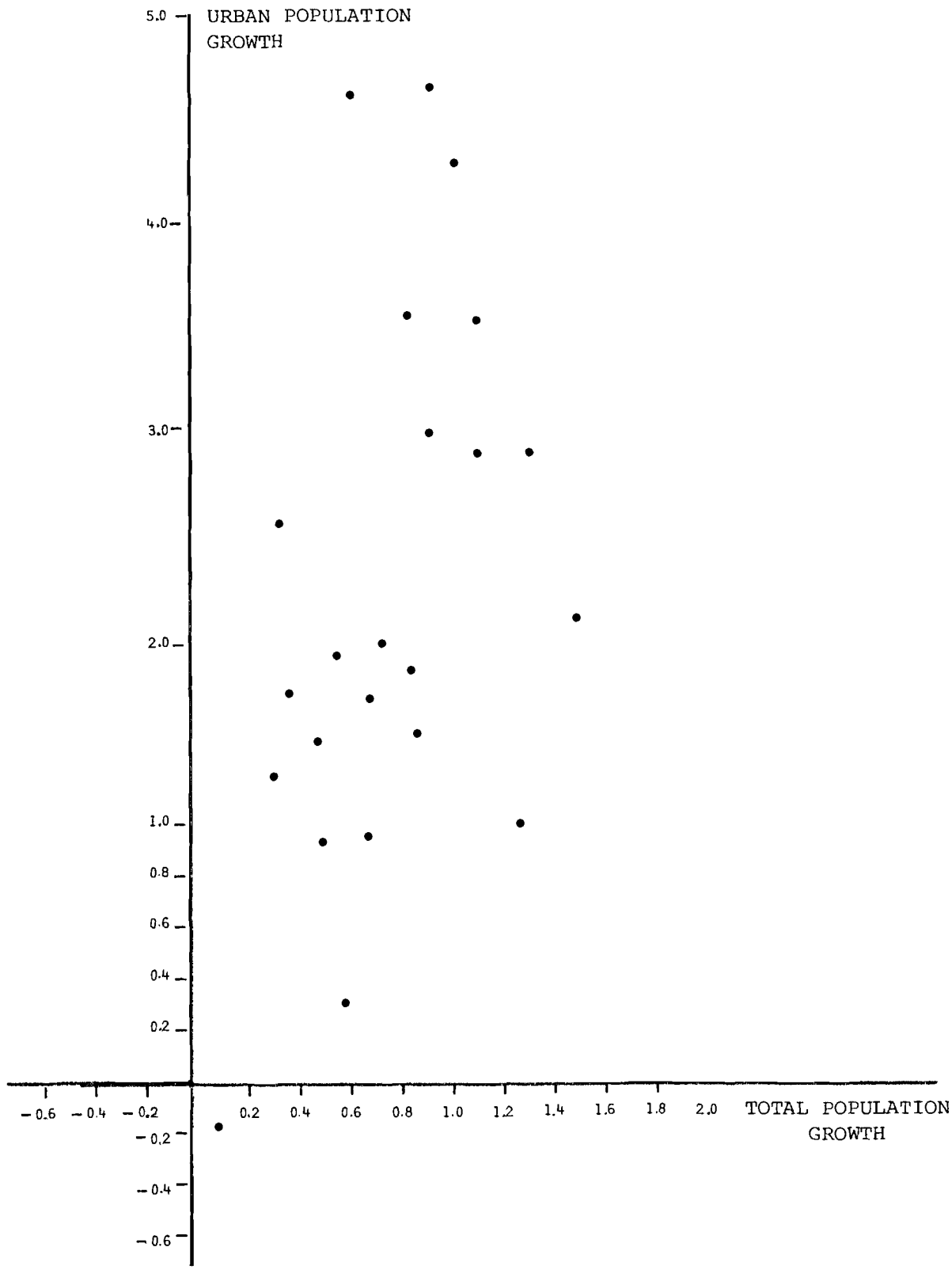


Figure 2. Mean Annual Population Growth Rates in European Countries during the 1960s.

Source: Economic Commission for Europe, 1979: Table IV.2:182.

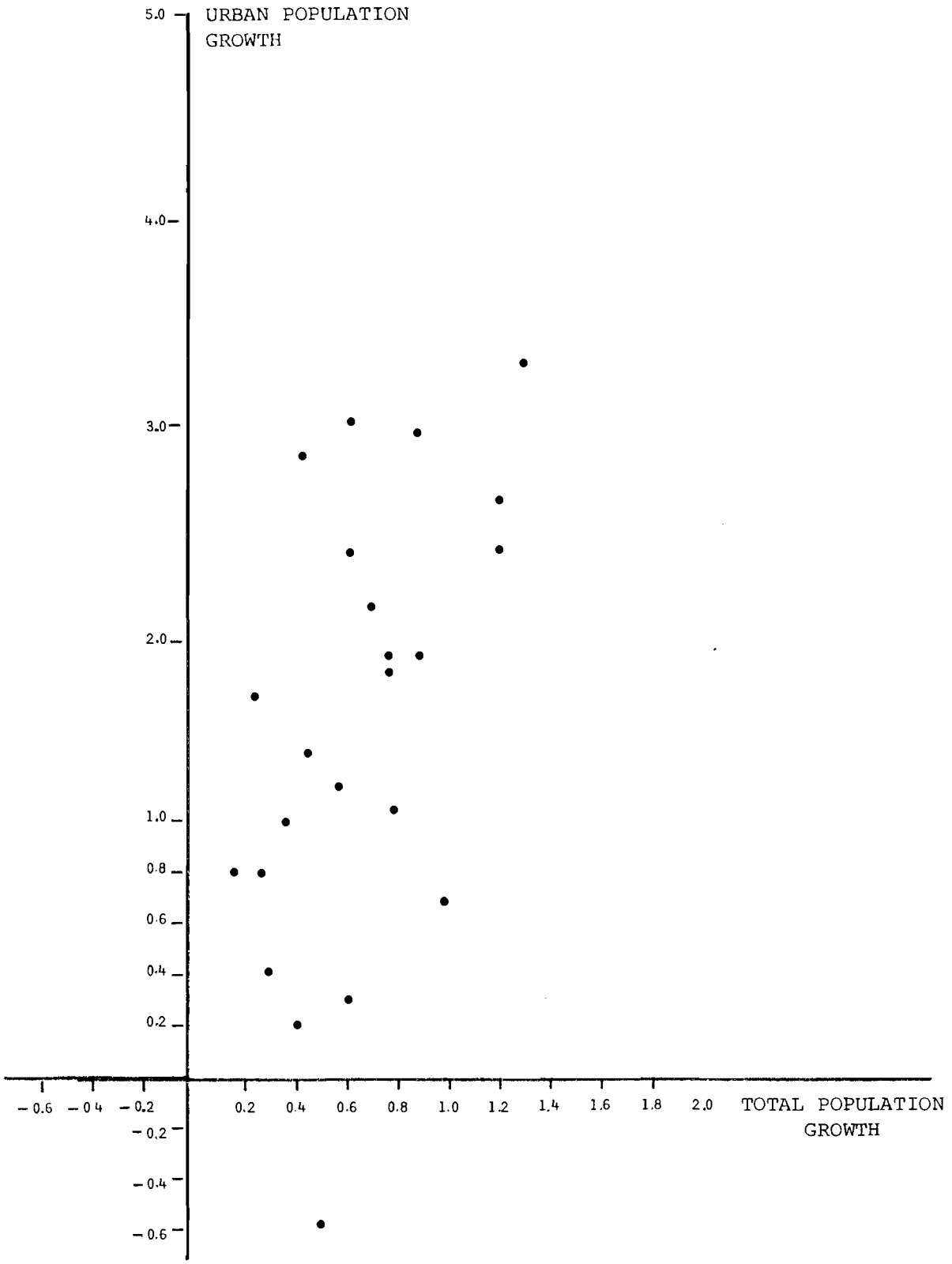


Figure 3. Mean Annual Population Growth Rates in European Countries during the early 1970s.

Source: Economic Commission for Europe, 1979: Table IV.2:182.

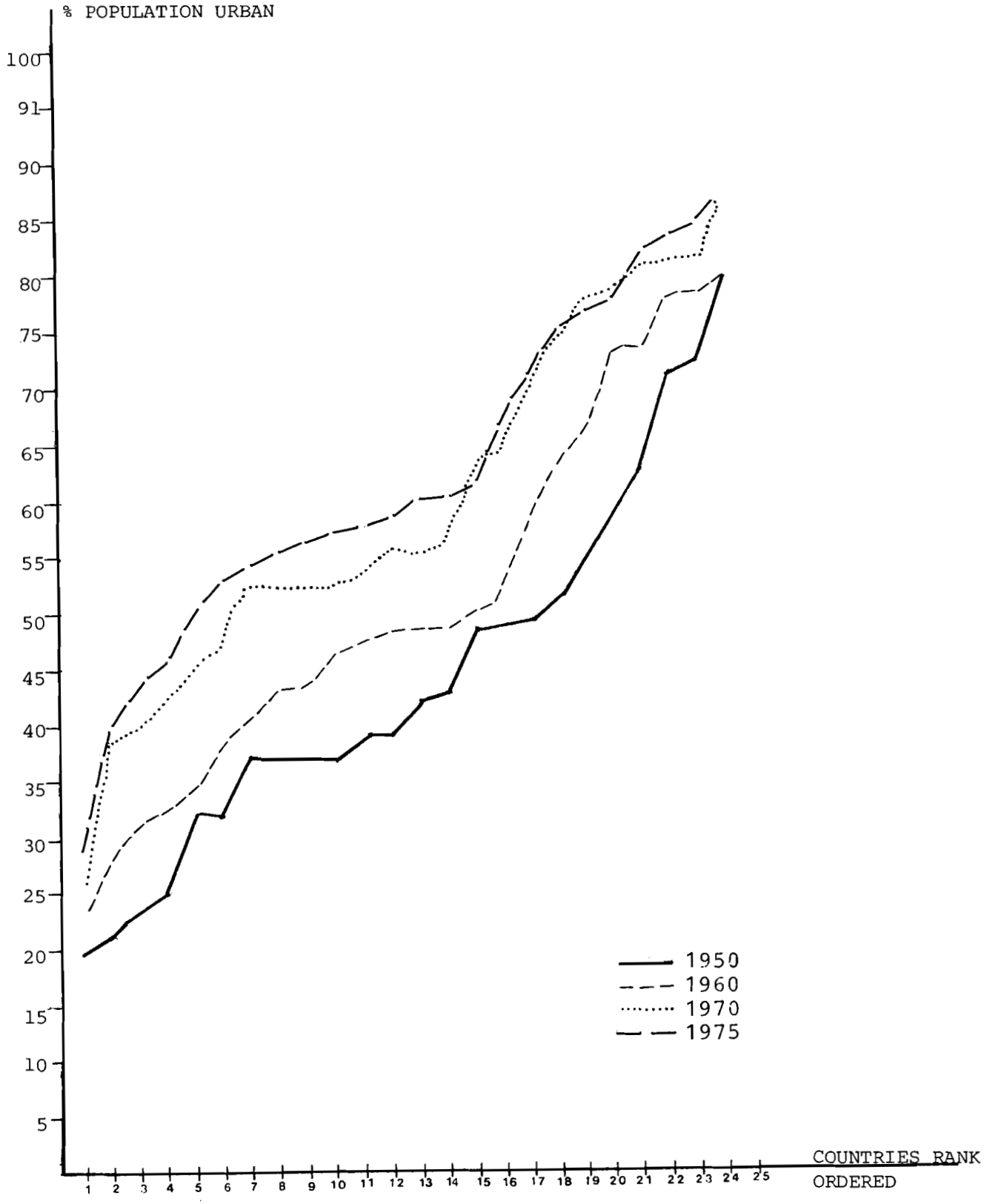


Figure 4. Changing Percentage of Urban Population in European Countries, 1950-1973.
Source: Economic Commission for Europe, 1979: Table IV.7:190.

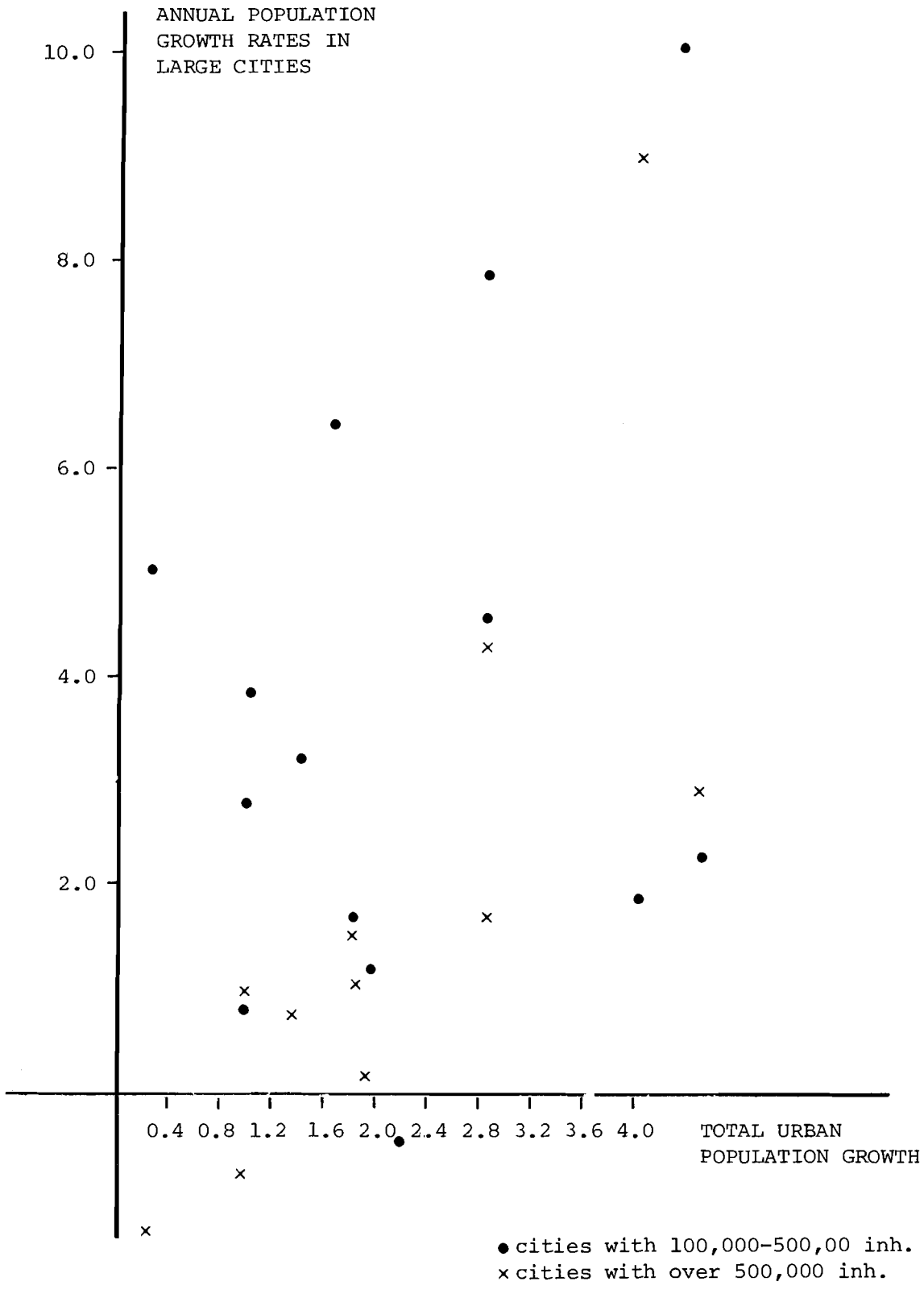


Figure 5. Urban Growth Rates during the 1960s in European Countries.

Source: Economic Commission for Europe, 1979: Table IV.3:183-184.

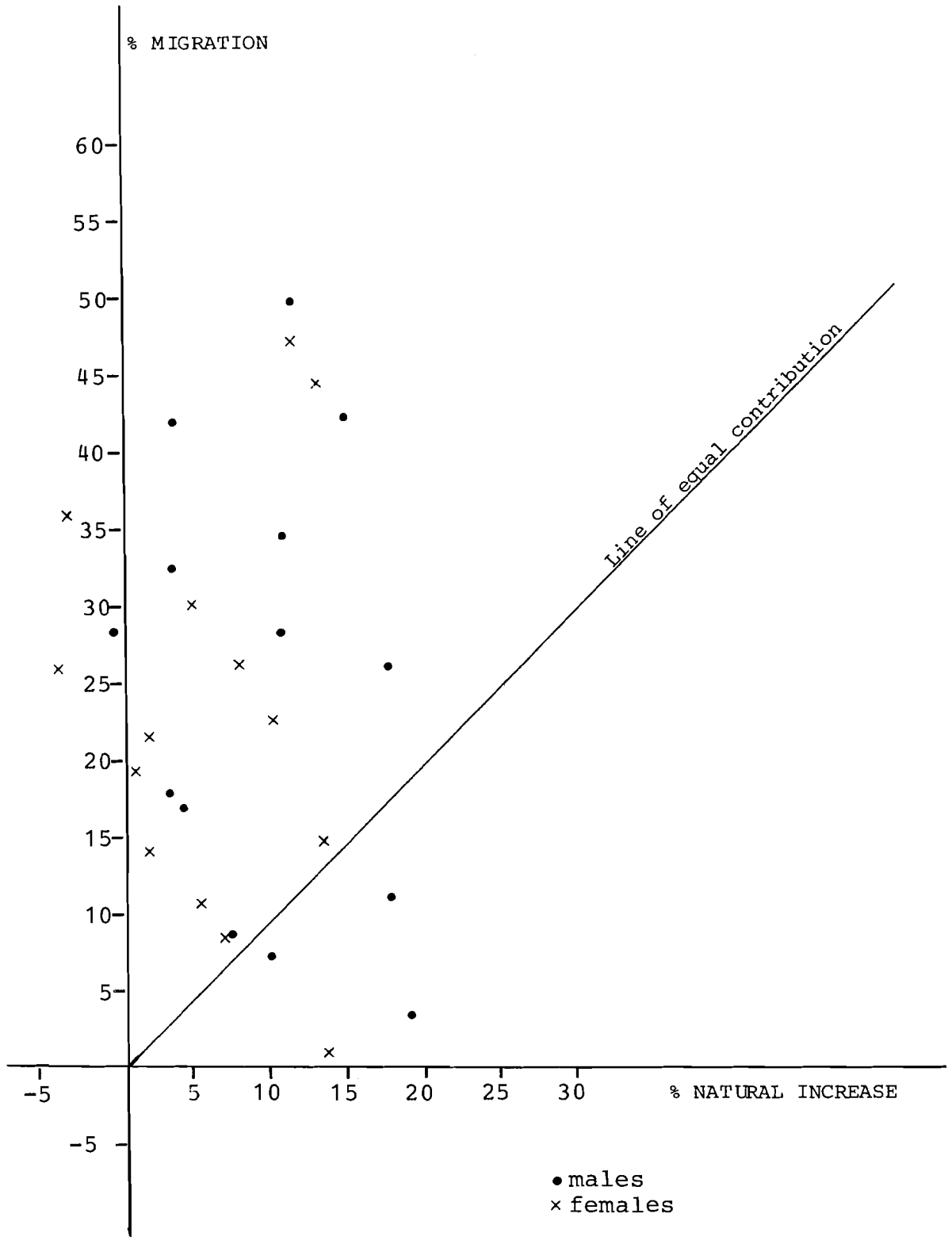


Figure 6. Components of Urban Population Change on European Countries during 1960s, 15-59 years age group.

Source: Economic Commission for Europe, 1979: Table IV.13:204.

Such a summary of current change can be questioned because: (a) it is based on spatial units that are not quite comparable from country to country, and (b) it fails to consider the effects which national settlement policies may have on the differential growth of cities of various size. This latter aspect will be dealt with in the following section of the paper. As far as the definitional question is concerned, it is fair to say that the trends outlined above also hold true when comparable delineations of urban areas are used. Figures 7-9 illustrate the changing path of interrelations between population growth rates and population size of the core areas of functional urban regions* for the Netherlands, Federal Republic of Germany, and Poland. The relation between growth and size either tends to be increasingly negative or changes from positive to negative with the passage of time. This is also illustrated by Table 1 which shows such relationships in 17 European countries for which population data have been arranged by urban cores, hinterlands, and peripheral areas. In the decade of the 1950s, the relevant statistical association was found negative in 11 out of the 17 countries examined; during the 1960s this was already true of all except one country (Finland). Furthermore, in 14 of these countries, either the negative correlation increased, or a shift from the positive to the negative correlation was noted.

When the population growth rate for urban cores is regressed on the log of their population size, satisfactory results are obtained for a score of countries within the sample only, notably for the Netherlands, Denmark, and Switzerland. (In the case of these three countries the slope values changed from -0.85, -0.99, and -0.13 in the fifties to -1.72, -1.67, and -1.37 during the sixties, respectively.) Nevertheless, all except a few urban cores with the population of one million and over experienced a decline of growth rates in the 1960s as compared to the 1950s and for nearly one half of these areas the latter decade brought an absolute decline in terms of population size. In the case of middle-sized urban cores the patterns of population change were

*For definition of functional urban regions see P. Gordon and T. Kawashima (1978).

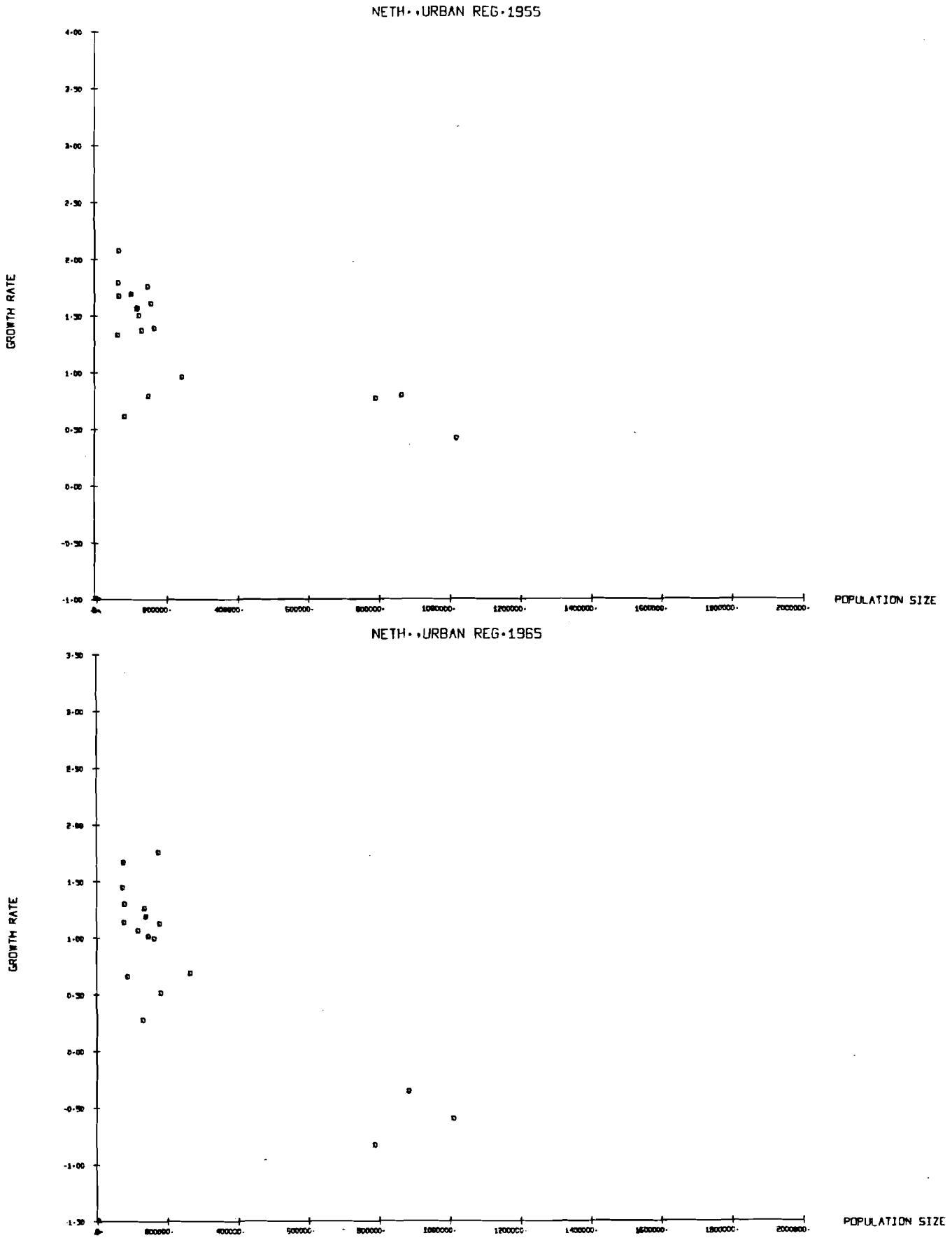


Figure 7. Mean Annual Rates of Population Growth for Cores of Functional Urban Regions: The Netherlands.

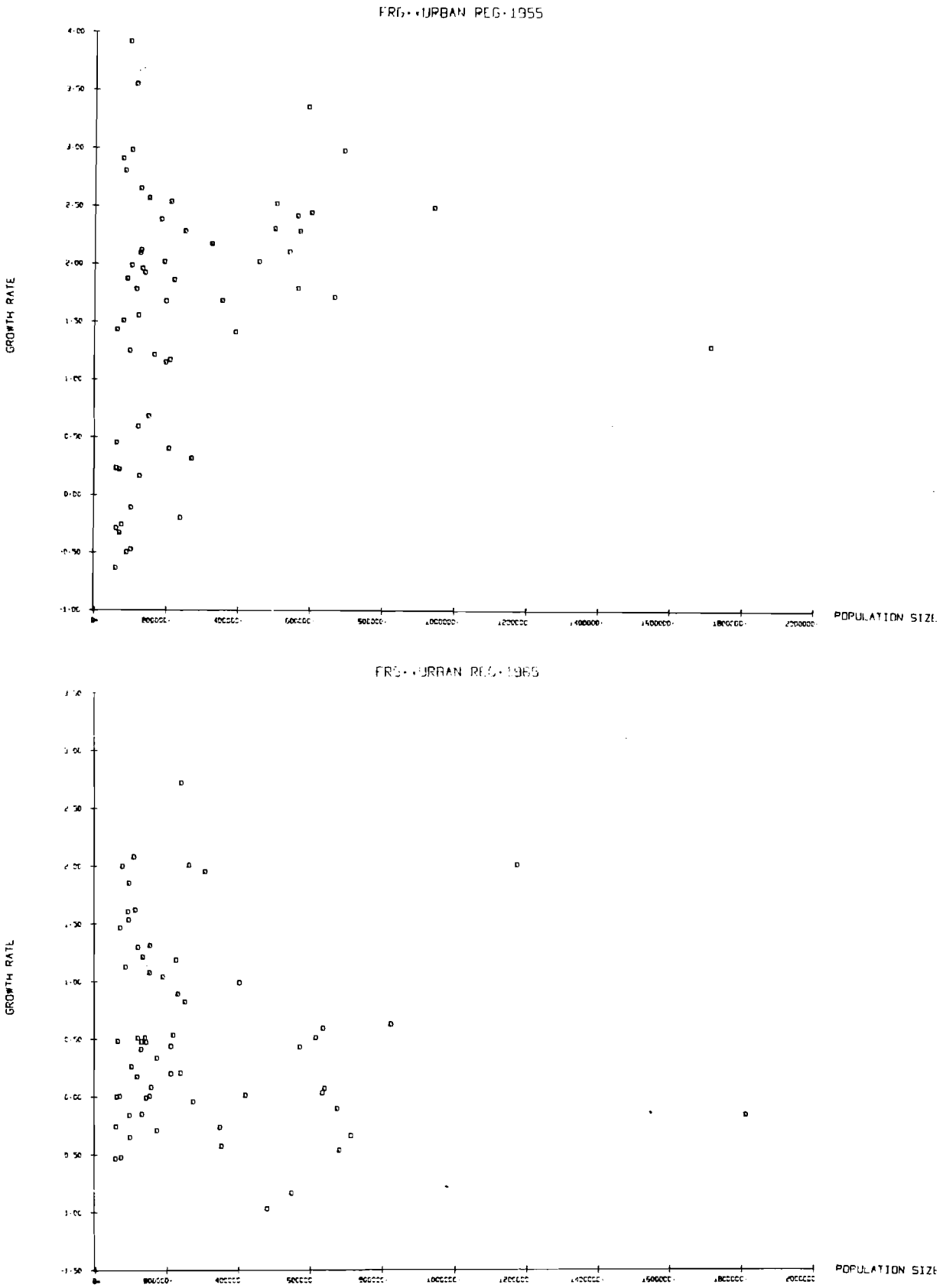


Figure 8. Mean Annual Rates of Population Growth for Cores of Functional Urban Regions: Federal Republic of Germany

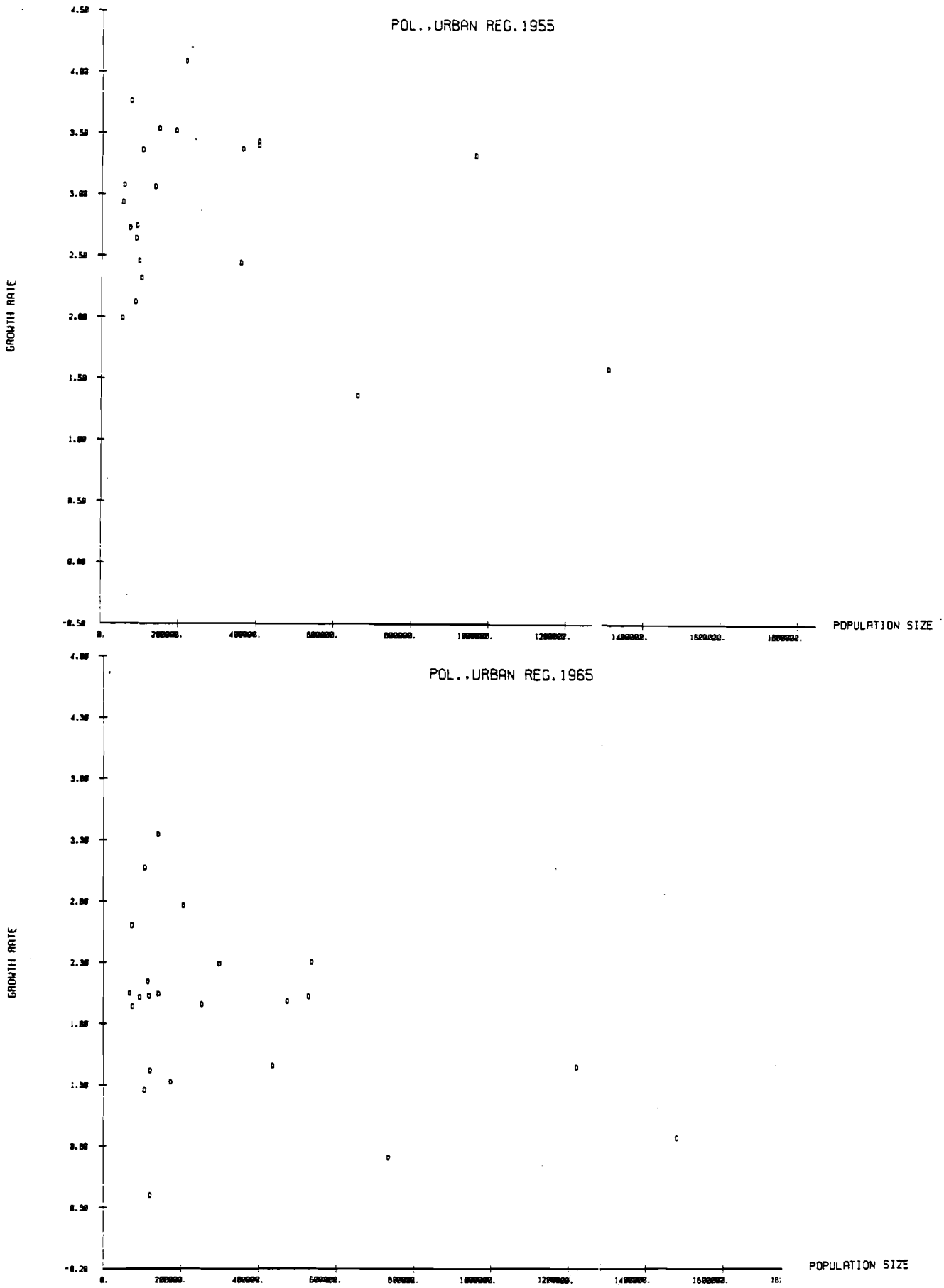


Figure 9. Mean Annual Rates of Population Growth for Cores of Functional Urban Regions: Poland.

Table 1. Association between population size and growth rate of the cores of functional urban regions.

Country	Simple Correlation Coefficient		
	1950-59	1960-70	1970-75
Netherlands	-0.69	-0.84	-
Portugal	-0.34	-0.76	-
Denmark	-0.74	-0.72	-
Switzerland	-0.09	-0.69	-
Austria	-0.45	-0.52	-
Hungary	-	-0.51	-0.69
Sweden	0.01	-0.49	-
United Kingdom	-0.25	-0.47	-
Norway	-0.40	-0.43	-
Ireland	-0.68	-0.37	-
Poland	-0.17	-0.35	-0.05
Belgium	-0.24	-0.26	-
Federal Republic of Germany	0.30	-0.15	-
Italy	0.18	-0.08	-
France	-0.18	-0.02	-
Spain	0.25	-0.01	-
Finland	0.74	0.04	-

highly diversified, ranging from very rapid growth to contraction. Some of these core areas will inevitably grow to the ranks of large urban cores, thus increasing the number of the latter. The overall picture for the highly urbanized countries, however, seems to be one of irregular, albeit pronounced, deconcentration trends within urban systems, and some of these trends can be traced back to the 1960s.

On the other hand, those countries that are characterized by a rapid population increase, in particular the less developed countries,* seem to experience urban growth patterns opposite to those outlined above. Their metropolitan areas continue to expand at rates comparable to, or faster than, total urban population growth, and, for individual large cities, the annual growth rates have been increasing over the last decades. Therefore, if

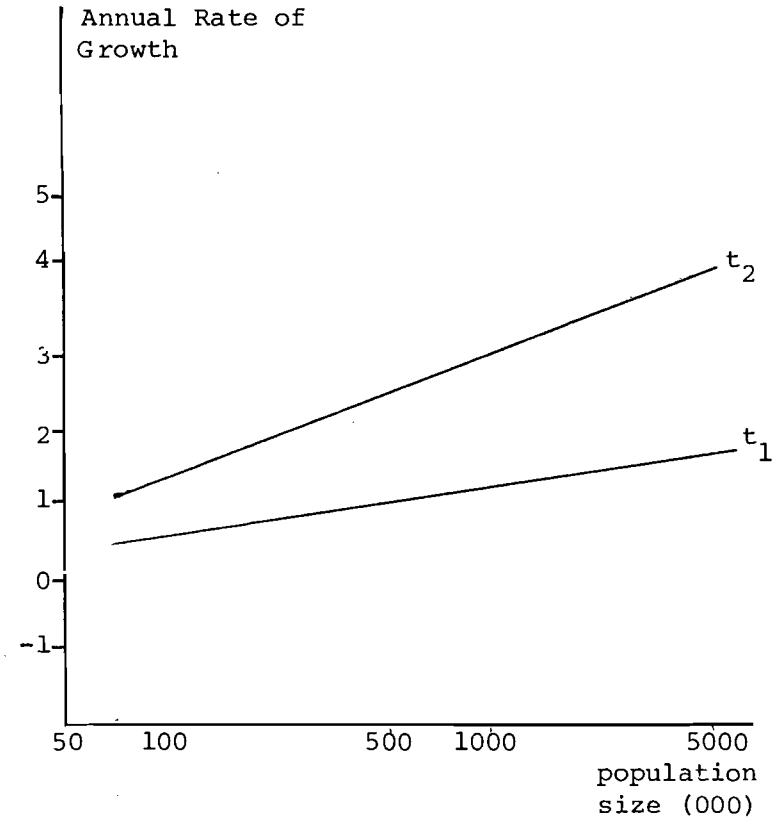
$$R_u = f(t, P_u)$$

where R_u is the rate of growth for an urban area over a certain limit of urban size (u), P is the population size, and t is time, then the pattern represented in Figure 10a will generally show growth comparisons for less developed countries, while the trend shown in Figure 10b will be typical of many highly urbanized countries over the 1950-1980 period.

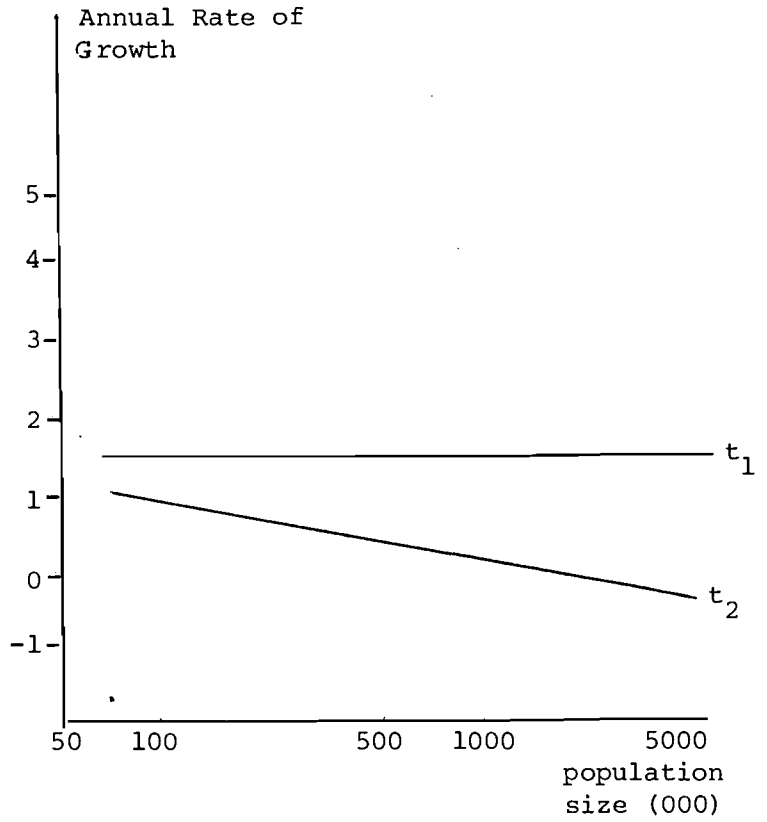
Such general trends, of course, are modified by variations in interregional growth rates while the lower limits of urban size (u) differ depending on overall population density and other socioeconomic factors. More importantly, the divergent nature of urban change should be viewed as a temporal phenomenon.

The large cities of today are clustered around two rather distant points on the logistic curve which describes secular urbanization trends. Ultimately, they need not necessarily be located on the corresponding curve, since growth cycles for individual urban centers and their national aggregates can be

*But also including countries such as Australia, whose population expands rapidly due to immigration.



A.



B.

Figure 10. Alternative Temporal Relationshps Between Urban Size and Rate of Growth.

repetitive, as they have been in the past, in response to renewed economic, political, or demographic impulses.

II. MAJOR POLICY ISSUES

An exploration into the recent literature on urban studies allows one to identify three pivotal issues to which most of the present-day urban planning and policy concerns are related:

1) Urban expansion and urban decline
2) Urban primacy
3) Manageability of intra-urban structure

These problem areas, in both the research and the policy sense, refer to urban change and settlement structure per se, rather than to primary economic, social, demographic, and technological trends that generate the observed change, and consequently, contribute to the relevant policy concerns. However, urban change is viewed not only as a spatial manifestation of those processes, but also in terms of its impact on their direction and pace. Taking the issues as they are listed in turn, it is necessary to elaborate on their: (a) causes and consequences, (b) range of validity, and (c) interrelations.

1. Urban Expansion and Urban Decline

For decades, both planners and researchers were preoccupied with the increasing population concentration in urban agglomerations, and they became quite alarmed when the phenomenon of urban contraction was identified around 1970. In fact, the interest is focusing on the large cities. As for the other components of the settlement networks, the alternative patterns of expansion, stability and decline, have for a long time been recognized and accepted. While a voluminous literature has already accumulated around the hypothesis of interregional deconcentration (or counterurbanization) as opposed to one of intraregional deconcentration which insists on the continuity of population overspill from the cores to peripheral zones of urban agglomerations, this dispute is incidental to policy-oriented urban research. In

fact, substantial variations occur in the patterns of spatial population change among countries characterized by comparable values of urbanization and economic development indicators. In Western Europe, for example, population decline in the London and Rhur regions proceeds parallel to a slow growth of the Randstad, and a substantial gain in the Paris region (Koch 1979). Areas with the highest migration gains still cluster around the large urban agglomerations; on the other hand, those peripheral regions that have recorded a recent population gain, still suffer a high net outflow of young and educated people. These variations are aptly summarized in a recent UN publication:

> During the latter part of the period studied (i.e., 1950-1975) the beginning of the movement away from metropolitan cities can be discerned in those countries in which urbanization had progressed furthest. While the trend in some countries may reflect mainly the movement from large cities to the suburbs, in others it appeared to indicate a growing preference for residence in non-metropolitan cities. In the latter countries, urban growth seemed to be taking place more and more in towns of intermediate size and in the hinterland of industrial centers (Economic Commission for Europe, 1979:273).

Although the observed patterns of urban change display considerable variations over space, it is fair to state that limits to urban-metropolitan growth are evident at present, at least in the developed countries, and that the "post-urbanization" phenomena deserve extensive research into both their underlying forces and consequences. As to the former aspect, the importance of demand-oriented factors, such as environmental preferences on part of the urban population, has been emphasized by many authors. However, Ch. Leven (1978a) asserts that these factors tend to be dominated by spatial variations in economic opportunity. Following Leven (1978b), we can speak of three main groups of determinants of urban change: namely (a) economic-technological, (b) demographic, and (c) policy-related factors.

The first category attributes the relatively poor performance of large cities in terms of population growth rates, to structural, intersectoral shifts and to changes in the spatial

distribution of economic activity. Locational shifts are explained by a declining role of scale and agglomeration economies and increasing diseconomies of large urban areas. As big plants are overrepresented in large cities, and small plants in smaller settlements, a change in the role of internal economies may affect comparative growth rates of population and employment in cities, depending on their size. A relative decline in the importance of agglomeration economies can be seen as a result of increasing ubiquity of transportation and communication infrastructure (S. Illeris 1979). As a growing number of industries are characterized by small urbanization economies indices, their location becomes insensitive to urban size. Furthermore, mounting negative externalities of the large-city concentrations tend to impair the traditional functions of metropolitan areas as "incubators" for new industries (H. Richardson 1978).

The demographic roots of urban change have not been explored until recently (W. Alonso 1978); however, they may be of special interest due to their univeral nature. The phenomenon of metropolitan stability and contraction may thus be attributed to long-standing population trends, in particular the decline in fertility, the changing age composition, and the related evolution of migration patterns. Subject to a particular national context, migration contributes highly varying proportions of total net population change in large metropolitan areas of the urbanized countries. However, such proportions will generally tend to decline. The out-migration potential of non-metropolitan areas is dwindling especially when the national trends in birth-rate decline are superimposed on the specific age and sex structure of the local population, resulting from past out-migration and recent inmigration patterns. Hence, urban growth is no longer becoming associated with inmigration from rural areas located within the commuting radius, or from peripheral regions representing migration pools on a national scale, but to an increasing degree, with the balance of urban-to-urban flows. When natural increase is small and migrations are more frequently urban-to-urban oriented, a growing percentage of cities and urban agglomerations may experience a negative balance of migrations, a situation described by W. Alonso (1978:28) in the following way:

"the migratory streams among metropolitan areas add-up to a zero-sum game, driving many areas into the category of population losers". Thus, the shrinking absolute size of the rural population, together with a turn in socioeconomic incentives in favor of medium-size urban areas, may further thin-out the population flows towards large urban agglomerations in the near future. So far, the predominant pattern of urban-to-urban migrations, in Europe at least, has been an upward motion within the urban-size hierarchy, but it is not clear whether such trends will continue. To quote an UN report again:

> In the highly industrialized countries, industry can be expected to move increasingly from the large cities to towns of medium size or even into the country, as improvements in transport facilitate the movement of supplies to the factories and the removal of finished products from them and make it possible for workers to be brought in from scattered villages. Where industries are located on the peripheries of towns, they will be able to draw their labor both from the cities outside which they are located and from the countryside beyond. Service occupations, by their very nature, are not necessarily concentrated in the larger towns (Economic Commission for Europe 1979:287).

And with regard to the impact of demographic trends:

> .....recent demographic trends and those expected in the near future will generally act adversely on the supply of labor in the 1980-2000 period particularly at the young ages. This impact will be stronger and felt earlier among those countries which experienced a marked decline in the annual numbers of births during the mid-1950s and early 1960s... the influence of purely demographic factors will be reinforced by the very limited scope for further increases in the participation rates of women... The rural areas now provide a far less obvious source of labor supply than was the case in the immediate post-war years. This applies not only to countries with a small rural population, but also to those where the age and sex structure of the rural population are not conducive to high employment (Economic Commission for Europe, 1979:287).

In addition to the factors mentioned, the presently-observed trends in population and employment distribution have been influenced by planning measures following either from explicit national urban policies, or from implicit urban policies embedded within overall socioeconomic policies. Settlement policy in many countries, including those which now exhibit the clear symptoms of the large-city decline, have for at least two decades been concerned with excessive population concentration in their main urban agglomerations and with the thinning-out of the population in peripheral regions, evidencing inadequate service provision levels and lack of employment opportunities. This applies equally to countries with a strong city primacy, as well as countries with a balanced urban hierarchical structure. Depending on socioeconomic conditions and the planning paradigm, the main emphasis was put on economic goals in some of those countries (for example, the Swedish policy of public service supply), while in others (Great Britain and the Netherlands) the emphasis was on spatial goals, such as urban containment. The recognition of negative externalities of large urban agglomerations, as related to their encroachment upon agricultural land, traffic, pollution costs, and other social costs, has been persistent so that the prevailing policies aimed at dispersing population from metropolitan to peripheral regions on the national scale, and in some instance from urban cores to marginal zones on a subregional scale. This has been the case even though priorities have changed over time, focusing mainly on the employment balance during the later period. Few studies have attempted to measure the actual impact of settlement policies in quantitative terms, but this impact is believed to be of a considerable magnitude. In Great Britain for example, the transfer of 325,000 jobs from the conurbations to the development areas between 1960-1976 was found attributable to direct policy measures (Moore and Rhodes 1979). In Poland, the effectiveness of large-city growth limitation policies, carried out during the 1960s, can be measured by a shift in the rate of annual expansion of employment in the city of Warsaw, from 50 percent above the national average during 1960-1964, to 40-50 percent below that figure by the late sixties.

The empirical evidence of a slowdown in urban growth and, occasionally, an absolute metropolitan contraction, has prompted postulates and action aiming at the refocusing of policies from growth control to growth generation (see P. Hall and Metcalf 1978; P. Drewe 1979). In the case of Poland, which was mentioned earlier, such principles have been introduced as early as 1970; the existing plans emphasize the development of a selected number of urban centers, including all the major urban agglomerations. The importance of policy as a factor of urban change should be underscored, although the scope of such policies considerably varies depending upon socioeconomic conditions. As policies tend to adjust to changing economic, technological, and demographic factors, they can not however be treated as a fully independent force of urban change.

Since factors and consequences of urban change are mutually interdependent, one can identify a number of outcomes for each of the determinants listed. Nondesirable consequences of metropolitan contraction generally recognized in the urban planning literature, include deterioration of the economic and financial basis of the major cities, resulting in the decline of such quality-of-life components as the level of services and environmental conditions; the rapid growth in energy costs associated with the progressing decentralization; and the mismatch between the distribution of economic opportunities and the skill levels of city residents.

Taking a more general perspective, one can expect that slow population growth of stability is associated with a number of demographic phenomena and related planning problems within large urban areas, which are quite different from those prevailing during periods of rapid growth. A low rate and a high selectivity of inmigration tends to result in considerable changes in the age and sex structure which in turn influences the amount, distribution, and composition of public services to be rendered to the local population. It also has pronounced effects on the demand for public transportation and housing. The ageing of the population tends to have adverse effects on the levels of income, productivity, and investments. Urban redevelopment and rehabilitation, a problem typical of all large urban areas, also represents

a different dimension in a situation of stability (or decline) whem compared to the "traditional", sustained growth conditions.

During the decades of rapid metropolitan growth the slowing down of its momentum was looked upon as a means to improve the quality of urban life.* Once the slowdown occurred, however, such a positive change did not seem to follow. As Koch (1979) concludes, population decline in some large urban areas (such as the London and the Ruhr regions) has not been accompanied by improvement of working and living conditions in these areas.

Individual problem areas associated with the prevalent patterns of urban change differ in terms of their spatial resolution level. Some factors enter at the national scale, for example changing foreign trade relations and overall demographic trends. A complementary explanation pertains to the changing allocation of resources between regions with the resulting interregional flows of capital and migrants. Yet other aspects of urban change can be interpreted with respect to the local level i.e., to the difficulties which large urban areas face in adjusting their spatial structure to evolving economic, technological, and social requirements. Turning the argument around, it can be claimed that given patterns of urban change are not without effects on national economic development, national demographic accounts, as well as interregional and core-hinterland proportions. Thus, a comprehensive study of factors and consequences of urban change should not bypass any of the spatial levels referred to here.

So far this section has focused on the decentralization and contraction phases of urban-metropolitan evolution. This should not suggest that the knowledge of problems associated with rapid urban growth, in particular as experienced by the less developed countries, is sufficiently advanced. On the contrary, neither the urban contraction, nor the rapid urban expansion phase of the urbanization process can be grasped comprehensively by existing theories of urban structure and change. As is emphasized in a recent UN document on migration and human settlement, there is

*See, for example, National Resource Committee (1937).

an urgent need for studies to identify linkages between socioeconomic factors and the growth of metropolitan areas in developing countries (United Nations 1977:13). On the one hand, the rapid urbanization and large-scale rural-urban migration are seen to have outpaced industrialization, and have thus aggrevated the problems of overcrowding, unemployment, slums, and deterioration of the human environment in urban areas. (For example, since housing construction did not keep up with population growth in the past, the greater of the requirements for new housing today is to shelter previous, rather than current, population growth.)* On the other hand,

> Data for a number of countries had shown that migrants tended to have a smaller number of children than non-migrants. Although it was difficult to determine whether migration operated as a cause or effect of lower fertility, there is an apparent association between migration and fertility level. Consequently, the impact of migration on urban growth and fertility levels should be further explored (United Nations, 1977: 5).

In addition, this impact is seen to be heavily dependent on urban size. It was therefore postulated that in the relevant studies, urban population should be subdivided according to city-size categories, and that special attention should be paid to the role of urban agglomerations having a million-plus population (United Nations, 1977:9).

2. Urban Primacy

One of the failures of previous analyses of metropolitan growth and contraction is an insufficient recognition of the changing role of large cities within regional and national settlement systems. A non-growth as well as a rapid growth of metropolitan areas (urban agglomerations) should be viewed not only in terms of its dependence and impact on national and intra-urban trends, but also in terms of the evolving urban hierarchy.

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*Of the five million new dwellings a year required in the ESCAP (East Asia and the Pacific) region during 1975-1980, three million were to replace deteriorated dwellings and to satisfy the backlog in housing which existed in 1970, and two million were to house current population growth (United Nations 1977:15).

Such an evolution entails shifts in the nature and location of specialized versus central-place functions, and the growing amount of interdependence among the urban agglomerations as well as between their cores and hinterland areas. Although the urban primacy question does not cover all the aspects of changing relations between large cities and the other components of settlement systems, it is a central issue within this broader domain and has as such been recognized by urban and regional planners.

Indeed, according to the already quoted UN document on East Asia:

> A serious problem of the region, of particular importance, was the tendency in some countries for the urban hierarchy to be disproportionately dominated by one city. The most striking example was Bangkok, Tahiland, which was about forty-five times larger than Chiang Mai, the next largest city in the country. The phenomenon was found to a lesser degree in Afghanistan, Burma, Iran, the Philippines, and the Republic of Korea (United Nations 1977:3).

Many authors have pointed out that no systematic statistical relations exist between city-size distribution patterns and economic development levels. Nevertheless, the highest primacy indices are associated with less developed countries, especially when a sample is limited to larger countries. As J. Abu-Lughod (1976) observed, the application of a rank-size formula may be particularly distorting in the case of small countries, where the restricted size of hinterlands and a limited number of urban places may prevent the emergence of certain orders in urban hierarchy. Furthermore, account should be taken of cases (such as India) where a regular rank-size pattern may be obtained by aggregating a number of essentially primate distributions. Considering these limitations (as well as others, such as variations in the definition of urban places) it would be fallacious to define primacy by resorting exclusively to the concept of city-size distributions. Instead, urban primacy should be treated in terms of the functional dominance of the large city, or the urban region, within a national settlement system and in the national patterns of rural-urban as well as urban-urban migration. Following this interpretation it is still likely that metropolitan

slow-growth, stability, or decline, as experienced by a number of developed countries, may result in a flattening of the functional city distribution gradient. On the other hand, for the majority of less developed countries such a gradient seems to increase even faster than the urban population-size distribution gradient. This change of the latter for North African countries is aptly described by J. Abu-Lughod (1976:200-201):

> It is readily apparent that allometric growth, i.e., the tendency for the large cities to be growing at higher rates than the smaller ones - isstill the dominant pattern, no matter how we may evaluate this fact. Whether capital cities in recent years have generally grown at the rate of at least five percent per annum, the provincial urban centers have grown at rates that seldom exceed three percent per year. Since that rate of growth is almost equivalent to the rate of natural increase... it is clear that these cities are just barely holding their own. The real net migration is going almost exclusively into the capital.

Failures to establish a statistical relationship between city-size distribution patterns and aggregate measures of economic growth, made scholars very cautious in defining urban primacy as an adverse characteristic of settlement sytems. Moreover, it was even found that those among the less developed countries with urban primacy indices growing most rapidly, have performed relatively well in terms of rate of GNP growth (H. Richardson 1979; K. Mera 1979). Yet, this finding may relate not so much to the advantages of urban primacy as to large-city economies (still very important in the less developed countries) and to the mainly short-lived effects of the massive outflow of population from the rural areas on agricultural productivity per capita. In fact, planners in both the developed and the developing countries have consistently identified urban primacy as a problem area and have devised a variety of policy measures aiming at the diminishing of the gap between the dominant city (typically, a nation's capital) and the remaining levels of urban hierarchy, if such a gap was found to exist. Among the best-known examples of such policies* are the French concept "métropoles d'équilibre", the Hungarian

*See E. Dalmasso (1979); M. Kaloszar (1975); and M.J. Bannon (1979).

policy of the development of five major provincial cities as counter-magnets to Budapest, and the corresponding attempts by Irish planners to promote nine secondary growth centers which would offset the excessive population and economic concentration of the Dublin area and which would keep the growth of the capital region at a level corresponding to the natural increase of its resident population.

The concept of an optimal population distribution and of an optimal structure of settlement systems is hardly conceivable, and, even if formulated, would be unlikely to serve as a base for national urban policies. However, arguments in favor of a "balanced" urban hierarchy can readily be assembled. First, such a hierarchy implies that services of a corresponding level can be provided within different regions, especially if it is expected that such units will gradually evolve into functional urban regions. Secondly, a spatially and hierarchically "balanced" urban system implies a better economic and cultural integration of a national territory. Thirdly, in the innovation diffusion process the hierarchical diffusion may prove more effective than the so-called neighborhood effect that is, spread from the diffusion origin outward. If this is the case, an explanation of some of the failures of the conventional growth pole approach, as encountered in a number of countries could be supplied (see N. M. Hansen, 1975 for a review).

Many authors insist on the decline in the role of agglomeration economies (see, for example, S. Illeris 1979). There is no evidence of such a decline, or of a growing importance of external urban diseconomies, in most of the less developed countries. But while the large size of urban areas may be seen as a factor conducive to faster economic growth and demographic transition, the urban primacy may constitute a hindrance to such developments. The above considerations have led to the postulate of promoting the growth of large urban centers as alternatives to the primate cities of today. To move beyond the domain of conventional wisdom, however, such policies have to be based on research pertaining to the interdependencies between the structure of settlement systems on the one hand, and the economic and demographic variables on the other hand.

3. Manageability of Intra-urban Structure

The third domain of urban planning issues refers to the internal organization of urban areas. Among these concerns there are specific problems (some of which have been discussed in the previous sections) related to urban size, the direction and rate of population and economic change, and general socioeconomic condidtions. Still, a number of components of the urban manageability issues are of a universal nature, and this is what makes this an attractive, as well as a challenging, area for comparative research and modeling. Whether growing or declining in terms of population size, large cities and urban agglomerations tend to expand territorially (as residential and employment densities decline) and are admittedly becoming less manageable. The improvements of the spatial patterns proposed, and occasionally implemented, such as the concept of transforming a large city into an urbanized region, fail to reconcile the specific yet crucial issues, which *inter alia*, include: (a) functionalization of urban space (separation of land uses) versus reduction of interaction costs, (b) energy conserving urbanism, (c) efficiency versus quality-of-life considerations in urban housing provision and allocation, (d) social integration on a local and a metropolitan-wide scale, and (e) extent and type of urban redevelopment.

As indicated earlier, the three sets of urban policy problems: the growth and contraction of metropolitan areas, their changing role in the settlement systems, and their internal organization, are both complementary and iterrelated. For example, if large urban areas were to experience prolonged periods of non-growth and decline, this would certainly affect their internal structure and well as their relations to other settlement units. On the other hand, neither economic performance nor population growth and composition are independent of changing intrametropolitan patterns.

If the observed and predicted economic and population changes (including shifts in the age-sex composition) can be translated into spatial relations between the residential, employment, and service sectors within urban areas, it would provide possibilities for the monitoring of urban change and the identification of

control variables to be used in correcting or setting the growth trajectories for individual urban areas and their spatial or functional aggregates. Of equal importance may prove to be the other side of the feedback relation, i.e., the extent and ways in which the given patterns of interaction, intersectoral change, land use, and density influence the population composition and its rate of change. However, any hasty generalization in this area should be avoided, as similar economic and population trends can be associated with quite different urban development and redevelopment patterns. This calls for the inclusion of variables relating to models of life, the role of planning and the socioeconomic systems.

The last section of this paper identifies some of the research prospects and priorities focusing on the planning and policy issues raised above. While making such an attempt one has to concur with Ch. Leven (1978b:4) when he insists that policies to alter or accommodate current trends can be forged out of an understanding of basic underlying causes, and that the trends themselves have to be considered in the perspective of time and place.

III. APPROACHES TO ANALYSIS

The field to urban studies is rich in theory formulations and has also produced a number of operational models of urban structure. There are, admittedly, two basic adverse characteristics of this development as well. First, links between individual approaches are either nonexistent or poorly articulated. Second, there is a notable scarcity of process-oriented concepts. Few models are available which focus on interrelations between population dynamics, and the economic and technological change on the one hand, and patterns of settlement on the other. Such models, however, are essential if one attempts to address any of the major urban planning issues (discussed in the previous section) and, by the same token, to interpret the observed and predict the future patterns of urban change. Thus the remaining part of this paper focuses on selected process-oriented concepts and models, pertaining to population and settlement with an aim to identify possible extensions of, and linkages between, individual approaches.

As was emphasized earlier, a study of urban change calls for (a) an integration of economic, demographic, and technological perspectives, (b) coverage of a wide array of spatial scales, ranging from national to regional and intra-urban. It will be shown that a set of concepts which offer relevant starting points to such a study include the following: (1) innovation diffusion and urban growth cycles, (2) migration and demographic change, and (3) spatial interaction and the evolution of urban regions.

1. Innovation Diffusion and Urban Growth Cycles

Unlike the bulk of location theory, the concept of innovation diffusion approaches the question of urban size from both a spatial and temporal perspective. A spatial diffusion model typically centers on one of the following innovation expansion patterns: (a) hierarchical diffusion, (b) neighborhood diffusion (spread), and (c) non-hierarchical, spatially noncontinuous transmission. J. Lasuen (1973), whose analysis is characteristic of the first type, implies that because successive innovations require increasingly larger scales of operation and larger markets, they are most likely to be adopted in the large cities first, and then diffuse to other components of the urban system. Stability of spatial innovation patterns results in a stable system of urban centers, whose hierarchy becomes articulated over time.

The second approach is represented by J. Boudeville's (1978) concept of the urban region. Spatial diffusion patterns within such a region are no longer of a hierarchical nature, and innovations tend to spread evenly over space. Due to the external economies that it offers, a large urban region is able to retain and reinvest most of the locally created wealth, and then to transform and modernize periodically its basic activities as well as technical and social infrastructure.

Finally, A. Pred's (1977) "a large-city focused model of city-system development" is probably the best-known case of the non-hierarchical (as well as spatially discontinuous) approach. The concept in question emphasizes the importance of inter-urban (rather than intra-regional) linkages which are shown to support the large-city growth. According to the model, a set of large

urban centers which had acquired a dominant position at an early development stage (as manufacturing or trade centers) enter a process of circular and cumulative growth, which is generated by self-perpetuating interactions among the large units of a national or multi-regional settlement system.

Thus, all the three basic interpretations of innovation-diffusion process support the notion of a continuous and unhampered expansion of large cities, somewhat contrary to the initial polarization concepts, to say nothing about the observed urban changes. Such a growth trajectory, however, results from external assumptions rather than the models themselves. These assumptions include both the existence and perpetuation of the positive feedback between size of an urban place and the magnitude and "quality" of inflows. Similar reservations apply to measures of economic interdependence (such as job control) as used in the models under discussion. In order to identify factors and inflection points on the growth curve when the nature of the feedback changes from positive to negative (or vice versa) one can turn to the notion of polarization reversal, which, although present in the classical works by J. Friedmann, has not been utilized much since. This notion may be defined as a turning point when polarization trends in the national economy towards the large cities give way to dispersion (H. Richardson 1979), and it is clearly related to Williamson's concept of a spatial divergence-convergence syndrome. One may hypothesize that interregional growth convergence trends tend to precede by a few decades the inter-urban polarization reversal, when the latter is expressed in population growth rates. This difference may be attributed to the delayed demographic change, as compared with the economic change, and it has been suggested on empirical grounds (see W. Alonso 1978).

In order to capture the polarization reversal effects one has to introduce changing location behavior of individual economic sectors. In a matrix form, the locations can be represented by city-size categories and/or structural components of metropolitan areas, such as cores, inner zones, and peripheral zones. Subsequent time periods would account for both the changing intersector proportions at the national level (following the concept of industry and product cycle, see M. Thomas 1979), and the locational

shifts among, as well as within, individual sectors. Building on input-output models such matrices would then be transformed to interaction matrices to define the employment and population shifts among the spatial units concerned. Data requirements to test such a model would be quite extensive, but not at an unattainable level in some countries. This is suggested, for example, by the study on the internal restructuring of British cities (D. Massey and R. Meegan 1978) which views the evolving industrial composition in urban areas as a consequence of developments at the level of national and international economy. One can also introduce the above assumption into a simpler simulation model along the lines proposed by W. Beyers (1978) so as to test long-range effects of hypothetical sectorial/regional adjustments, as well as development policies over sets of urban regions, or city-size categories.

The bottom tier of the framework discussed here, i.e., the translation of interregional economic divergence-convergence trends into the differential population growth rates for urban areas of various size, has been recently discussed by B. Newling (1979). Using Jamaican data he found that over the period 1702-1970 that country's capital underwent three subsequent growth cycles, each cycle being closely approximated by the Gompertz curve, defined as:

$$P_t = A/e^{be^{-ct}}$$

where A is the population level to which the curve tends asymptotically, b is the natural logarithm of A/t_0, and c is the measure of the rate of change of the rate of growth over time. These cycles were identified by Newling as concentration (the earlier phase) and deconcentration (the latter phase of the cycle) of spatial economic growth. The concentration-deconcentration trends, in turn, were established as measures of the slope of rank-size arrays calculated for the remaining urban places in the system. The statistical analysis indeed shows, for each of the growth cycles identified, that while values of the urban primacy index

are rising, the values of the rank-size slope parameter are falling, and vice versa. These findings led Newling to suggest that different regional and population distribution policies should be followed during various phases of the primate city's growth cycle.

Although the economic side of Newling's analysis is quite informal and simplistic, the idea of urban growth cycles is as such, appealing. It is also consistent with the innovation diffusion and polarization reversal notions discussed here and may be built upon to simulate urban growth patterns in a long-term perspective.

Within the IIASA Urban Change Task framework (see the Appendix), the study of interrelations between intersectoral shifts and regional industrial policies, and the changing structure of urban systems has focused on the case of Sweden (see L. Ohlsson 1979a, b, and c). For an economy, such as the Swedish one, which is relatively small and also open to world markets, changing external trade relations are seen to transmit down to the urban economy scale. Therefore, one of the objectives of the study has been to investigate the industrial adjustment performance of Sweden's major metropolitan areas. Preliminary analysis has shown that over the 1965-1975 period, the regions of Stockholm, Gothenburg, and Malmoe did not manage to switch over their employment rapidly enough to sectors which either had a high market growth rate or had gained much in comparative advantage. The largest region, namely Stockholm, had a favorable employment composition at the beginning of the period, and, although this structure was then improved even further, it was mainly due to contraction of employment in those sectors that ranked low on both of the growth criteria identified. The best adjusters, on the other hand, were some of the regions which received regional aid, aiming at amelioration of their employment problems within or beyond the industrial sector. Since these regions however had generally poor employment conditions initially, this result implies a levelling of interregional disparities in terms of employment (L. Ohlsson 1979a:43-44).

The above findings, however partial, run against conventional models of innovation diffusion and economic growth transmission within urban systems. The expanding and innovative sectors tend to be no longer concentrating in large urban areas; this trend occurs in the case of both secondary and tertiary activities. To elucidate future economic development at the macro and sectoral level, the Swedish study aims at the development of a general equilibrium model which can be used to test the impact on the urban system of alternative exogenous conditions, including available economic and technological predictions. Such a model can also be applied to other national case studies.

2. Migration and Demographic Change

A comprehensive framework of the analysis of spatial population shifts among the idividual components of urban systems is provided by multiregional demographic models (see A. Rogers 1975; F. Willekens and A. Rogers 1978). Recent applications of these models in a number of country case studies throw more light on the contribution of, and interaction between, the patterns of fertility, mortality, and mobility, as factors of urban change. These studies have demonstrated, for example, the extent to which particular age composition of inmigrants offsets a region's low-fertility, a feature common to most large urban regions in the developed countries, and thus prevents many of these regions from falling into the non-growth category, in terms of population trends. Although most of the models' applications have so far involved the use of observed data under an assumption of unchanged behavior, it has been postulated that for policy analysis purposes the data on migration (which represent the main policy variable in the model) should be generated by a complementary model, and should be allowed to vary over time.

Economic models of migration reveal a variety of approaches (see J. Miron 1979 as well as A. Andersson and D. Philipov 1979, for recent surveys), including the optimal factor-mobility, the cost-benefit, the behavioral mover-stayer, and the labor market perspectives. The relevant variables and equilibrating mechanisms of labor supply and demand which appear in such models vary, as they tend to reflect individual socioeconomic systems and economic

development levels. A common feature of economic models of migration, however, is their generally poor linkage to the theory of urban structure. The models generally fail to capture such essential characteristics of the origin and destination areas as existing housing supply, commuting costs, environmental quality, and the contact potential within a broader urban system. These omissions are partly due to the shortcomings of the geographical theory of migration within systems of urban centers, since apart from the widely used gravity approach, the only basic concepts available in this area are rather vague notions of mobility transition (W. Zelinsky 1971), and of step-wise, urban hierarchical migration. Nevertheless, such concepts can be used to specify barrier conditions in economic models of migration.

A framework which may be used to expand the multiregional demographic models, is one of spatial and occupational mobility (see M. Cordey-Hayes 1975; D. Gleave and D. Palmer 1977). At a relatively advanced level of economic development, it is claimed that hierarchical migration patterns, which represent basic intersectoral shifts, are replaced by moves among the regions with high resource allocation rates per capita, and among large cities in general. Such flows are fostered by both the increasing occupational mobility, and the accumulation of migration-prone individuals in the particular regions. The resulting pattern is consistent with the demographic theory which emphasizes relationships between mobility and age, although as A. Rogers (1978) has shown, it is not necessarily contradictory to the economic push-pull theory of migration.

To make the links effective, the spatial demographic models should allow for disaggregation of migrants by selected socio-economic characteristics. The single most relevant variable seems to be the level of education. (This is implied by a number of authors who point to the high association between spatial mobility and the level of skills; see, for example, T. Fielding 1979; Z. Rykiel 1979). Educational facilities, including higher and specialized vocational education, are not evenly distributed over space (and, in the case of many countries tend to cluster in major urban centers). The spatial educational structure, therefore,

would be subject to change according to the potential of skills-generating centers, as well as the diffusion (or concentration) of skills resulting from a particular size and configuration of migration flows.

An alternative approach was taken by J. Ledent and P. Gordon (1978) who have introduced a demographic component into an inter-regional model of economic growth rate differentials. Their version of the model allows one to consider migration, labor force participation rates, and other demographic characteristics as independent as well as dependent variables. Simulation runs of the model performed on a hypothetical data set reveal that, as a consequence of population shifts due to migration, the economic process of divergence and convergence assumes a cyclical form. So far the model looks into the urban-rural division rather than into a more complex spatial structure which would correspond to the patterns of settlement systems; nonetheless it allows one to include the crucial features of dynamics and of nonlinearity.

While emphasizing the study of internal migration in the urban change context, it is also necessary to point to the lack of systematic knowledge of interrelationships between the evolution of fertility and mortality, and the changing settlement structure. It is usually assumed that inter-urban variations in fertility and mortality rates are far less significant than rural-urban differences. However, one can suggest that population size is in fact highly correlated with fertility levels, so that city-size patterns may represent a continuum of reproduction values, from high (rural areas) to low levels (large cities) on the respective ends of the rank-size distribution. Alternatively, since large cities are often regarded as harbingers of the demographic transition, one can hypothesize that the most valid distinction is one between metropolitan areas and the remaining areas, both urban and rural. In any case, if fertility can be shown to vary systematically with the settlement structure (as represented by urban size and/or population density distributions) such a finding would have important implications for population policies in the developing countries, and might help

to establish links between these policies and spatial development policies. In such a vein, a recent United Nations sponsored expert group meeting on population and development modeling recommended *inter alia*, that:

> Promising lines of advance in the development of appropriate economic submodels relate to investment in human capital, migration and urbanization, economic-demographic interrelations... and labor market behavior. In particular, education should be modelled as a productive investment activity and a specific instrument of public policy. Models of migration should be developed, linking the demographic and economic aspects of population movement with models relating to urban demographic structures (United Nations 1979: 3(11)).

These are the research objectives to which the type of population analysis discussed in this section is particularly well suited.

3. Spatial Interaction and the Evolution of Urban Regions

The emphasis on spatial interaction, which represents one of several major approaches to the study of internal structure of cities may be justified not so much by the virtues of the existing spatial interaction models as by: (a) the role of population flows and land-use interdependence as variables crucial to the understanding and prediction of the evolution of intra-urban patterns, (b) a consistent policy-orientation of the bulk of research on urban spatial interaction, (c) partial and/or non-empirical nature of alternative modeling frameworks (see, for example, L. S. Bourne's 1978 criticism of urban land market models). Spatial interaction models have received a good deal of criticism as well because of their oversimplified image of urban structure, misinterpretation of the friction of distance, and comparative statics form. Nonetheless, the models seem flexible enough to absorb improvements, and they can also focus on emerging policy issues, for example, energy conserving urbanism.

In terms of their correspondence to the theory of intra-urban structure, the interaction models still need to account for residential relocation which is governed by factors other than distribution of jobs, and for basic urban forms (such as density and ecological patterns) and their change. In terms of distance measures, the intervening opportunity concept is recognized as perhaps more realistic than the gravity approach.

Although the models are built for projection purposes, their structure does not incorporate truly dynamic elements which would allow one to differentiate urban space internally. Improvements in this area have also been suggested (P. Korcelli 1976), including alternative sectoral disaggregations to facilitate inclusion of feedbacks between endogenous and exogenous sectors, as well as the linkage with multiregional demographic/migration models. Another advantage of having such a linkage would be the possibility of an integrated analysis of migration and commuting flows which, at selected spatial intervals are considered to be mutually substitutive (see M. Termote 1979). An analysis of this type would, in turn, be of interest to those who are concerned with more narrow, sectoral allocation models, in particular, aggregate housing construction models.

Possible extensions of spatial interaction models are in fact much more numerous, and a number of studies have pointed in this direction. Some of the recent attempts, related to the Urban Change Task at IIASA, include the work by J. Ledent and P. Gordon (1980) on the demographic dimension of the models, and by B. Shmulyan (1979) and J. Popkov (1979) on the interplay of deterministic characteristics of urban spatial systems and a stochastic nature of interactions within such a system.

Models which would allow one to trace adjustments of urban spatial structure to changing intersectoral proportions, technological change, and family structure, have still to be formulated and such models are more likely to be partial than comprehensive. Spatial adjustments can be expressed in metrics relating to population distribution, employment gradients, degree of internal specialization, and intensity of interaction among city subareas. It is possible to construct model sequences of urban forms, using

the above metrics, while referring to the concepts of urban regions. Individual stages in these sequences can be represented by city-hinterland (the concentration phase), metropolitan dominance (the specialization phase) and urban field (the dispersion phase) patterns. Since each stage is characterized by specific patterns of population movement, such patterns can be simulated in a scenario fashion, and the observed sequences extended on the basis of alternative assumptions concerning economic, technological, and social change, as well as spatial policy.

It was mentioned earlier that the process of residential allocation and relocation within urban areas should be modeled by referring to other factors, in addition to spatial structure of employment opportunities. It is true that most of the existing models use alternative allocation terms, as well as constraints which are expected to account for such factors. Even the two-stage models, however (which allocate people to housing stock that is also endogenously generated) fail to grasp an apparent lack of causal relationship between the job-search (allocation) and residential search (allocation) which is characteristic of a large fraction of allocation decisions within urban areas. Recent literature on migration features the so-called unified theory of movement (W. Alonso 1978). The divergent nature of interregional and intra-urban moves suggests, however, that these two processes should be modeled separately. While the former focuses on labor-related factors, the latter seems better couched in terms of urban ecology, both social and environmental.*

Since demographic characteristics represent a major component of urban ecological structure, and tend to display ordered (mostly concentric) spatial arrangements, it would be justifiable to generate intra-urban migration by means of a spatial demographic model. This would imply an extension of intra-urban studies into the analysis of spatial mobility as a function of the human life-cycle.

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*To a certain extent, this distinction may prove to be of a temporary validity only. Either the energy cost factor may alter intra-urban migration functions, or, alternatively, the patterns of interregional population flows may become dominated by environmental factors, following the already established trends.

IV. SUMMARY

This paper, firstly, summarizes selected empirical materials pertaining to recent patterns of population change for urban areas arranged by population size. Secondly, it uses this background to present major settlement policy areas. Such areas include: (a) determinants and consequences of rapid urban expansion, as well as of urban decline, (b) disadvantages of urban primacy, (c) problems of the manageability of intra-urban structure. Thirdly, research prospects and priorities focusing on those basic settlement policy issues are briefly discussed. The relevant research areas refer to (1) innovation diffusion and urban growth cycles, (2) inter-urban migration and demographic change, and (3) spatial interaction patterns within urban regions. Finally, an attempt is made in the Appendix to translate the arrays of policy and research questions identified in this paper into a working framework for the Urban Change Task, within the Human Settlements and Services Area at IIASA.

APPENDIX: THE URBAN CHANGE TASK STRATEGY

I. The Urban Change Task approaches selected research questions which can be derived from the list of planning and policy issues discussed in Section II of this background paper. These questions include:

(1) Changing intersectoral proportions and locational requirements of individual sectors as determining factors in the evolution of urban systems

(2) Changing structure of urban systems as affected by the evolution of fertility and mobility on a national and regional scale

(3) Adjustment of the urban spatial structure to changing economic, technological and social requirements (including the redistribution of jobs, changes in household size and composition, as well as in housing demand)

II. For each of the levels identified, a modeling framework is to be formulated, following the assumptions presented in Section III of this paper. Such a framework would then be applied and tested within national case studies, carried out for the individual NMO countries. Individual case studies typically will

emphasize one of the three levels under discussion, while they will all focus on interactions between economic and demographic components. Given the state of knowledge, this interaction is regarded as vital to any major thrust in urban model building. Within the national case studies more detailed analyses will be conducted for a selected number of large urban regions. The in-depth case studies will include those for Sweden, Poland, GDR, Canada, the Netherlands, Great Britain, and possibly the USSR, the USA, and Brazil.

III. In addition to national and regional case studies, there is a possibility of carrying out two comparative studies (for all the 17 NMO countries) which would represent a follow-up extension stage of the Comparative Study on Migration and Settlement, conducted during 1975-1978. IIASA's comparative advantage in this field is particularly large due to the modeling expertise, the accumulated experience, the existing stock of comparable data from earlier tasks, as well as the established working contacts with individual NMO countries. The relevant extensions could include:

(1) Application of the multiregional demographic model for systems of spatial units corresponding to the rural, urban, and metropolitan components of the settlement systems

(2) A study of migration-generation factors, in which the size and composition of population flows, as one of the inputs to the multiregional model, would be endogenized by introducing economic submodels

IV. Interaction between individual case studies will be augmented by means of occasional workshops. In addition to the Task-sponsored case studies, these workshops would also aim at covering other topically related research work carried out in the individual NMO countries. For instance, a workshop on Migration and Urban Change could bring together progress reports on the relevant case-studies (including those for Poland, the Netherlands, and the United States), as well as reports on spatial

anatomy of migration flows, based on research activity not formally included in the Urban Change Task framework.

V. The Task activities should include evaluations of the state of development and application of selected categories of urban models. Such surveys could also be included in the workshops, beginning with one devoted to spatial interaction models, which have been extensively studied and used in the planning process within most of the NMO countries.

VI. The work of the Task is expected to yield three major publications, each preceded by a series of working papers:

(1) A volume consisting of studies on new approaches to urban-population modeling

(2) A volume containing summary reports of national and regional case studies of urban change

(3) A volume devoted to review and appraisal of individual categories of urban models (such as spatial interaction models); this could be published as a special issue of a journal (for example, Urban Studies, Geographical Analysis, Geographia Polonica)

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