Population Changes in a Growth Center Region with Reference to the Israeli Negev

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Abstract: The aim of this paper is to present a scheme of relative population changes in a geographic-termed growth center region, with reference to a real problem of development as implemented in the Israeli Negev arid zone. The growth process described in the scheme leads to dynamic steady-states which indicate stable structure and stable relationships between the components of the regional system — the growth center and its urban and rural hinterlands. It was found that the relative population growth process in the Negev during the last thirty years is similar to the process determined by the scheme. Furthermore, geo-political changes in the area due to the peace treaty between Egypt and Israel may alter this process and open a new period of regional growth. An additional thrust of this paper is methodological: to introduce and apply the hexagonal diagram to describe and classify processes of relative population growth.

Introduction

It is almost trivial to state that the literature dealing with growth pole and growth center concepts is extensive. It is also recognized that the concepts of these two terms, either in pure economic or geographic context, have been ill-defined and lack sufficient empirical substantiation (Darwent 1969, Hansen 1972, Parr 1973).

One of the major contributions to growth pole and growth center concepts is Friedmann's (1966, 1967, 1968) center-periphery model. This model is outside the traditional problem of inter-sectoral distribution of resources and addresses itself to real problems of regional development in geographic space. An essential but rarely used determinante of development in a geographic space is population distribution and growth either in absolute or in relative terms. Moseley (1973), for example, presents a summary of 13 interpretations of growth centers based on different growth determinants from which only 3 interpretations use population as a determinante for regional growth. Furthermore, relative changes of population distribution may indicate different growth behavior patterns of the population of a settlement system.

The settlement system is naturally considered as an open system. Relative population changes in such a system express the net effect of the following events: a. intra-regional migration, b. inter-regional migration, c. international migration, d. non-proportional internal growth (or decline) of the different regional components and, d. reclassification of rural-urban components. Among these properties, non-proportional internal growth depends upon differences in the sex-age structures within the region. It must be noted that in discussing hereon relative population growth, all these events have already been accounted, thus being expressed by the relative growth values.

The aim of this paper is therefore to present a descriptive scheme of relative population changes in a geographic-termed growth center region, with reference to a real problem of regional development as implemented in the Israeli Negev arid zone. It is the purpose of the scheme to describe a growth process of relative population distribution in a regional system, based on a growth center with urban and rural hinterlands. The growth process described in the scheme leads to dynamic steady-states which indicate stable structure and stable relationships between the components of the regional system. The transition from one
A Scheme of Population Changes

In a growth center region absolute population growth is continuously observable in all parts of the regional system. However, the relative behavior of the different parts is not uni-directional. The absolute population growth trend of the entire region contains stages of relative growth, stages of dynamic equilibrium, and stages of relative decline with regard to the different parts of the region. Fig 1a presents a three-stage scheme of absolute population growth in a hypothetical growth center region divided into two parts: a growth center, and an adjacent hinterland. The size of the circles in Fig 1a represents the absolute population of each part at different stages of regional development. On the other hand Fig 1b represents the relative population changes which occur during these stages. The first stage represents the emergence of one urban settlement of the region as a growth center either in a spontaneous way, usually as a result of forces from within the region (Semple 1977, Hewings 1977), or in a planned way, usually associated with external investments directed to a pre-selected town (Cassetti and Semple 1969).

At the beginning of this stage the relative population weight of the evolving center is small in comparison to its hinterland. Later, growth impulses are accompanied by massive population growth causing an exponential increase of the center's relative population weight (as shown in Fig 1 - first stage). The relative population weight of the hinterland will consequently decrease.

In the second stage of regional development, the relative population weight of the growth center is larger than it was in the first stage and impulses of innovation known as "nodal response" (Parr 1973) are thought to be transmitted from the growth center to its hinterland. The center's relative population weight is still increasing although in an asymptotic way tending toward a relative dynamic equilibrium state. Such a state is characterized by an absolute population growth in the entire region, but the ratio or relative population weights between the growth center and its surroundings converge to be constant (Fig 1a, 1b - second stage). The effect of the "nodal response" is observable in the third stage in which population growth occurs in the periphery, in both urban and rural communities and two-way inter-nodal linkages are observed. One example for such linkages is intra-regional commercial activity which affects the development of a radial commuting pattern and encourages intra-regional migration (Gaile 1979). These changes are considered to be the result of positive feedback between the growth center and the periphery (Goodman 1974), as well as of inter-regional migration due to an increase in the attractiveness of the periphery.

At this point the relative population weight of the growth center decreases with a simultaneous increase in the relative population weight of the surrounding communities. In relative terms the urban periphery now behaves somewhat similar to the behavior of the original growth center in the former stage. This third stage reflects a new but lower state of dynamic equilibrium.

The hypothetical changes of the center's relative population weight can thus be described by two opposite-directed S-shaped curves (Fig 2). These continuous curves reflect one of the important concepts of system dynamics phenomenon of relative S-shaped growth (Forrester 1969, 1971; Meadows and Meadows 1973).

The three-stage scheme of population change, although hypothetical, generalizes a regional system in which the hinterland includes both urban and rural settlements. Therefore, population changes in the periphery as described in the scheme are the result of two significantly different processes of population change occurring in the peripheral urban and rural communities separately. Consequently