SYSTEMS APPROACHES TO HUMAN SETTLEMENTS

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Preface

This paper is a critical survey of spatial development
theories and policies in the light of evolving human settle-
ments systems in the United States, Western Europe and Japan.
It is intended as a background paper for the Human Settlement
Systems: Development Processes and Strategies research task
within IIASA's Human Settlements and Services Area. The
issues raised are of widespread concern in Socialist countries
as well as in nations with mixed economies.

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Other Papers in the IIASA Series on Human Settlement Systems:
Development Processes and Strategies

1. Peter Hall, Niles Hansen and Harry Swain, Urban Systems:
   A Comparative Analysis of Structure, Change and
   Public Policy, RM-75-35, July, 1975.

2. Niles Hansen, A Critique of Economic Regionalizations
   of the United States, RR-75-32, September, 1975.

3. Niles Hansen, International Cooperation and Regional
   Policies Within Nations, RM-75-48, September, 1975.

4. Peter Hall, Niles Hansen and Harry Swain, Status and
   Future Directions of the Comparative Urban Region
   Study: A Summary of Workshop Conclusions, RM-75-59,
   November, 1975.

5. Allan Pred, The Interurban Transmission of Growth in
   Advanced Economies: Empirical Findings Versus
   Regional Planning Assumptions, (to be published).

Abstract

Regional and urban policies always have consequences for the whole of the national territory, whether or not they were intended to do so. Thus policy makers should have a reasonably good grasp of the structure of human settlement systems and of the nature of the processes that underlie evolving settlement patterns.

A number of traditional approaches to urban systems are critically evaluated, and more recent contributions with respect to hierarchical diffusion models and the relationship between business organization and spatial organization are examined. Then recent changes in actual human settlements patterns in developed countries are discussed in some detail. It is argued that although various theories have provided partial insights into these processes, none has proven adequate. The concluding section outlines an analytic framework for improving policy-related research on settlement system development processes.

Systems Approaches to Human Settlements

Niles Hansen

Introduction

In the past two decades governments increasingly have attempted to influence patterns of spatial resource allocation and population distribution. These efforts usually have been prompted by two concerns. First, there is a widespread feeling in many countries that one or more of the largest cities is too big, in the sense that the social costs of further growth exceed the social benefits. It is also widely felt that assistance should be given to promote the growth of lagging regions. These regions are usually rural and tend to have a relatively high proportion of their employment in the primary sector, but in some instances they are old industrial areas that need modernization. Obviously the problems of big cities, lagging regions, and other parts of any given country are not independent of one another because the various areas are linked by flows of goods and services, migration, information, etc. Regional and urban policies always have consequences for the whole of the national territory, whether or not they were intended to do so. Thus policy makers should have a reasonably good grasp of the structure of human settlement systems and of the nature of the processes that underlie evolving settlement patterns. This paper presents a brief critical summary of the state of the art of social science contributions in these regards and indicates promising directions for future major research efforts.

When numerous governments first became interested in human settlements policies there was surprisingly little guidance available from the social sciences. In the early 1960s it could still be said that "the conceptual structure

necessary for intelligent making of policy is in its infancy.
The social sciences, principally economics and sociology,
have been laggard in taking notice of space; while geography,
which has always dealt with space, has lacked analytic power"
(Friedmann and Alonso, 1964, p.1).

Today the situation is quite different, especially in
the economics and geography disciplines. With respect to
economics there has been a remarkable international expan-
sion of university programs, books and journals dealing with
urban and regional problems. This has been due in large
measure to the fact that significant amounts of governmental
funds have become available to support such activities.
Moreover, geography has undergone a quantitative-theoretical
revolution; indeed, one of its most brilliant leaders has
suggested, in a recent private communication, that the move-
ment has already "run its course and may even be spinning
its wheels."

Even after these major recent developments it is not
uncommon to find older approaches to human settlements still
being used despite their limitations. Examples include
central place theory, export base theory and input-output
analysis. Because of their staying power they will be
examined briefly in the following section. Then attention
will be turned to a model which attempts to explain spatial-
temporal growth processes in urban systems by synthesizing a
number of strands developed for the most part in economic
and geographic analyses made in the 1960s. Next the adequacy
of this model is questioned in the light of empirical evidence
and recent changes in human settlement patterns. The remain-
der of the paper is devoted to current spatial policy issues
and to a research strategy for dealing with them.

Traditional Approaches to Urban Systems

Central Place Theory

A major characteristic of human settlements is the pre-
sence of many separate nodes or centers of concentrated

activity. From historical case studies we learn that cities
have grown because of a wide variety of initial advantages.
For example, some have had military or political advantages,
some have had good natural harbors and productive hinterlands,
and some have benefited from location at the intersection of
major transportation routes. In many instances the original
reason has ceased being the main basis for continuing growth
because the functions of the city have become highly diversi-
fied.

A complementary approach has attempted to explain the
spatial distribution of cities in terms of their size and
functions, rather than concentrating on individual cities
and their peculiarities. This systems approach, generally
termed central place theory, was pioneered by Christaller
(1933) and Lösch (1940) and and has subsequently been de-
veloped by numerous economists and geographers, most notably
Berry (1964) and Beckmann (1968).

The "range" of a good and a "threshold" population (or
purchasing power size) are the key concepts in central-place
theory. The range of a good denotes the zone around the
central place from which persons travel to the center to
purchase the good or service offered at the place. In theory,
the upper limit of this range is the maximum possible sales.
radius. Beyond this limit, the price of the good is too high
because the distance involved makes it so or because of the
closer proximity of consumers to alternative centers. The
lower limit of the range is the radius that encloses the
minimum number of consumers necessary to provide a sales vol-
ume adequate for the good to be supplied profitably from the
central place. This lower limit is the threshold population.
The lowest level of center performs certain functions or
provides certain goods that are constrained in number and kind
by the limited population within usual range of the center.
The center of the next highest order performs all the functions
of the lower-order center, plus a group of additional functions.

The next highest order of center will offer all the goods
offered by the first two levels but will be differentiated
from the order just beneath by a group of goods with greater
ranges than those possessed by any of the goods of the next
smaller center. In this manner a hierarchy of centers is
determined.

It should be pointed out that population by itself is
not necessarily a good measure of centrality. A large,
specialized-function center may have only a small hinterland
area and little influence on it. Thus, centrality is better
considered in terms of centralized services, including admin-
istration, culture, health and social services, organization
of economic and social life, finance, trade, service indus-
tries, the labor market, and traffic.

In the central place literature one frequently ecounters
market area maps that resemble honeycombs. The reason is
that of all the systems of regular market areas that will
completely cover a plane, the hexagonal one is most efficient
in terms of minimizing the distance to be covered between
supplier and demander per unit area when demand is given (see
Table 1). The advantage of the hexagonal market area system

Table 1: Average Distance Between Supply and Demand

Type of Market Area	Equal Radii	Equal Areas
Cicular	$\frac{2}{3}$ R	$\frac{2}{3}$ r
Hexagonal	$\left(\frac{1}{3} + \frac{1}{4} \log 3\right)$ R ≈ 0.6079 R	0.6685 r
Square	$\left(\frac{\sqrt{2}}{3} + \frac{1}{3} \log \tan \frac{3\pi}{8}\right)$ R ≈ 0.5407 R	0.6776 r
Triangular	$\left(\frac{1}{3} + \frac{1}{6\sqrt{3}} \log \tan \frac{5\pi}{12}\right)$ R ≈ 0.4600 R	0.7154 r

is actually understated in Table 1 because a more efficient market system permits prices to be lower, consumption to be higher and the density of firms to be larger, so that average distances would differ by even more than indicated.

Despite elegant modifications that have been made to earlier central place schemes in order to explain better the typical spacing, size and hierarchy of settlements, the usefulness of central place theory for human settlements policy is severely limited. The assumptions of the theory have some relevance to spatial patterns of mercantile centers but they are not applicable to most kinds of manufacturing activity. Moreover, the theory is essentially static; it provides little insight into processes of spatial economic development. Because it explains and evaluates localization from the perspective of the private firm it also is not a very useful tool for coming to grips with the external diseconomies and social costs of agglomeration, a major concern of human settlements policy.

As mentioned earlier, the urban hierarchy developed by Christaller and Lösch was based on function not population size. These are not synonymous but they are closely related. In the 1940s Zipf (1949) noted that if the cities of a given country are ordered by the integers 1,2,3..., then there exists a rank-size relationship which may be stated as follows:

$$P_r = \frac{P_1}{r^q} \quad .$$

In words this simply says that the population of any city of rank r is equal to the population of the largest city divided by the rank of the city in question raised to an exponent q. When the log of population size is plotted

against the log of rank, q generally has a value close to
unity. Although Zipf derived the relationship empirically
he went on to make the normative judgement that a value close
to unity is desirable because it indicates national political
and economic unity. Empirical evidence in this regard is not
conclusive, but von Böventer (1973) has convincingly argued
on theoretical grounds that satisfactory economic growth
and the personal well-being of a country's citizens are
compatible with a wide range of differences in the degree
of spatial concentration of population and economic activity;
particular rank-size distribution parameters are no help in
national planning decision processes.

Export Base Analysis

Policies with respect to human settlements must take
into account the nature of growth processes in the economies
of cities and regions. One of the most widely used tools of
spatial economic analysis is the export base method, which
emphasizes the importance of events outside a given area in
determining the area's levels of income, employment and
output.

Two economic sectors are identified: the basic sector,
which sells to markets located outside the given area; and
the service sector, which sells to markets within the given
area. The major premise of the analysis is that exports
play the most important role in the economic growth and well-
being of a region, because basic employment generates income
for local residents that is spent on goods and services that
in turn generate service employment. The ratio between basic
and service activities, usually measured in terms of employ-
ment or income, represents a multiplier. Thus, if basic
employment is 10,000 and service employment 20,000, any change
in basic employment will result (though not instantaneously)

in a readjustment so that the 1:2 ratio is maintained. For example, if basic employment doubles to 20,000, service employment will double in response to 40,000.

The export base approach involves many theoretical and practical problems. For example, along with normal difficulties in obtaining reliable data there are questions of the proper delineation of the area involved, the definition and measurement of the economic base, the assumptions that the marginal propensity to export is stable and that the marginal and average propensities to export are the same, and the assumption that exports are independently and autonomously determined. In addition, the economic base approach has been shown empirically to be a poor predictor of urban growth. It has even been argued that long-run urban growth is more a function of the service sector than of basic activities; because the economic base changes over time, a competitive service sector is necessary to replace stagnating basic activities with vigorous new ones.

> The economic base of the larger metropolitan area is, then, the creativity of its universities and research parks, the sophistication of its engineering firms and financial institutions, the persuasiveness of its public relations and advertising agencies, the flexibility of its transportation networks and utility systems, and all the other dimensions of infrastructure that facilitate the quick and orderly transfer from old dying bases to new growing ones. A diversified set of current exports--"breadth"--softens the shock of exogenous change, while a rich infrastructure--"depth" --facilitates the adjustment to change by providing the socioeconomic institutions and physical facilities needed to initiate new enterprises, transfer capital from old to new forms, and retrain labour (Thompson, 1968, p.53).

Whether one wishes to maintain that service activities in the broadest sense are induced or inducing, or that basic and service activities are mutually interdependent and co-equal in importance, it is still clear that analyses based

on a distinction between basic and other activities or be-
tween service and other activities have not provided general
explanations of why cities have grown the way they have.
The determinants of urban growth are too complex to be hand-
led within a framework which merely examines functional re-
lationships between "basic" and "service" activities.

Regional Input-Output Analysis

Input-output (I-O) analysis represents a considerably
more sophisticated approach to regional and urban growth
than the simple export base method. Formal presentation
of I-O techniques is beyond the scope of this paper but
several good sources are available (Isard, 1975; Miernyk,
1965; Richardson, 1972). The popularity of regional I-O
analysis is due largely to the fact that it is the only
general equilibrium approach that provides a practical means
for examining interregional trade flows empirically. It also
is possible to take distance into account in the form of
transportation costs. Moreover, although Eastern and Western
countries may make different uses of I-O for planning pur-
poses, the method is essentially neutral from a policy view-
point.

The most commonly expressed objection to I-O as a means
of specifying city-system interdependencies and growth trans-
mission channels is simply its impracticality. It has been
argued, for example, that

> Input-output studies of the variety carried out for
> the Philadelphia, Seattle-Tacoma, and Stockholm metro-
> politan complexes are expensive and extremely time-
> consuming. Furthermore, such studies provide little
> locational information, only describing the relation-
> ships of an urban complex with "the rest of the world"
> or, at best, "the rest of the state." Thus, in order
> to secure details sufficient enough to outline growth
> transmission channels at a large scale, i.e., in order
> to specify sectoral input-output relationships between
> several urban regions of a national city-system, it
> would be necessary to undertake a project of unprece-
> dented dimensions. And, even if it were feasible to

carry out such a gargantuan project, its results and
utility would still be open to the criticisms--concern-
ing changing input and production coefficients and other
matters--often directed toward much more modest input-
output analyses (Pred, 1975, p.8-9).

There also is another fundamental problem when I-O is
used to explain regional and urban growth. In practice I-O,
like export base analysis, traces the effects of changes in
final demand backward to the intermediate and primary supply
sectors. In location terms this implies that market orien-
tation and backward linkages are all that matter; no atten-
tion is given to input orientation or to forward and
complementary linkage effects. Yet the symmetry of an I-O
table means that in principle it is neutral with respect to
whether the initiating causes of regional growth are to be
found in changes in final demand, in primary supply (e.g.
changes in the quality of the labor force) or within the
intermediate sector (e.g. technological changes that alter
technical coefficients). Thus, in place of the usual demand-
driven model one could just as well use a supply-driven
model of regional growth that takes demand for granted and
makes regional activity dependent on the availability of
resources to put into production. The source of change now
becomes primary supply rather than final demand and avail-
ability of labor, capital, imported inputs, and public
infrastructure makes possible--through forward linkages--
certain intermediate activities oriented to these inputs.
Conceptually, the supply-driven process is very much like
the demand-driven process, but in practice there is a
critical operational difference. Usually there is not much
flexibility in the kind and amount of input required for a
given output. In contrast, if one has, say, an extra pound
of copper it is difficult to tell whether it will be used
to produce wire, cooking utensils, roofs, or something else.
This is the reason why purely technical coefficients are
referred to as <u>input</u> coefficients (demand-driven model)

rather than output coefficients (supply-driven model) even
though the symmetry is complete. The demand-driven and
supply-driven models are each one-sided; they need to be
combined to gain an adequate understanding of real growth
processes. Unfortunately, no existing analytic model
adequately combines these complementary approaches.

Growth Centers and Human Settlements

During the past two decades there has been a phenomenal
expansion of spatial theory literature concerning growth
centers. Detailed consideration of the history, nature, and
significance of growth center theory is not appropriate here,
but such studies are available elsewhere (Hansen, 1972, 1975;
Kuklinski, 1972, Moseley, 1974). At the same time growth
center policies intended to influence human settlement pat-
terns have been adopted by countries throughout the world,
although the extent to which they have been influenced by
growth center theory has varied considerably.

In many respects growth center theory began as a re-
action to approaches such as those discussed in the previous
section because of their inadequacy in coming to grips with
the dynamics of change. The emphasis given in classical
location theory to minimizing transportation costs, for
example, may be contrasted to the decline in importance of
shipping costs of heavy and cumbersome goods. Long-distance
transfer costs have been significantly reduced, while the
rapid movement of relatively light but highly elaborated
products has increased in importance, as has the need to
communicate information and intangible services. Moreover,
whereas industrial location in the past was heavily influ-
enced by factors such as energy sources, water, and trans-
portation facilities, entrepreneurs today tend to be more
attracted by "external economies of agglomeration" of the
kind that will be discussed shortly. Economic activity

also has become increasingly footloose. It has been estimated
that today only about seven per cent of the labor force needs
to be located close to natural resources, whereas only several
decades ago thirty per cent were resource-bound. The trend is
for the labor force to be potentially footloose and to locate
in proximity to consumers, who themselves are relatively foot-
loose. Economic opportunity, therefore, is increasingly
associated with capital and human skills and not with land and
natural resources (Spengler, 1967). Finally, a number of
studies of the relative importance of various plant location
factors from the viewpoint of industry have indicated the
importance of markets. This does not deny the importance of
tertiary activities because market and tertiary factors are
mutually reinforcing. Because they deal with such functions
as communications, construction, trade, finance, government,
the professions, and recreation, tertiary activities are, by
and large, closely tied to markets.

Urban markets thus serve and are served by large numbers
of persons and firms located in close proximity. It is the
great proximity in cities that generates so many external
economies of agglomeration. The term "externalities" implies
relationships other than those between buyer and seller. The
term "external economies of agglomeration" refers to economies
of operation that are external to the firm (or household) but
result from the previous presence of other firms (households)
and social infrastructure such as roads, schools, and util-
ities. Richardson (1973) has made a useful distinction among
business, household, and social external economies of agglom-
eration. Business-agglomeration economies include access to
specialized business services; sources of capital; labor-
market economies in the form of more varied skills, greater
elasticity of labor supplies, superior training, and better-
organized worker-placement services; a larger stock of man-
agerial and professional talent; good public services; cul-
tural amenities; opportunities for specialization because of

the large market (product specialization, technical exter-
nalities, transport cost savings); economies of information
and communication, especially where face-to-face contact is
involved; greater adaptability and flexibility in the use
of fixed capital; and the presence of a variety of business-
entertainment facilities.

Household-agglomeration economies would include oppor-
tunities for earning higher incomes, and a wide variety of
jobs, shopping facilities, public services, leisure and
cultural amenities, and housing. The efficient provision
of major educational facilities, public transportation,
hospitals, entertainment facilities, and other types of
social infrastructure usually requires some minimum popula-
lation-size threshold, though there may be a levelling off
in many benefits in the medium size range.

Then there are the more nebulous social-agglomeration
economies. This refers to the functions performed by cities
as centers of innovation, and the role of cities in trans-
mitting innovation through the urban hierarchy and to urban
hinterlands.

In a sense, then, it is the prevalence of these exter-
nalities that make a city what it is. However, the external
economies that attract people and firms to cities often are
accompanied by their negative counterpart, external dis-
economies, that are reflected in traffic congestion, air,
water and noise pollution, social disorder, physical blight,
and similar phenomena. If firms are able to slough off on
society the social costs that their presence generates the
market system will be biased in favor of large urban areas.
Because of this problem some persons have advocated policies
to reduce the size of large cities; others have argued that
it is not feasible to attempt to reduce large city sizes and
that it would be more efficient to correct negative exter-
nalities by prohibitions of noxious activities, taxes, or
subsidies for investment in abatement. The latter position

may be theoretically sound but in practice it is often im-
possible to measure all of the social costs of adding a given
firm or plant to a city. Perhaps it is this practical dif-
ficulty that has led so many countries to adopt another alter-
native, namely the growth center strategy.

Growth centers that are the object of public policy are
not simply urban places that already are growing rapidly, i.e.
spontaneous growth centers. Indeed, one of the principal
arguments for investments in induced growth centers is that
population can thereby be diverted away from allegedly over-
crowded metropolitan areas toward smaller cities. This ap-
proach has another policy advantage because most governments
also wish to promote growth in economically lagging regions.
Growth center theory and policy maintain that the most
efficient way to generate development in lagging regions is
to concentrate projects in a relatively few places with
growth potential; the growth center approach quite explicitly
recognizes the existence of external economies of agglomera-
tion. If the policy worked ideally, public investments in
induced growth centers would initiate a kind of chain re-
action of mutually induced public and private investment.
Moreover, the benefits would not be limited to a few select
centers; in theory the economic expansion would spread from
the growth centers to their hinterlands, thereby achieving
truly regional development.

How well have growth center strategies worked in practice?
With some exceptions in small countries they have not been
very successful. In particular, they have suffered from a
tendency toward proliferation of a large number of relatively
small centers incapable of effectively performing the role
attributed to them. There is increasing realization that
viable growth center strategies require greater selectivity
in choice of centers and of activities. However, it still
is uncertain whether spread effects from induced growth
centers can really raise income and employment opportunities

in lagging or declining regions to levels comparable to those
in more advanced regions. In some cases it is possible that
the economic infrastructure bias that has accompanied growth
center policies has done a disservice by shifting attention
away from the critical health, education, and social problems
that plague less developed regions. Preoccupation with spread
effects also has hindered efforts to explore the role of in-
duced growth centers as migration centers. In many of the
countries considered here the fastest growing urban areas are
neither the largest metropolitan areas nor the small towns
and cities, but rather intermediate-size cities. In the last,
I would suggest, public funds could be integrated with existing
or potential external economies to produce more rapid growth
with a minimum of diseconomies of congestion. Although such
places do not "need" growth center subsidies, it may be easier
to accelerate their growth than it would be to accelerate
growth in a lagging region. However, the accelerated growth
of intermediate growth centers should be made conditional on
the granting of newly created employment opportunities to a
significant number of workers from lagging areas who could
either commute or migrate. This approach would serve to keep
workers from areas with poor growth prospects at least rela-
tively close to their original homes. Moreover, if the govern-
ment knows what places are going to grow it can provide public
facilities in advance of demand. In other words, a growth
center strategy could be integrated with rational physical
planning to the greater benefit of both. It is evident that
a successful growth center strategy would have to be based on
careful analyses of data on employment growth prospects, com-
muting, migration, and the location preferences of people in
the context of actual opportunities available in alternative
locations. Even so, however, political realities may make
it impossible to implement a development strategy based on
only a relatively few urban centers.

Hierarchical Diffusion: A Spatial-Temporal Dynamic Model

In the late 1960s several major geographic and economic
analytic strands of thought were synthesized in a general
model of hierarchical diffusion of innovation. As described
by Berry (1970), this urban-oriented framework of economic
activities in space has two major elements: (1) a system of
cities arranged in a functional hierarchy and (2) correspond-
ing areas of urban influence surrounding each of the cities
in the system. Given this framework, the spatial extent of
developmental spread effects radiating from a given urban-
center are proportional to the center's size and functions.
"Impulses of economic change" are transmitted from higher
to lower centers in the hierarchy so that continuing innova-
tion in large cities is critical for the development of the
whole system. Areas of economic backwardness are found in
the most inaccessible areas, that is, between the least ac-
cessible lower-level towns in the urban hierarchy. Finally,
the growth potential of an area located between any two cities
is a function of the intensity of interactions between the
cities.

> One would conclude from this that, if metropolitan de-
> velopment is sustained at high levels, differences
> between centre and periphery should be eliminated and
> the space-economy should be integrated by outward flows
> of growth impulses through the urban hierarchy, and
> inward migration of labour to cities. Troughs of
> economic backwardness at the intermetropolitan periphery
> should, thereby, be eroded, and each area should find
> itself within the influence fields of a variety of urban
> centres of a variety of sizes. Continued urban-indus-
> trial expansion in major central cities should lead to
> catalytic impacts on surrounding regions. Growth
> impulses and economic advancement should 'trickle down'
> to smaller places and ultimately infuse dynamism into
> even the most tradition-bound peripheries (Berry, 1970,
> p.45-46).

It was pointed out earlier that static central place and
urban hierarchy schemes are not in themselves adequate for
analyzing growth and change. The synthesis just described

takes the central place framework as a kind of locational matrix or landscape within which dynamic processes take place. Growth center concepts also fit well within the general synthesis. One merely has to view induced growth centers as means for linking lagging regions more closely with the national system of hierarchical filtering and spread effects from urban centers to their hinterlands. Clearly, the synthesis has a great deal of inherent intellectual appeal and it has had some demonstrated applicability, especially in explaining industrial decentralization processes and the spatial-temporal diffusion of certain product innovations, e.g. television sets.

Having looked at the positive side, it must also be said that the model is not adequate for dealing with many important human settlements issues, even in Western urban-industrial countries. The failure of growth center policies to generate significant spread effects to lagging region hinterlands already has been pointed out. Although these policies may not have provided an adequate test of the theory--because they used too many small centers--the burden of proof nonetheless still rests with the believers in spread effects.

An equally fundamental problem with the model is that it does not deal adequately with an increasingly crucial aspect of the complex interaction between economic growth and spatial organization, namely, the interplay between business organization and the transmission of growth within systems of cities.

Business Organization and Spatial Organization

At least in Western nations, there is a pronounced tendency for economic theory to lag behind changes in economic reality. Spatial theorists do not gladly give up the convenience of assuming that the world is composed of single-product firms operating under competitive market conditions, though there has been some willingness to explore the spatial implications of oligopolistic markets. However,

the consequences for human settlement patterns of the size of
the multi-product, multi-locational firm--which has reached
gargantuan dimensions in the multi-national corporations--
have just begun to be investigated by economists and geogra-
phers.

From the economic side the major contribution has been
made by J.R. Lasuén (1973), who has attempted to re-establish
growth pole theory by giving it more of a systems orientation
with respect to both economic organization and spatial-temporal
development processes It is not possible to do justice to the
complexity of his arguments here, but essentially he maintains
that economic development results from the adoption of suc-
cessive packages of innovation in clusters of establishments
linked to a regional export activity. These clustered sectoral
sets are also clustered geographically. The diffusion and
adoption of successive sets of innovation follow similar pat-
terns, resulting in a fairly stable system of poles. Over
time, successive innovations demand greater scales of oper-
ation and larger markets; they also come at shorter intervals.
Large cities are the earliest adoptees of innovations, which
then diffuse to the rest of the urban system. As a conse-
quence of this process, the system of growth poles become
increasingly hierarchic in nature. Lasuén also places great
emphasis on the international generation of innovations and he
argues that if innovation diffusion is delayed because of
inadequate organizational arrangements then changes need to
be made in order to minimize the costs and risks inherent in
the learning process. This implies that development policies
should put less emphasis on production promotion and more
emphasis on marketing and technical know-how. Moreover,
permanent and long run integrated activities (multi-city
conglomerates or large single-city firms) are deemed to be
better development organization solutions than the short
run integration of activities through contracting arrangements.

According to Lasuén, most innovations in the western
world today originate in four megalopolises: the eastern
and western American seaboards, the Ruhr-Rhine valleys, and
the London-Midland plain. In the future he expects that:

> large towns will grow relatively larger than middle-sized
> ones; and these latter larger than the smaller ones, with
> the obvious exception of urban centres absorbed by others
> and cities created in new open areas; but all of them will
> tend to grow maintaining their relative places in the
> urban system, because more and more the whole system will
> participate in the adoption of new techniques. This trend
> will accelerate naturally if organisational policies of
> the type indicated are applied to geographical clusters at
> all levels, in order to integrate them tightly in the
> national innovation adoption process (Lasuén, 1973, p.187).

There are several problems with Lasuén's arguments from
a human settlements viewpoint. First, what is to sustain the
increase in population in the larger cities? Will small towns
and rural areas decline or will there be high rates of national
population growth? As will be shown subsequently, both of
these alternatives are difficult to reconcile with current
demographic tendencies. Second, it is by no means obvious
that London is today a major western center of innovation.
Great Britain is widely held to be the sick man of Europe, in
large part because of lack of innovation. How does one account
for this in Lasuén's theory? Finally, Lasuén's model is es-
sentially a highly sophisticated version of the hierarchical
filtering theory. Some of the shortcomings of this approach
have been noted. However, there is more general evidence that
national systems of cities are more complex than hierarchical
filtering models would indicate.

The influence of organizational decision-making linkages
on growth processes within urban systems has recently received
considerable attention from a number of geographers (Goddard,
1975; Pred, 1973, 1975; Törnqvist, 1973). Pred, in particular,
has systematically explored the role of large private and
public organizations in the diffusion of growth-inducing

innovations that affect city-system development. He finds
that:

> the cities chosen for innovation implementation, regard-
> less of size, most frequently are identical either with
> those cities where the large organization is already
> operating or those cities with which it has strong inter-
> organizational linkages. This is so because existing
> office, sales, and production facilities represent im-
> mobile, fixed capital, because of limited search behavior,
> and because the manifold uncertainties that surround
> growth-inducing innovations can be reduced by working
> in familiar environments. The selection of already
> familiar centers, of course, contributes to large-city
> rank stability within systems of cities and their regional
> subsystems.
>
> The asymmetrical hierarchical spatial structure of organ-
> izations portrayed here is synomynous with the large-city
> specialization and complex metropolitan interdependencies
> that are probably the most important structural character-
> istics of systems of cities in advanced economies (Pred,
> 1975, p.256).

However, the diffusion implications of this asymmetrical
structure are not consistent with the trickle-down in the strict
hierarchical diffusion model discussed earlier. Pred (1975,
1976) in fact presents empirical evidence that growth-inducing
innovation linkages run from large cities to even larger cities,
from smaller to larger cities, and even between cities of com-
parable size.

A highly simplified synoptic view of the process of growth
transmission is presented for heuristic purposes in Figure 1.
At time T, the totality of linkages existing within and among
organizations creates a goods and services interaction matrix,
or growth transmission matrix, among cities. (Subprocesses by
which self-sustained growth is maintained in metropolitan
areas are ignored here.) Each of the economic linkages in the
goods and services matrix involves an exchange of information,
that is, each economic transaction has a dual over which some
specialized information flows. The network of contact linkages
may be viewed as a matrix of probabilities influencing both
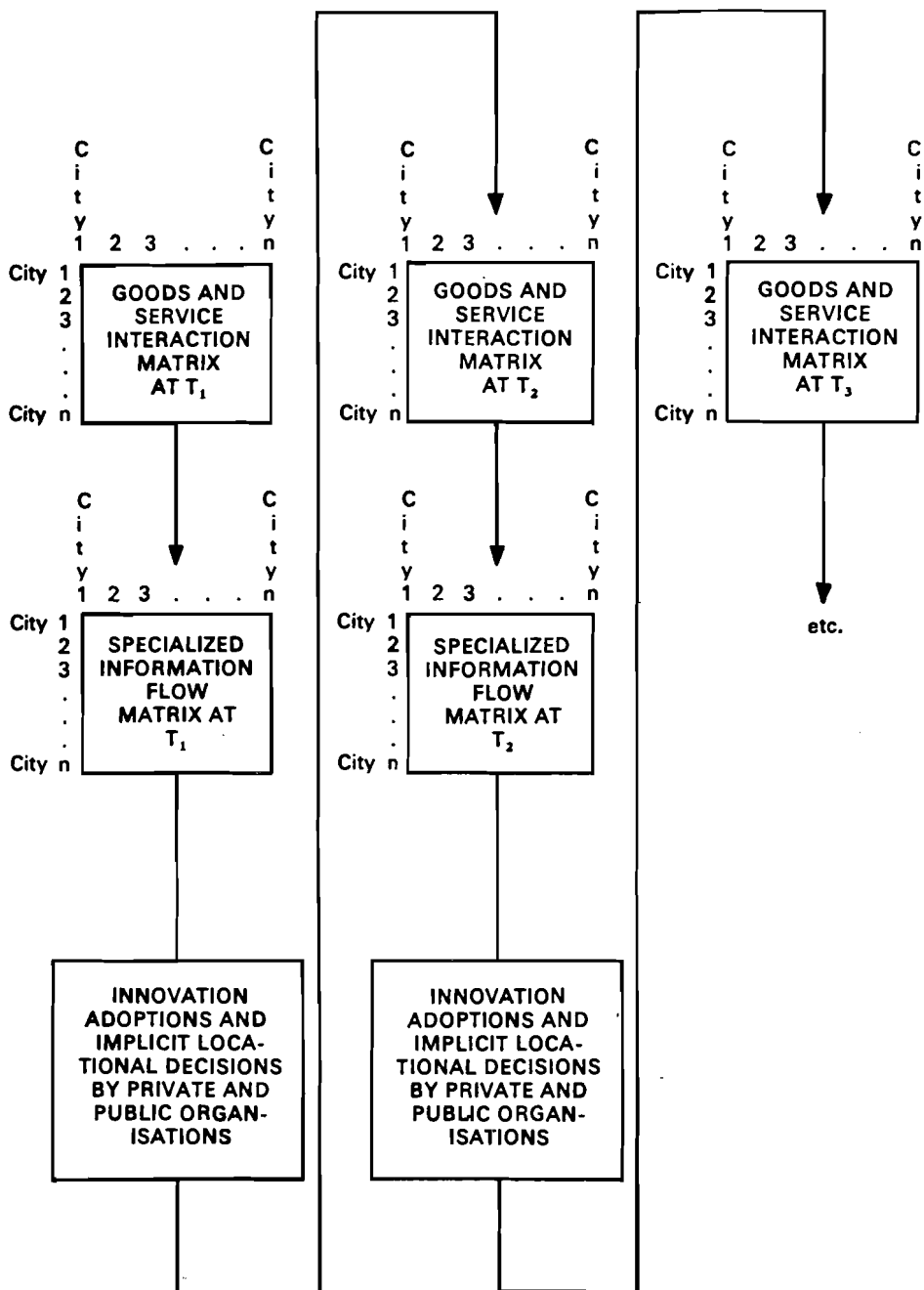the cities to which growth-inducing innovations diffuse and the

Figure 1. The Process of Growth Transmission
Within a National System of Cities.

Source: A.R. Pred, "Growth Transmissions Within
the Australian System of Cities—Obser-
vations and Recommendations," in The
Australian System of Cities: Need for
Research. Canberra, Australian Govern-
ment Publishing Service, July, 1975,
p. 42.

the cities identified for the implementation of new implicit
location decisions. Each innovation adoption and implicit
location decision either creates new growth transmission
linkages within and between organizations or reinforces
existing linkages. Thus by time T_2 a new modified goods
and services interaction matrix has emerged, giving rise to
a corresponding information flow matrix which influences
subsequent explicit and implicit location decisions. At
time T_3 another goods and services interaction matrix has
evolved, and so the process continues.

Pred does not claim that the evidence conclusively sup-
ports this conceptual model. His empirical findings rest
heavily on data for the amount of employment in other metro-
politan areas "controlled" by major industrial organizations
from the metropolitan areas where the respective organiza-
tional headquarters are located. It is assumed that the
number of growth-inducing innovations steered to a city from
headquarters is roughly proportional to the number of employ-
ees in the organization in the given city. Clearly this
assumption needs closer investigation, particularly by detailed
case studies of the amount and kinds of investments made in
various dispersed organizational units.

Nevertheless, from a policy perspective, the literature
on information flows already makes it apparent that "no re-
gional-planning policy is likely to be either goal consistent
or as successful as anticipated unless its formulation is
preceded by studies establishing the peculiar underlying
structure of growth-transmission interdependencies within the
concerned regional and national system of cities (Pred, 1976,
p.40)." But how precisely can knowledge about information
flows be used to restructure human settlement patterns? It
will be recalled that the objectives of most human settlements
policies usually involve some form of concentrated decentrali-
zation. Pred suggests that if this is what policy makers want,
then they should

create new interdependencies between selected small
metropolitan areas, regardless of whether or not they
are located in the same broadly defined region. In
particular, if the policy is to increase its proba-
bility of long-run success through circular and
cumulative feedbacks, some high-level organizational
administrative activities--with their characteristically
high local multipliers--should be among the activities
located at the decentralized foci. The artificially
created interdependencies associated with such a policy
would, in turn, require improved air connections between
the selected "intermediately-sized" cities so as to
facilitate the non-local face-to-face exchange of non-
routine specialized information (Pred, 1973, p.62).

This is about as specific as the relevant literature gets
with respect to policy recommendations. What obviously is
missing is careful consideration of the costs and benefits of
such schemes. Recent investigations by geographers of the
nature and significance of information flows in an urban
systems context have opened promising vistas for policy-
oriented research on human settlements; however, future
extensions of this research should attempt to incorporate
more economic analysis.

Recent Changes in Human Settlement Patterns

Up to this point primary attention has been devoted to
various theoretical approaches to the structure and develop-
ment of human settlement systems. In contrast, this section
examines actual changes in human settlement patterns in a
number of industrially-advanced countries. It will be seen
that these changes represent rather dramatic shifts from
patterns that prevailed even in the recent past. Theoretical
models which had difficulty in explaining past settlement
structures and growth are even less likely to give adequate
understanding--much less policy guidance--in the newly-
emerging settlement context.

The United States

Earlier in this paper it was pointed out that cities
have grown primarily because of the external economics of

agglomeration they have provided for interdependent specialists
who have needed to interact with one another frequently or
intensively. On the other hand, proximity also gives rise to
pollution, congestion and other undesirable external dis-
economies that make cities unattractive. In addition, modern
transportation and communications technologies have reduced
the need for spatial concentration of many kinds of economic
activities and household amenities.

The implications of these and related phenomena for
human settlement patterns in the United States between 1950
and 1970 are illustrated by the data in Table 2 and by Figure
2. During the 1950s metropolitan areas increased in popula-
tion by 26.4 per cent while nonmetropolitan areas grew by
only 5.3 per cent. The growth of the suburbs of central cities
was a remarkable 45.9 per cent. During the 1960s the growth
rate of metropolitan areas declined to 16.6 per cent, but this
still exceeded the corresponding national rate of 13.3 per
cent. As in the previous decade, the growth rate in the sub-
urbs was four times that in central cities. The growth rate
in nonmetropolitan areas increased to 6.8 per cent.

Figure 2 shows the extension over time of commuting dis-
tances around metropolitan areas. Absorption into the com-
muting field has brought significant increases first in in-
come, and then in population. Within these commuting fields
the size of a city or town has not been as important for resi-
dential and employment growth as distance to the metropolis and
the presence of environmental and recreational amenities.
Beyond metropolitan commuting fields population and eocnomic
activity have continued to centralize into larger urban centers.
"Low-wage, 'trickle down,' industries soak up excess labour
supply with minimal welfare impacts. The higher order centers
are islands of prosperity in a sea of stagnation. The one sign-
ificant exception to this historical pattern...is the acceler-
ated growth of retirement or recreation communities drawn to
amenity-rich sites (Lamb, 1975, p.186)."

Table 2. Population of the United States by Place of Residence 1950 to 1970 (in thousands, except for per cent)

Residence	Population		1970		Per Cent Change		Average Annual Change	
	1950	1960	Total	Per Cent	1950-60	1960-70	1950-60	1960-70
Total	151,326	179,323	203,212	100.0	18.5	13.3	1.7	1.3
Standard metropolitan statistical areas	94,579	119,595	139,419	68.6	26.4	16.6	2.3	1.5
Central cities	53,696	59,947	63,797	31.4	11.6	6.4	1.1	0.6
Outside central cities	40,883	59,648	75,622	37.2	45.9	26.8	3.8	2.4
Nonmetropolitan areas	56,747	59,728	63,793	31.4	5.3	6.8	0.5	0.7

Note: All figures as of April. Covers 243 SMSAs as defined in 1970.

Source: U.S. Bureau of the Census, Statistical Abstract of the United States: 1972 (Washington, D.C.: U.S. Government Printing Office, 1972), p.16.
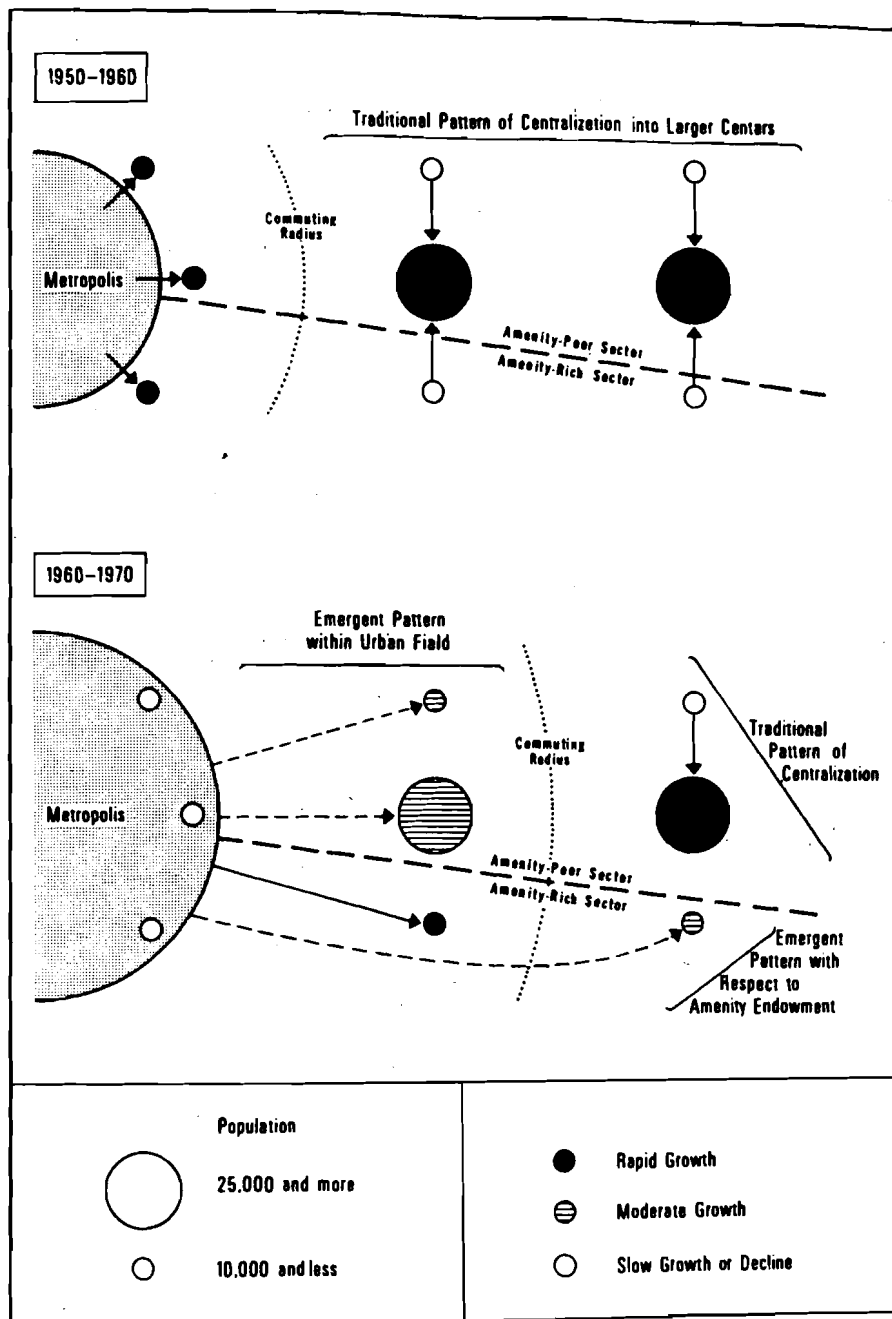
Figure 2. Graphic Summary of Recent Non-
Metropolitan Growth Trends.

Source: R. Lamb, Metropolitan Impacts on
Rural America. Chicago, University
of Chicago, Department of Geography,
Research Paper No. 162, 1975, p. 187.

The importance of decentralizing forces, and particularly of nonmetropolitan amenities, no doubt accounts for the fact that by the early 1970s there was positive net migration from metropolitan to nonmetropolitan areas. Despite the movement from central cities to their suburbs and sometimes beyond, only Pittsburgh among the nation's twenty-five largest metropolitan areas lost population during the 1960s. By 1974, ten of these areas—including New York, Chicago, Los Angeles, Philadelphia, and Detroit—were declining absolutely. One in every three metropolitan residents now lives in a declining area.

The data in Table 3 show that whereas in the 1960s the annual average growth rate in metropolitan areas led the corresponding nonmetropolitan rate by 1.6 per cent to 0.4 per cent, there was a reversal between 1970 and 1973 (0.9 per cent versus 1.3 per cent, respectively). This unprecedented reversal is not simply the latest manifestation of urban sprawl around metropolitan areas. Referring to the data in Table 3, a leading demographer points out that the most dramatic net migration changes have taken place "in those counties with the least commuting to metropolitan areas and in those classified rural nonadjacent. That component of change, in those two categories of counties, carries the clearest message: the more remote kinds of places—those that as a group used to be regarded as 'nowhere'—have today become 'somewhere' in the minds of many migrants (Morrison, 1975, p.12)."

Regional employment change data lend further support to this position. The locus of fastest employment growth shifted from suburban counties prior to the 1969 national economic downturn to nonmetropolitan counties throughout the 1969-72 business cycle. Moreover, nonmetropolitan growth rates were highest in less-developed regions, indicating that employment decentralization was more than mere metropolitan spillover (Nelson and Patrick, 1975).

Table 3. Population Change for Groups of Metropolitan and
         Nonmetropolitan Counties, 1960-1970 and 1970-1973.

Population Category	Provisional 1973 Population (000's)	Annual Population Growth Rate	
		1970-1973	1960-1970
United States	209,851	1.0	1.3
Inside SMSAs[a] (Metropolitan)	153,350	0.9	1.6
Outside SMSAs (Nonmetropolitan)	56,500	1.3	0.4
In countries from which:			
≥ 20% commute to SMSAs	4,099	1.9	1.0
10%-19% commute to SMSAs	9,683	1.4	0.7
< 10% commute to SMSAs	42,719	1.2	0.3
Entirely rural counties not adjacent to an SMSA[b]	4,401	0.9	-0.4

Source: P.A. Morrison, The Current Demographic Context of National
        Growth and Development. Santa Monica, Calif., Rand
        Corporation, September, 1975, p.10. Data are from Richard
        L. Forstall, "Trends in Metropolitan and Nonmetropolitan
        Population Growth Since 1970," forthcoming; and Calvin L.
        Beale, *The Revival of Population Growth in Nonmetropolitan
        America,* ERS-605 Economic Development Division, Economic
        Research Service, U.S. Department of Agriculture, June 1975.

[a] SMSAs defined as of December 31, 1974, except in New England, where
definitions in terms of entire counties have been substituted.

[b] "Entirely rural" means the counties contain no town of 2500 or more
inhabitants.

Great Britain

Tables 4 and 5 present data on employment and population by urban zone in Great Britain. The zone categories refer to basic spatial units of analysis that are now in common use there. In brief, the urban core and metropolitan ring comprise the Standard Metropolitan Labour Area (SMLA), which together with the outer metropolitan ring makes up the Metropolitan Economic Labour Area (MELA).

Table 4 compares population and employment proportions by spatial zone in 1971. Employment is more concentrated in urban core areas than is population. The reverse situation holds for metropolitan ring areas, though it is not so pronounced in the outer ring areas. Commuting is the major factor behind the differences shown in Table 4, though there are some differences in labor force participation rates. Even more interesting, however, are the comparisons over time shown in Table 5.

The 1951-1961 period was marked by a small but increasing concentration of employment into SMLAs at the expense both of outer metropolitan ring and unclassified areas. There was little difference between metropolitan core and ring employment growth rates. The general picture was one of urban concentration and rural depopulation related to declines in agricultural employment. In the 1961-1971 period a more basic process of change was superimposed on the previous pattern. Decentralization of employment from core areas to metropolitan rings (and to a lesser extent, outer metropolitan rings) became significant. Total employment growth in the ring areas amounted to about 700,000 jobs; and in the outer ring areas to 130,000 jobs. This took place during a period of relative national stagnation in employment growth. The data in Table 5 also indicate that decentralization of employment lagged the decentralization of population to metropolitan rings and outer metropolitan ring areas.

Table 4. Great Britain: Proportions of Employment and Population
         by Urban Zone, 1971.

		Population	Employment
1.	Urban Core Areas	47.42	58.56
2.	Metropolitan Ring Areas	31.86	22.87
3.	Standard Metropolitan Labour Areas (1)	79.28	81.44
4.	Outer Metropolitan Ring Areas	16.42	14.91
5.	Metropolitan Economic Labour Areas (2)	95.70	95.44
6.	Unclassified Areas	4.30	4.06
7.	Great Britain	100.00	100.00

           (1)   Row 3 = Row 1 + Row 2
           (2)   Row 5 = Row 3 + Row 4

Source: R. Drewett, et al., Employment Change in the Urban
          System. London, London School of Economics and
          Political Science, Department of Geography, Urban
          Change in Britain: 1961-1971 Project, Working Report
          No. 15, June, 1975, p.5.

Table 5. Great Britain. Growth Rates of Population and
         Employment by Urban Zone.

		1951-1961		1961-1971	
		Population	Employment	Population	Employment
1.	Urban Core Areas	1.88	6.72	-2.77	-3.06
2.	Metropolitan Ring Areas	13.33	6.63	17.17	15.04
3.	Standard Metropolitan Labour Areas	5.71	6.70	4.36	1.42
4.	Outer Metropolitan Ring Areas	3.13	-0.43	9.76	3.91
5.	Metropolitan Economic Labour Areas	5.27	5.57	5.25	1.79
6.	Unclassified Areas	-0.92	-5.53	-1.36	-0.70
7.	Great Britain	4.97	5.06	4.95	1.69

Source: R. Drewett, et al., Employment Change in the Urban
         System. London, London School of Economics and
         Political Science, Department of Geography, Urban
         Change in Britain: 1961-1971 Project, Working Project
         No. 15, June, 1975, p.6.

If one examines the structure of Great Britain's entire urban system over time it is apparent that there has been a pronounced flattening out of the rank-size distribution as population has shifted away from the largest cities to medium-size cities and as new urban areas with high rates of population growth have been added to the lower rungs of the urban hierarchy. These changes, together with the decentralization processes within SMLAs and MELAs, have led British scholars who have studied these developments closely to pose "the question of the meaningfulness of the centrally focussed definition of urban areas as a basis for understanding urban growth in the future (Drewett, et al., 1974, p.13)."

Sweden

Data on population increase in urban regions of Sweden between 1960 and 1970 are presented in Table 6. During this period the urban population--defined to be people living in places with 200 or more inhabitants--increased from 72.7 per cent to 81.4 per cent. In the three largest urban regions--Stockholm, Göteborg, and Malmö--population expanded much more rapidly in outlying satellites than in the more narrowly defined central urbanized areas. But then this was also the case for most urban regions with more than 30,000 inhabitants. The rural population decreased by 26.5 per cent during the 1960s; almost all communities experienced rural population declines, usually close to the national average. Thus, Sweden had a decentralizaton of its urban population on two levels: first, from the central urbanized areas of large- and middle-size urban regions to outer suburbs or satellites; and second, from the two largest urban regions to other urbanized areas of the country. The Stockholm central urbanized area, it will be noted, had zero population growth during the 1960s.

In the early 1970s the entire urban regions of Stockholm and Göteborg were experiencing zero population growth.

Table 6.   Population Increase of Urban Regions * in the 1960s
in Sweden.

Urban Region	Urbanized Areas and Satellites			Urbanized area		Satellites	
	Inhabitants 000, 1970	Increase 1960-70	per cent per annum	Inhabitants 000, 1970	Increase per cent 1960-70	Inhabitants 000, 1970	Increase per cent 1960-70
Stockholm	1 384	19	1.8	973	0	411	113
Göteborg	600	20	1.9	486	9	114	110
Malmö**	434	27	2.4	265	14	169	53
Västerås	135	33	2.9	99	30	36	42
Uppsala	112	37	3.2	93	27	19	116
Norrköping	114	13	1.2	91	6	23	53
Örebro	125	22	2.0	87	20	38	28
Helsingborg	179	19	1.8	82	8	97	29
Jönköping	102	20	1.9	81	13	21	57
Linköping	92	25	2.3	77	17	15	85
Borås	100	17	1.6	73	10	27	40
Eskilstuna	95	27	2.4	69	21	26	46
Gävle	112	15	1.4	65	11	47	22
Sundsvall	89	23	2.1	54	22	35	24
Karlstad	92	22	2.0	52	22	39	22
Halmstad	67	23	2.1	50	19	17	34
Umeå	58	44	3.7	48	47	10	32
Trollhättan	75	25	2.3	41	31	34	18
Växjö	58	49	4.1	39	58	19	34
Karlskoga	70	12	1.1	37	18	33	6
Luleå	49	40	3.4	37	23	12	141
Uddevalla	45	12	1.1	35	8	9	29
Borlänge	80	15	1.4	35	18	45	14
Kalmar	48	20	1.9	35	14	13	41
Karlskrona	64	19	1.8	34	1	30	49
Nyköping	53	41	3.5	31	30	22	61
All urban places of 200 inhabitants	6 575	21	1.9				

*)   For the three largest cities all urbanized areas within a
radius of 40 km were included, for other urban places with
more than 30 000 inhabitants the radius was 25 km.

**) Malmö, excluding Landskrona with satellites, which was
included in Helsingborg.

Source: G. Alexandersson and T. Falk, "Changes in the Urban
Pattern of Sweden, 1960-1970: The Beginning of a Return
to Small Urban Places," Geoforum, 4 (1974), p.91.

Although this surprised many members of the planning community,
it should have been apparent from trends in the 1960s that a
small change in place preferences could easily lead to no
growth in Sweden's two largest urban regions. Meanwhile,
many small urban places in southern Sweden have had rapid pop-
ulation growth, especially where schools and easy access to
sports and recreation are available. In both southern and
central Sweden high standards of private transportation have
made it quite feasible to separate residences and work places.
Decentralization also has been encouraged by an increase in
effective demand for single-family homes as compared with
apartment dwellings. In the 1960s ambitious plans were
formulated for big- and medium-sized city regions all over
the country; ample space was provided for apartments and
industrial uses. Because land near these cities was often
not available for single-family units many persons moved to
small places a considerable distance away. Traditionally
about 80 per cent of the people in Swedish cities have lived
in apartments. In 1965 apartments accounted for 71 per cent
of new dwelling units; by 1972 this figure was down to 64 per
cent. In general, then, "Journey-to-work distances of 40-50
kilometers are becoming rather common in the early 1970s even
for medium-sized cities. The green wave in Sweden is a move
back to the small urban places, where land for homes is
abundant and cheap, but so far it has not been a move back
to the countryside, which held 80 percent of the population
in 1880 but only 19 percent in 1970 (Alexandersson and Falk,
1974, p.92)."

Japan

Although this paper is primarily concerned with Western
urban-industrial nations, it is appropriate to give due con-
sideration to Japan because in many respects it has equalled--
and in some cases even surpassed--the economic performance of
some nations in this category.

The pace of urbanization in postwar Japan has been quite remarkable. In 1950 only about two in every six Japanese lived in urban areas; by 1970 the corresponding figure was five in every six. Glickman (1975) has analyzed population and employment growth in the Japanese urban system for the four quinquennia from 1950 to 1970. The spatial units of observation used were Regional Economic Clusters (RECs), which are analogous to American Standard Metropolitan Statistical Areas. Two-thirds of the 1970 population lived in 80 RECs and half lived in eight large Standard Consolidated Areas. The system of cities tended to centralize between 1950 and 1970. There was relatively rapid growth in a few large population centers--many of which had an important manufacturing base--near Tokyo and Osaka.

Central cities accounted for 55.0 per cent of the total REC population in 1950, 58.5 per cent in 1960, and 54.8 per cent in 1970. Thus there was increasing centralization within metropolitan areas between 1950 and 1960, but some decentralization in the 1960-70 period. No employment data were available for 1950. However, between 1960 and 1970 the proportion of employees living in central cities of RECs declined from 58.0 per cent to 54.3 per cent, indicating that employment decentralized along with population but not nearly to the extent that was observed in the countries discussed previously in this section.

Among major metropolitan centers, Tokyo's population growth rate declined in each quinquennium, from 23.7 per cent in 1950-55 to 13.7 per cent in 1965-70. In contrast, Tokyo's outlying suburban areas had increasing growth rates over this period. The employment growth rate in Tokyo fell from 25.4 per cent in 1960-65 to 13.4 per cent in 1965-70, but the growth rate in many outlying areas increased. Osaka's population growth rate declined from 20.4 per cent in 1950-55 to 14.8 per cent in 1965-70. Growth rates in outlying suburbs increased over time but not as much as in those of Tokyo.

With respect to employment growth, Osaka went from a 31.2
per cent increase in 1960-65 to a 14.4 per cent increase
in 1965-70, though growth in outlying areas increased in the
late 1960s.

In terms of employment, then, the rapid growth of
Japanese manufacturing regions appears to be similar to
what happened in the United States and the United Kingdom
in the first half of this century. In terms of population
(and to some extent employment) the cities that grew the
fastest during the 1950-1970 era grew less rapidly during
1965-70; conversely, cities that grew the slowest seemed to
grow less slowly (or have less negative growth) during the
1965-70 period. This suggests that at present decentrali -
zation effects may be becoming more apparent in the Japanese
urban system.

From Nodal Cities to Megaregions

Various theories have provided partial insights into the
organization and development of human settlements. None--
either by itself or in combination with other theories--has
proven really satisfactory in explaining human settlement
processes or in giving specific guidance to public policy.
In the preceding section it was shown that recent decentral-
ization of population and economic activity has made the very
notion of a system of nodal cities (and their hinterlands)
questionable. Although evidence was presented for only four
countries, there are indications that decentralization is a
widespread phenomenon in Western Europe (Alexandersson and
Falk, 1974).

The changing nature of human settlements patterns was
anticipated ten years ago in a well known article by
Friedmann and Miller.

> Looking ahead to the next generation, we foresee a new
> scale of urban living that will extend far beyond ex-
> isting metropolitan cores and penetrate deeply into the

periphery. Relations of dominance and dependency will
be transcended. The older established centers, to-
gether with the intermetropolitan peripheries that
envelop them, will constitute the new ecological unit
of America's post-industrial society that will replace
traditional concepts of the city and metropolis. This
basic element of the emerging spatial order we shall
call the "urban field (Friedmann and Miller, 1965,
p.313)."

The urban field, in this view, represents a fusion of
metropolitan areas and nonmetropolitan peripheries into
areas with a minimum population of 300,000 persons and
extending outward for approximately one hundred miles,
that is, a driving distance of about two hours.

Similarly, Berry points out that:

Gradients of distance accretion are now beginning to
replace those of core-centered distance-decay within
the larger megalopolitan complexes as persons of
greater wealth and leisure seek homes and work among
the more remote environments of hills, water, and
forest, while most aspire to such settings as an
ideal. In consequence core-dominated concentration
is on the wane; the multi-node multi-connection
system is the rule. It is the spontaneous creation of
new communities in zones of superior residential amenity,
the flows that respond to new transportation arteries,
the waves emanating from growth centers, the mutually-
repulsive interactions of antagonistic social groups,
the reverse commuting resulting from increasing seg-
regation along city boundary lines as employment de-
centralizes, and all the other facets of social
dynamics that today combine to constitute today's
urban systems in America.

It is these dynamics that produced significantly different
patterns of regional growth in the 1960s, and call for
a different theory of regional development than has
traditionally been used (Berry, 1973, p.40).

Berry correctly stresses that if regional growth processes
are to be understood adequately it is necessary to have at the
outset a precise functional definition of the nature of urban
regions. In the context of the United States he has proposed
using a set of 173 "daily urban systems" which exhaust the
national territory. These regions were defined according to

the following criteria:

> After identifying economic centers, intervening counties
> were allocated to the centers. The assignment was made
> primarily on the basis of the journey to work pattern
> around the economic centers. Comparative time and dis-
> tance of travel to the economic centers, the inter-
> connection between outlying counties because of the
> journey to work pattern, the road network, and the
> linkages of counties by such other economic ties as
> telephone traffic, bank deposits, television viewing,
> newspaper circulation, and topography were also used
> to determine placement of peripheral counties into the
> appropriate economic area. In places where the com-
> muting pattern of adjacent economic sectors overlapped,
> counties were included in the economic area containing
> the center with which there was the greatest commuting
> interconnection. In the case of cities where the com-
> muting pattern overlapped to a great degree, no attempt
> was made to separate the two cities; instead, both were
> included in the same economic area (Berry, 1973, p.11-15).

The areas thus defined have in fact been adopted for
purposes of regional analysis by the Bureau of Economic
Analysis, U.S. Department of Commerce. Ideally they have
a high degree of "closure" with respect to employment and
housing markets, as well as tertiary activities. A problem
arises when there is increasing cross-commuting between
areas; this suggests that in the future adjacent daily
urban systems should be merged as their employment and
housing markets coalesce. What might this new pattern of
American megaregions look like? Figure 3 shows one of the
most frequently cited projections of the American urban
landscape at the end of the twentieth century, that made by
Pickard for the U.S. Commission on Population Growth and
American Future.

In Western Europe the history of economic development
has also produced a megaregion system running from the south
of Great Britain to the north of Italy. In this landscape
the Rhine occupies a central position. Here are found
most of the population, industrial activity and services
of Western Europe. Around this axis, the south of Italy,
Spain, the west and southwest of France, Ireland, Scotland,

Based on 2-child family projection

1. Metropolitan Belt
   1.a. Atlantic Seabord
   1.b. Lower Great Lakes
2. California Region
3. Florida Peninsula
4. Gulf Coast
5. East Central Texas—
   Red River
6. Southern Piedmont
7. North Georgia—South
   East Tennessee
8. Puget Sound
9. Twin Cities Region
10. Colorado Piedmont
11. Saint Louis
12. Metropolitan Arizona
13. Willamette Valley
14. Central Oklahoma—
   Arkansas Valley
15. Missouri—Kaw Valley
16. North Alabama
17. Blue Grass
18. Southern Coastal Plain
19. Salt Lake Valley
20. Central Illinois
21. Nashville Region
22. East Tennessee
23. Oahu Island
24. Memphis
25. El Paso—Ciudad Juarez
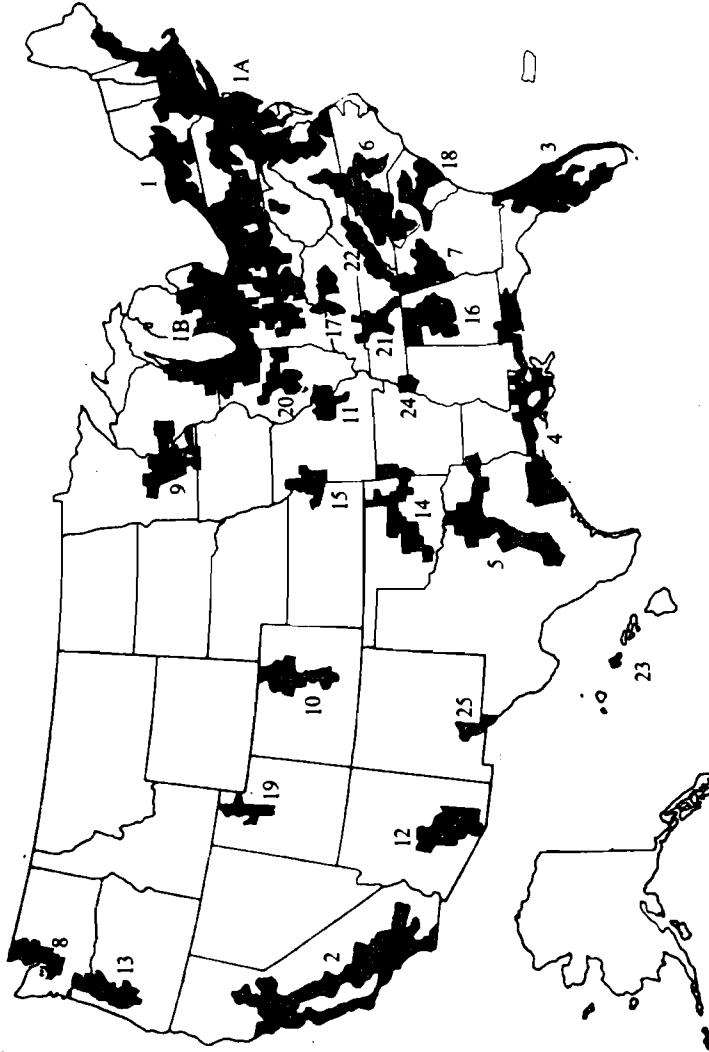
Source: U.S. Commission on Population Growth and the American Future, *Population Distribution and Policy*, Sara Mills Mazie, ed., vol. 5 of Commission research reports (Washington, D.C.: U.S. Government Printing Office, 1972), p. 143.

Figure 3.   Projected Megaregions in the Year 2000.

and the north of Scandinavia constitute a relatively under-
developed and lightly-populated periphery. It is noteworthy
that the Netherlands, Belgium and West Germany are situated
almost entirely within the industrial corridor. England is
linked to it by London and Italy by the industrial centers
of the north, though not without an alpine impediment. On
the other hand, the Paris region is not well linked to the
ensemble. The second most important French region--Rhone-
Alps--is somewhat better situated in this regard (Délégation,
1974).

Obviously the megaregions of Europe, the United States
and Japan are not political units. It also is misleading to
regard them as mere configurations of population densities.
Within megaregions there are of course very densely-settled
areas, but these by no means necessarily typify the regions
shown, for example, on Figure 3. Even within the Atlantic
Seaboard Metropolitan Belt (megalopolis) the amount of built-
up area accounts for only six per cent of the total area.
Thus, the megaregion is not so much a physical entity as a
pattern of localizations and connecting flows of people,
information, goods, and services.

In sum then, the nineteenth-century nodal city has
given way, in varying degree, to the metropolitan area, the
urban field, and the megaregion. Yet spatial-temporal de-
velopment processes are still very imperfectly understood.
This in itself explains why even though nearly all of the
countries considered feel a need for some form of human
settlements policy, few are able to elucidate clearly what
the problems really are.

A Framework for the Analysis of Human Settlement Systems

Any major effort to gain better understanding of spatial-
temporal development processes should have at the outset a
framework of functional economic areas. It should reflect the

fact that these processes are increasingly international in
character. It also should be flexible enough to take into
account differences in degree of development among national
(and even sub-national) economies as well as differences in
degree of national economic planning.

Such a study is now being undertaken within the Urban
and Regional Project of the International Institute for
Applied Systems Analysis, in collaboration with the Univer-
sity of Reading, England. The research covers the United
States, Canada, Japan, and most of Western and Eastern
Europe. The basic units of analysis are urban regions,
which essentially are functional labor market areas cor-
responding to the daily urban systems of the United States
and the Metropolitan Economic Labour Areas of Great Britain
(Hall, Hansen, and Swain, 1975a, 1975b).

The initial phase of this study is attempting to define
the hinterlands of urban core areas and to delineate the
boundaries of functional urban areas. However, as discussed
earlier, it may not be possible to make core-hinterland
distinctions when dealing with urban fields and megaregions,
though in the latter it may be possible to identify multi-
ple cores, e.g. in the Ruhr and in the Atlantic Seaboard
Metropolitan Belt of the United States.

Given this context it should be possible to test the
theory that, at least in some settings, innovation and eco-
nomic growth have a two-fold spatial-temporal character, that
is, they trickle down through the urban hierarchy and also
spread from urban cores to their respective hinterlands. But
the hierarchy may include urban fields, megaregion cores and
perhaps even megaregions rather than just the traditionally
defined cities or metropolitan areas.

It also should be possible to test the theory that urban
system development is a function of contact systems and in-
formation flows--which frequently must be viewed in an inter-
national setting--and that economic growth and innovation

diffusion patterns may not correspond to the predictions of the theory of hierarchical filtering and hinterland spread. Thus, for analytic purposes mappings of information flows can be superimposed on urban region mappings.

Throughout most of this paper primary attention has been given to growth processes but it also was pointed out that many entire urban regions are experiencing--and still others will experience--population loss as national birth rates decline. It is not likely that the process of growth and decline are symmetrical but as yet there is not much systematic knowledge about the potential problems and opportunities that may accompany population stability or decline. Even if a nation reached a no-growth situation the selectivity of migration flows would produce different regional consequences. Clearly any meaningful systems approach to human settlements must be informed by knowledge about the nature and significance of human migration. This important issue has not been dealt with in detail here be-cause it is being examined within the Urban and Regional Project in a major closely-linked research effort on mi-gration and settlement.

Finally, problems common to "natural" regions cut by political boundaries--disparities in growth rates, customs barriers, limitations on labor mobility, lack of coherence in infrastructure and industrial location policy, etc.--have in the past been slighted because of economic and political nationalism. Today the development of the Common Market is drawing attention to these issues; and in the United States there has been sharply-increased interest recently in the special problems of regions along the frontier with Mexico. Hopefully, the research effort just outlined will be able to contribute not only to a better understanding of the problems of border regions, but also to their resolution to the benefit of all of the populations concerned.

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