

DYNAMICS IN METROPOLITAN PROCESSES AND POLICIES

Editor:

Börje Johansson

*Centre for Regional Science Research (CERUM), University of Umeå,
S-90187 Umeå, Sweden*

RR-86-8

November 1986

Reprinted from *Scandinavian Housing and Planning Research*, 2 (3–4), 115–251 (1985).

INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS
Laxenburg, Austria

Research Reports, which record research conducted at IIASA, are independently reviewed before publication. However, the views and opinions they express are not necessarily those of the Institute or the National Member Organizations that support it.

Reprinted with permission from *Scandinavian Housing and Planning Research*, 2, (3-4), 115-251 (1985).

Copyright © 1985 Scandinavian Housing and Planning Research.

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage or retrieval system, without permission in writing from the copyright holder.

Printed by Novographic, Vienna, Austria

FOREWORD

Metropolitan growth has been fast in many industrial nations since the beginning of World War II. At the beginning of the 1970s a marked downward shift was observed, especially in metropolitan regions dominated by old industries. For this category of urban settlements the decline process has continued. Simultaneously, in the 1980s, one can identify a set of creative regions that function as international focal points for knowledge creation, R&D, negotiations, and other face-to-face activities. In many respects, these diverse development patterns reflect a profound technological transition in the world economy.

These changing patterns have been studied and analyzed in Project "Dynamics of Metropolitan Processes and Policies", which started in 1983 within the Regional Issues Group at the International Institute for Applied Systems Analysis (IIASA). The project was organized as a comparative and collaborative effort of research groups in about 20 metropolitan regions. The approach of the project, which is still active as a network, was two-pronged, including:

- (1) Empirical comparisons of change patterns.
- (2) Development of theories, models, and methods suitable for the dynamic analyses of metropolitan processes.

This *Research Report* consists of contributions belonging to the first category, many of which are condensed and elaborate versions of earlier IIASA Collaborative Papers. Contributions belonging to the second category are collected in *Spatial Dynamics and Metropolitan Change*. (RR-86-9), also edited by Börge Johansson.

BORIS SEGERSTAHL
Deputy Director
International Institute for Applied Systems Analysis

CONTENTS

Dynamics of Metropolitan Processes and Policies <i>Börje Johansson</i>	115
Towards a Dynamic Model for Amsterdam <i>Leo van Wissen, Annemarie Rima and Peter Nijkamp</i>	125
Part I: Population, Housing and Land Use Interactions	131
Population Dynamics of Metropolitan Regions <i>Piotr Korcelli</i>	133
The Development of Helsinki Metropolitan Region and Its Current Planning Problems <i>Juha Savander</i>	147
The Spatial Dynamics of the Turin Urban System <i>Cristoforo S. Bertuglia, Silvia Occelli, Giovanni A. Rabino, Carlo Salomone and Roberto Tadei</i>	155
Dynamics of Metropolitan Processes and Policies in the Warsaw Agglomeration <i>Piotr Korcelli and Grzegorz Węclawowicz</i>	161
Part II: The Housing System and Housing Market Regulations	167
The Swedish Housing Market: Structure, Policy and Issues <i>Alex Anas, Ulf Jirlow, Jan Gustafsson, Björn Hårsman and Folke Snickars</i>	169
Urban Development and Planning Problems in Oslo <i>Geir Thorsnæs, Dagny Gärtner Hovig and Kirsti Nøst</i>	189
Urban Development in Vienna – Summary <i>Manfred Fischer, Herbert Purschke and Uwe Schubert</i>	195
Long-Term Dynamics of the Leeds Region <i>R.L. Mackett</i>	201
Part III: Structural Adjustments of the Metropolitan Economy, and Spatial Repercussions	205
The Changing Economic Structure of Metropolitan Regions <i>David F. Batten</i>	207
The Dortmund Region <i>Dennis Hay and Michael Wegener</i>	225
Metropolitan Processes and Policies in the Melbourne Agglomeration <i>David F. Batten, Peter W. Newton and John R. Roy</i>	231

Past Processes, Present Trends and Future Prospects of the Budapest Region <i>N. Hörcher and Sándor Kádas</i>	239
Part IV: Beyond Comparative Analyses of Metropolitan Dynamics	245
Beyond Comparative Analyses of Metropolitan Dynamics <i>Folke Snickars</i>	247

Dynamics of Metropolitan Processes and Policies

Introduction

BÖRJE JOHANSSON

University of Umeå

Metropolitan growth has been dramatic in many industrialized nations since the second world war. In the beginning of the 1970s a shift in the development pattern was observed. Population growth slowed down and turned into decline in many cases, especially in metropolitan regions dominated by old industries. Although the demand for housing was reduced much less than average population change would indicate, housing construction dropped gradually during the period after the early 1970s.

The IIASA project "Nested Dynamics of Metropolitan Processes and Policies" was initiated in the beginning of the 1980s as a comparative and collaborative effort of research groups, and planning and decision-making institutions in around 20 metropolitan regions located in industrialized countries spread over the globe in both market and planned economies. The ambitions of this project is to analyze the simultaneous interactions between metropolitan "subsystems" (population, housing, services and infrastructure, economy and workplaces, and metropolitan management) and between fast and slow change processes. The ultimate objective is to increase the level of understanding with regard to metropolitan processes operating at significantly different speed.

The approach is two-pronged: (i) empirical comparison of changes in the various regions included in the study and qualitative theoretical analyses based on such comparisons, and (ii) development of theoretical and computable models of metropolitan processes and policies and assessment of methods in planning and management of metropolitan change.

The various metropolitan regions participate in the project by providing studies that enable the comparative analysis; in addition most of the research groups have decided to undertake different basic studies which are of general interest. The active regions are presently (i) Amsterdam, Budapest, Dortmund, Helsinki, Leeds, Leipzig, Prague, Stockholm, Turin, Vienna, Warsaw, (ii) Chicago, Los Angeles and San Francisco Bay, and (iii) Nagoya, Osaka and Melbourne. Closely associated studies also take place with regard to Florence, Rome and Tokyo.

As the initial step in the project each city-group has produced a background study analyzing structural adjustments in each region.¹ In this volume we present short miniversions of these reports from Amsterdam, Helsinki, Turin, Warsaw, Vienna, Leeds, Budapest, Dortmund and Melbourne. In addition a short presentation of the Oslo region has been included. The volume also contains major

studies of population development, the housing sector, adjustments in the economic sector, and an outline of theoretical aspects of metropolitan dynamics.

METROPOLITAN REGIONS AS NODES IN NATIONAL AND INTERNATIONAL NETWORKS

Metropolitan regions may be viewed as large production and information processing systems. Taken together they usually encompass a major share of the economic activities in a country. They constitute the nodes of the interregional network of nations and of the international system. The role a large urban region plays in such networks may vary significantly from areas dwelling large scale industrial production to centers for business and governmental decision making, negotiations, knowledge creation and other face-to-face activities.

Metropolitan regions rise gradually out of smaller settlements that grow more rapidly than other settlements. Their development includes not only stages of fast growth and stagnating maturity, but also obsolescence and decline. Over time they usually acquire specialized roles in the national and international systems. As these systems change the specialization of a region may become out-dated and rigidities may prevent rejuvenation of its activity pattern. Like Dortmund in the Ruhr Area, some agglomerations which are based on declining resource processing industries, are hit by their lacking locational attraction on expanding sectors of the economy. Another example of this kind is the Leeds region, earlier dominated by wool clothing industry and heavy engineering. In the case of Leeds this has brought the region a new role; it has shifted from a manufacturing city to a regional service center.

At some stage of its development a metropolitan region often functions as a birth place for new technologies in the form of new products and production. Studies of urban development during the last two decades show how technology and knowledge-intensive industries locate in new regional patterns with a preference for regions with a rich variety of education, research and cultural opportunities. In many cases these locations coincide with or have a good accessibility to already established agglomerations like the San Francisco Bay Area, Paris, Budapest, Boston or the area south west of London.

For urban regions like Copenhagen, Helsinki, Oslo and Stockholm, the adjustment to changes in the world economy and shifts in the international division of labour is of special importance. These settlements are the only real agglomerations in the Nordic countries. If they fail to continuously adjust their way of functioning to changes in the world economy and reorientation of R&D activities, that will also imply a failure on the national scale. Hence, for regions like this, renewal of the internal structure and revitalization of their international contact pattern becomes a nation-wide policy issue.

As regions develop at different speed and in different directions, this has very strong demographic repercussions. Migration and intraurban relocation of households are not only reactions to the economic development but have their own dynamics and are strongly affected by clear population cycles. Some of these latter phenomena are to some extent not only universal but also parallel among

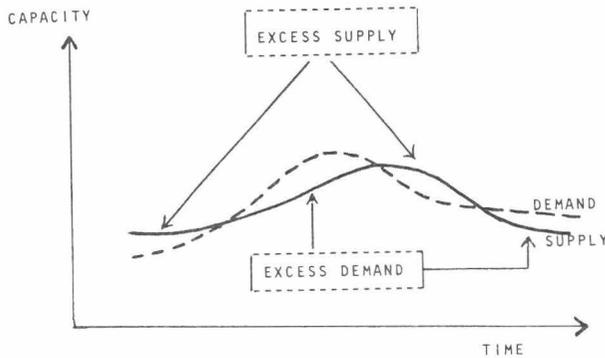


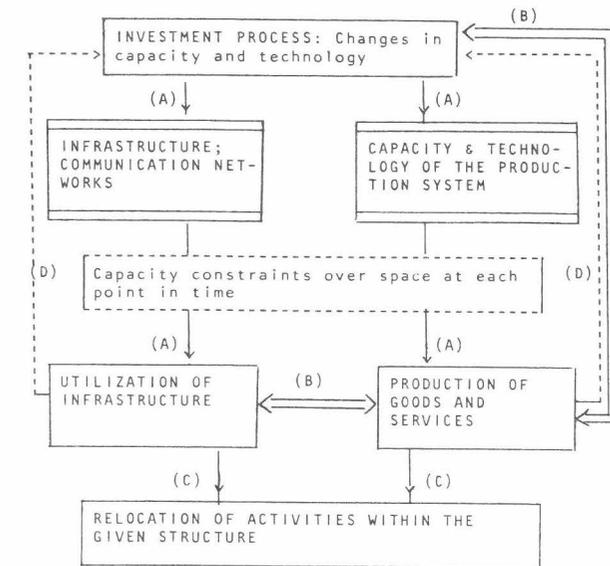
Fig. 1. Tension signals.

the industrial nations and thereby common to metropolitan regions which may differ in many other respects. Urban areas constitute in many ways a family of closely related "species". The growth from a non-metropolitan to a metropolitan system takes the form of activity expansion and construction of physical elements such as housing and industrial units, infrastructure and transportation facilities. Many attributes of the physical elements are shared by the flora of individual metropolitan regions. The growth and expansion process itself has certain general consequences which are universal for all regions; more and more space becomes occupied by buildings, facilities and other extremely durable structures; the activity density increases in central locations etc. As time goes by, various rigidities are built into the structure and relocation of activities becomes gradually more demanding as regards investment programmes. In short, every metropolitan region develops from a young to an old structure which may not only have a long life but may also prolong its vitality through renewal processes. These observations indicate the possibilities of obtaining new insights by comparing change processes in a variety of metropolitan regions which have developed (and are developing) in quite different institutional settings and under markedly different external conditions.

With this background, one may contemplate the project objectives as summarized in a report by Quigley, Varaiya and Wiseman (1985): (a) Developing a taxonomy of urban systems and processes applicable across cities with different economic organization, levels of centralized planning, and stages of economic development: (b) Developing a better theoretical framework for modelling, simulating, and forecasting urban change.

INTERNAL DYNAMICS AND METROPOLITAN MANAGEMENT

Over time, a metropolitan region is forced to adapt its internal structure in response to external economic and demographic changes. Such disturbances include short term fluctuations and slowly changing conditions as regards the region's interaction and exchange with other regional economies. One slow internal process which functions as an almost exogenous driving force is the time-dependent change in the age composition of the region's population.



- (A) Delayed adjustments that affect specific capacities in specific locations with sudden jumps; the overall change of capacities is usually slow.
- (B) Fast adjustments
- (C) Delayed, medium speed adjustments
- (D) Investment decisions which generally involve considerable time lags.

Fig. 2. Variations in speed of adjustment.

The internal processes of change include complex dynamics of spatial relocation, household formation and incongruencies between supply of and demand for capacities in the transportation, housing and service systems. The major policy instruments of urban management include land use planning, regulation and taxation, investment in infrastructure, operation of public facilities, migration and labour market policies, and housing market control.

In a long-term perspective, metropolitan policy formation affects the attractiveness and development potential of the region. The policy may in this context try to influence the location of (i) R&D activities, public and private research and education centers; (ii) infrastructure and communication networks; (iii) different types of education and competence categories of the labour force; and (iv) production capacity.

The major part of metropolitan management takes the form of adjustment and responses to signals of malfunctioning and tensions in the urban system. Often such signals may be misleading in a longer perspective if the dynamics are only vaguely understood. Fig. 1 illustrates a case in which both the demand and supply of capacity develop in a smooth way. In spite of this the tension signals fluctuate. The "capacity" in the figure may refer to a certain employment category, a specific type of land or floorspace, a given type of dwellings or a particular transport mode.

Although the two development paths follow each other fairly closely in the

figure the sign of the capacity tension fluctates. Quick responses to this type of signals may easily aggravate the short-term mismatching and cause new oscillations in the supply and demand paths and thereby produce confusing signals of tension. Indeed, the possible overshooting in the response pattern may obtain both through (i) planning and public interventions, and (ii) market reactions. In many cases market and public management stimulate each other to an "over-reactive" behaviour. Housing market phenomena of this type can for example be found during the last 30 years in Stockholm and Vienna as well as in the San Francisco Bay area.

When the speed of change is fast in a certain dimension, the imbalances may be substantial. In highly attractive regions of location, local inflation in the housing and related service sectors and congestion on the transportation network are typical indicators of disequilibria. A study of the Tokyo Metropolitan Region land market (Fujita, 1983) shows an inefficient suburbanization of housing as a consequence of a disdequilibrium growth of land prices in the central parts of the region.

Many features of the population change and household formation processes have been shared by most of the regions in the IIASA study. Such properties are e.g. (i) a slowdown during the 1970s in population growth and in migration, (ii) an increasing number of households also with a stagnating population, and (iii) a reduced rate of housing construction.

Metropolitan management and market behaviour associated with change processes of the type described above concerns to a large extent extremely durable structures. Construction and location of infrastructure, housing areas, production facilities etc. affects usually the metropolitan life many decades into the future. In Europe, a lot of the urban structure was determined centuries ago. In particular, the process of capital formation determines the anatomy of the whole metropolitan region. It is then at the same time an intriguing fact that metropolitan regions which have developed under markedly different influences and conditions, still have so many "anatomic" features in common.

SPEED OF ADJUSTMENT—FAST AND SLOW PROCESSES

A common element of urban change processes in most metropolitan areas is the inertia in the interprocess adjustment mechanisms. As housing is constructed in peripheral rings to accommodate an increased population, the pressure on the land in the down-town business district may accelerate. A relocation of households and workplaces between different zones (subregions) in a metropolitan region brings about multi-faceted tensions; both the land market and the transportation system are affected. The tensions and their signals of manifestation give rise to adjustments of different time scales. Capital stock inertia and differentials in household and sector mobility may thereby give subareas traits typical of their vintage of development.

Fig. 2 is an attempt to provide a schematic illustration of generic types of adjustment processes. The interaction between the production system and the given infrastructure comprises adjustments which are close to be instantaneous,

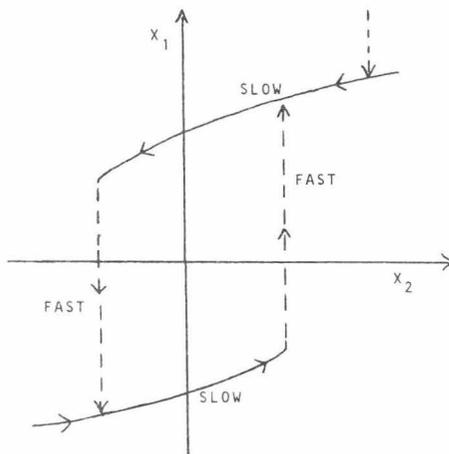


Fig. 3. Oscillations of fast and slow time scales.

given the capacity constraints that prevail at each point in time and space. Changes of the capacity constraints and relocations must be filtered through a time consuming decision process. Hence, investment and relocation decisions are delayed in relation to observed tension signals of under or overutilization of existing capacities (in the form of congestion, queuing, local inflation etc.). The investment process itself brings about new capacities at a slower pace than the B-type interactions (capacity use). The resource consumption in the investment activities contains fast adjustments. The capacity change in individual locations occur with sudden jumps, but the overall change of capacities in the production, housing and transportation systems is a much slower process than adjustments of B-type. As an example, in Sweden the annual construction of new dwellings usually amounts to around 2 per cent of the value assigned to housing stock. Investments in the built structure in an urban area seldom reach more than a few per cent of the value of existing structures. Spatial relocation of households and production units of various kinds represents a medium speed type of adaption.

The classification in Fig. 2 can be used to shed light on the possibilities to explain, model and forecast metropolitan dynamics. If we study in a model what we have called the fast adjustments, the slower processes will appear disguised in the form of parameters in the model. Conversely, a model of the slow adjustments will contain parameters which are explicitly or implicitly affected by the fast adjustment mechanisms. In both cases the parameters are not actual constants but may change slowly over time. With nonlinear models we should then expect sudden shifts (based on bifurcations or singularities) in the model behaviour for certain parameter values (see e.g. Varaiya and Wiseman, 1984). This type of phenomena in urban systems has not been systematically examined. One objective of the IIASA Metropolitan study is to carry through studies of such phenomena. That includes both comprehensive empirical observations and theoretical investigations. In particular, it should be observed that policy measures and planning may both prevent and create this type of phenomena.

The problem of fast and slow processes may also be studied from a slightly

Table 1. *Population change in metropolitan regions during the 1970s*

	Reduced population growth	Reduced household size	Suburban- isation Urban sprawl	Gentri- fication of inner city	Housing demand (construction) higher than indicated by population change
Stockholm	Yes	Yes	Yes	Yes	Yes
Oslo	Yes	Yes	Yes	?	Yes
Helsinki	Yes	Yes	Yes	Yes	Yes
San Francisco Bay	Yes	Yes	Yes	Yes	-
Melbourne	Yes	Yes	Yes	?	Yes
Dortmund	Yes	Yes	Yes	-	Yes
Budapest	Yes	Yes	Yes	Yes?	Yes
Leeds	Yes	Yes	Yes	-	Yes
Amsterdam	Yes	?	Yes	-	?
Warsaw	-	Yes?	Yes	-	?

Source: Background studies of the IIASA Metropolitan Study.

different perspective. If the system depicted in Fig. 2 develops in such a way that new capacities are created at the same speed as the demand for new capacities, there will be no imbalances or tensions. Such a change process develops along a trajectory that we may think of as an equilibrium path. In a sense this represents a balanced rate of change for the system as a whole.

A system following a steady path as described above may suddenly be influenced by strong exogenous changes, e.g. a fall in demand for certain of the region's export products or a shift in migration or fertility rates. This will bring about a faster speed of change in some parts of the system.

A third rate of change would then be the kind of catastrophes mentioned above. In this case it should be observed that usually one may pick out a specific subset from a large dynamic process in such a way that the smaller system describes the mechanisms that give rise to "catastrophic" shifts in the speed of change (see e.g. Casti, 1985). In Fig. 3 we illustrate a case in which shifts occur repetitively (cyclically), possibly with a long duration for the slow phases. The figure may for example describe the relation between land value and activity density in a given subarea. The centre point in the figure represents an unstable equilibrium of the change process. The system illustrated will develop in cycles around the equilibrium point with longer periods of slow change broken by short periods of fast change.

PROVINCIALISM IN SPACE AND TIME

Researchers and planners actively involved and engaged in the development of their own city, often perceive this development as particular and markedly different from changes in other urban areas. This type of natural but unfortunate provincialism is especially accentuated when it comes to identifying particular problems and to assess solutions to these problems. One may compare city

planners and managers with a medical care staff which in sequence focuses on each particular patient as an individual case. However, as time goes by, such a staff acquires general experiences from a broad variety of clients. One aspect of the Metropolitan Study is to organize comparative information of this kind.

If we compare the capital cities in the Nordic region with metropolitan cities in the rest of Europe, some differences may be classified as essential. One such feature is that Copenhagen, Helsinki, Oslo and Stockholm each has an extremely central position in the contact landscape of its own country. These urban regions also constitute the four focal points of inter-Nordic communication. Moreover, a major share of the Nordic R&D-resources is concentrated on these four locations. In general, the European scenery is different. Metropolitan regions are located close to each other, and there exist many possibilities of substitution in space. Among the case studies in this volume Vienna, Budapest and perhaps Warsaw have a national dominance which is similar to the one found with regard to e.g. Stockholm and Helsinki.

The paper on economic structural adjustments uses a framework according to which the direction of aggregate change is similar in all metropolitan regions. Instead the paper focusses on differentials with regard to which point in time a specific change process starts in each region and the speed at which it continues. The paper on population development follows an approach which attempts to classify the regional dynamics. Also in this case the focus is on similarities in direction and speed of change from an aggregate perspective. The paper on housing sector dynamics follows an entirely different strategy. It develops a framework for describing the fine details of institutional mechanisms of the housing sector. The rationale for such an investigation is an ambition to formulate a housing model which, compared to current practice, is founded on a much more precise knowledge about the institutional setting and its associated market/exchange mechanisms. The Stockholm region is used as a prototype case. As descriptions and models along this line are developed for more regions, similarities and differences may be examined also in terms of this finer description of systems dynamics.

At a somewhat superficial level one may indicate that most of the regions follow a similar pattern of change. This is illustrated by Table 1 which describes various elements of population change that have been discussed a lot among the Nordic countries.

OUTLINE OF THE VOLUME

The volume consists of three major parts focusing on in sequence population development, housing sector dynamics and economic structural adjustments. Each of these parts contains one theme paper and several short papers which illustrate aspects of the same theme by describing metropolitan change since 1950. In a last part some prospective conclusions are presented. As an initial example of the case studies in the following parts, this introduction is supplemented by a minipaper summarizing both the past development history of the Amsterdam region and the research strategy and ambitions of the group of Amsterdam researchers.

NOTE

1 These "Background Studies" are available at IIASA, International Institute for Applied Systems Analysis, Laxenburg, Austria.

REFERENCES

- Casti, J. (1985) "Simple Models, Catastrophes and Cycles". Research Report RR-85-2. Laxenburg, Austria: IIASA (see also *Kybernetes*, vol. 13, 1984).
- Fujita, M. (1984) "The Spatial Growth of Tokyo Metropolitan Area". Collaborative Paper, CP-84-03. Laxenburg, Austria: IIASA.
- Johansson, B., P. Korcelli, G. Leonardi and F. Snickars (1983) "Nested Dynamics of Metropolitan Processes and Policies". Project Document 2. Laxenburg, Austria: IIASA.
- Quigley, J., P. Varaiya and M. Wiseman (1985) "Metropolitan Dynamics in Comparative Perspective". Research Proposal. Berkeley: University of California, Institute of Urban and Regional Development.
- Snickars, F., B. Johansson and G. Leonardi (1982) "Nested Dynamics of Metropolitan Processes and Policies". Draft Project Description. Laxenburg, Austria: IIASA.
- Varaiya, P. and M. Wiseman (1984) "Bifurcation Models of Urban Development", pp. 61-68 in Andersson, A. E., W. Isard and T. Puu (eds.), *Regional and Industrial Development Theories, Models and Empirical Evidence*. Amsterdam: North-Holland.

Towards a Dynamic Model for Amsterdam

LEO van WISSEN, ANNEMARIE RIMA and PETER NIJKAMP

Free University, Department of Economics, Postbus 7161, 1007 MC Amsterdam, The Netherlands

INTRODUCTION

In this mini-paper a brief outline* is given of the research project 'A dynamic model for Amsterdam'. After a short report on the development of Amsterdam since 1950 with respect to different subsystems (population, housing-market, labour-market, transportation), the general structure of the model will be discussed.

DYNAMICS IN AMSTERDAM

Population developments

Developments in population take place as the result of demographic changes (birth, death, ageing, etc.) and of population movements. Both elements have had a strong impact on the population of Amsterdam. In the period 1945–1958 the population of Amsterdam increased due to a marriage and birth 'boom' after the Second World War. In the 1960s not only people from outside Amsterdam moved to suburban locations, but also a large outmigration flow of inhabitants of Amsterdam took place. The negative implications of the outmigration of mainly young and more affluent families became apparent after 1970. The selectivity of this process led to a concentration of less wealthy and small households in older residential areas of Amsterdam.

The quantitative development of the population of Amsterdam since 1950 can be seen in Fig. 1.

Housing market developments

The period after 1945 has for a long time been characterized by a tremendous shortage of dwellings. Despite the emergence of new residential areas, supply was still lagging behind the demand for dwellings. After 1960 a solution was found: a deconcentration of urban population. Thus, the housing market extended beyond the city boundaries, first toward neighbouring areas and later even toward more distant locations. As a result of this enormous excess demand, the government of Amsterdam has drastically restricted the free functioning of the housing market. In the largest part of the housing market, the so-called distribution sector, both the rent of dwellings and the allocation of households to dwellings are regulated by public authorities.

After the 1960s the municipality of Amsterdam began to recognize the negative effects of the policy of deconcentration; later on the concept of the 'compact' city

* For more detailed information we refer to the more comprehensive background paper regarding Amsterdam.

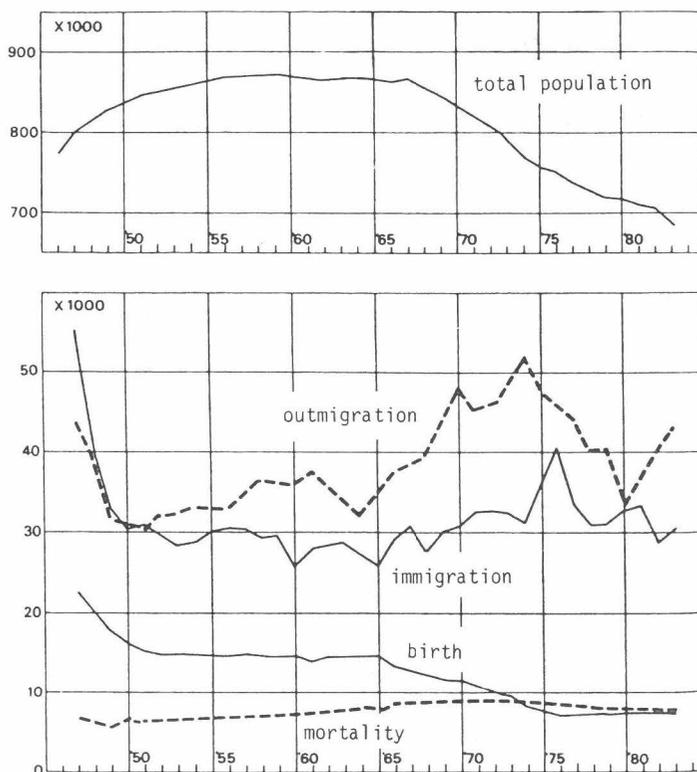


Fig. 1. The development of the population of Amsterdam and its demographic components, 1947–1982.

emerged. As a result large urban renewal schemes were developed; nowadays housing policy is gradually shifting from quantitative towards qualitative aspects of the housing market.

The developments of the housing stock in Amsterdam since 1950 can be seen in Fig. 2.

Labour market developments

The development of the local labour market tended to follow the movement of industries and service sectors. In the first period after World War II (1945–1960)

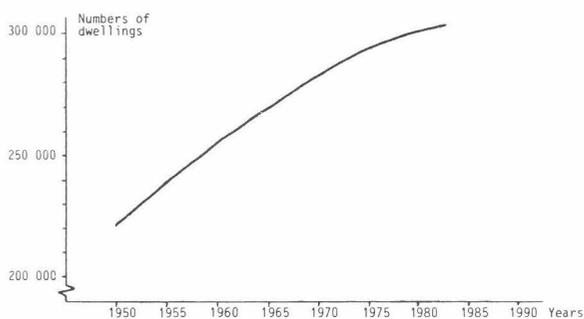


Fig. 2. The development of the housing stock in Amsterdam, 1950–1983.

	1979	1980	1981	1982
(1) Amsterdam				
men	9989	13936	20649	25963
women	5354	6934	9887	13272
total	15343	20870	30536	39235
(2) The Netherlands				
(x1000) men	143.8	219.7	331.7	454.1
women	82.6	102.7	142.0	190.0
total	226.4	322.4	473.7	644.1
(3) (1)/(2) × 100%				
men	6.9	6.3	6.2	5.7
women	6.5	6.8	7.0	7.0
total	6.8	6.5	6.4	6.1

Fig. 3. Number of unemployed persons in Amsterdam and the Netherlands (male and female, at the end of December), 1979–1982.

many industries moved to the urban fringe (a so-called suburban industrialization), while the tertiary sector expanded in the downtown areas. From 1960 onwards, the industrial expansion took mainly place in industrial areas outside the population centres. However, the service sector (especially less consumer-oriented activities such as head offices and banks) also moved to suburban areas. From 1975 a selective re-urbanization of business activities in the city centre is taking place (for instance, small-scale industry in downtown areas), while the major industries and the service sector were relocating at a slow pace, as the economic stagnation caused a retardation of investment efforts.

From the middle of the 1970s onwards, spatial policy in the Netherlands has explicitly aimed at reducing spatial mobility by placing more emphasis on a spatial juxtaposition of labour markets and housing markets. The present labour market situation in Amsterdam reflects the transition process of the Dutch economy, where several industries are stagnating or declining (textile, e.g.), while others are increasing (electronics, e.g.).

Since 1979 the Netherlands experiences a drastic growth in unemployment. Also the large cities of the Netherlands contribute to this undesirable process and, although the share of Amsterdam's unemployment in the total national unemployment is decreasing (see Fig. 3), the absolute figures are a source of major concern.

Transportation developments

It is evident that the availability of transportation did play an important role in the deconcentration movement in the 1970s. The necessary traffic infrastructure was constructed to establish the planned desurbanization. For instance, an underground railway system was built from the city centre to the Bijlmermeer, a large development area added by annexation to Amsterdam in 1966, and a new railway now connects Amsterdam with the new towns Almere and Lelystad.

The development in Amsterdam of both the length of tram and bus lines and of car-ownership since 1950 is illustrated in Fig. 4.

A DYNAMIC MODEL FOR AMSTERDAM

In this section we will provide a first design of the above-mentioned dynamic model for Amsterdam. This model should comply with the following conditions:

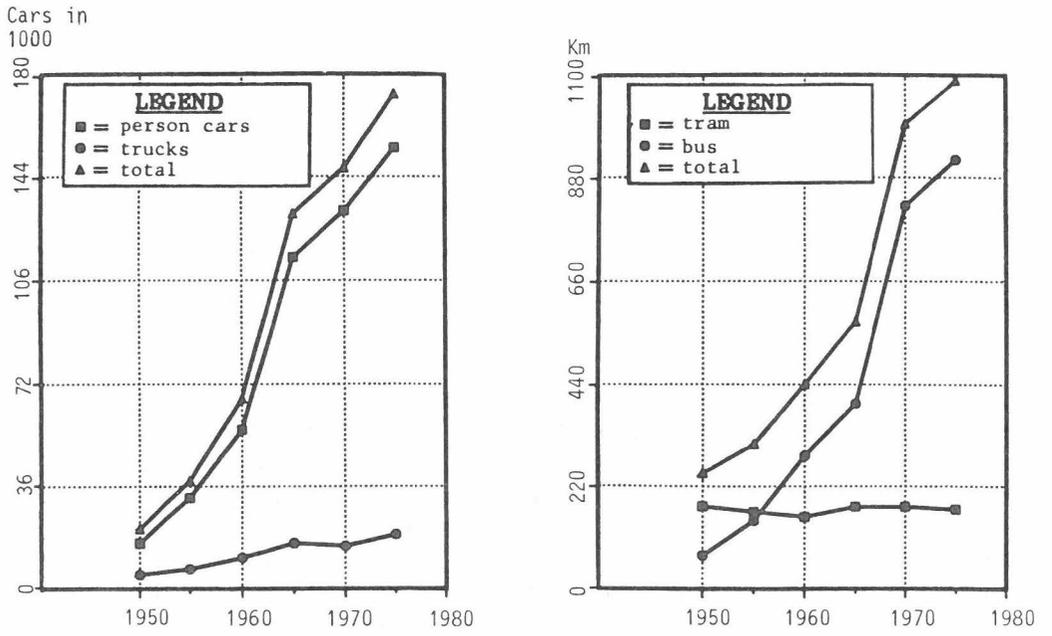


Fig. 4. Length of tram and bus lines in kilometers and number of cars in Amsterdam, 1950-1975.

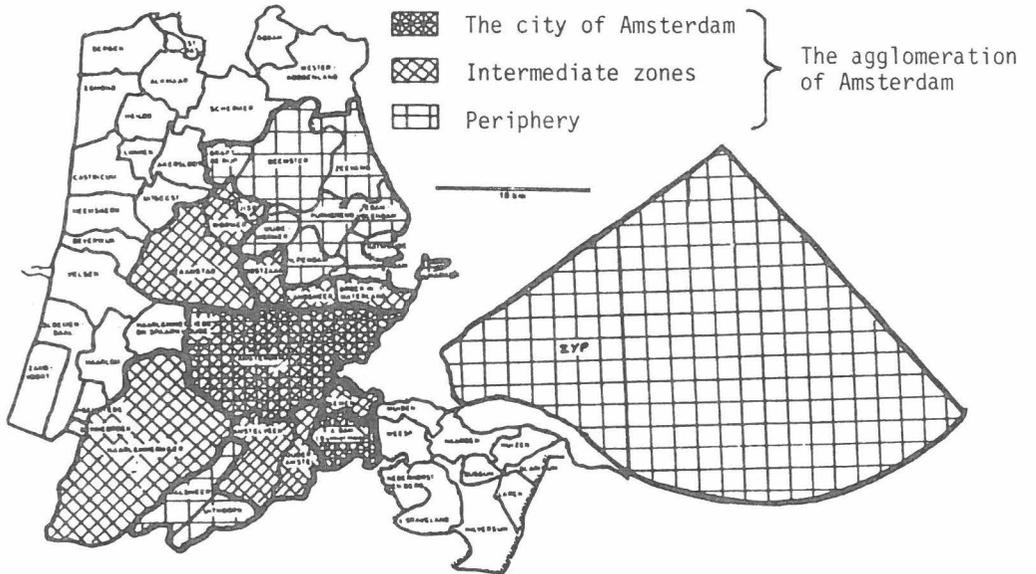


Fig. 5. The city and agglomeration of Amsterdam.

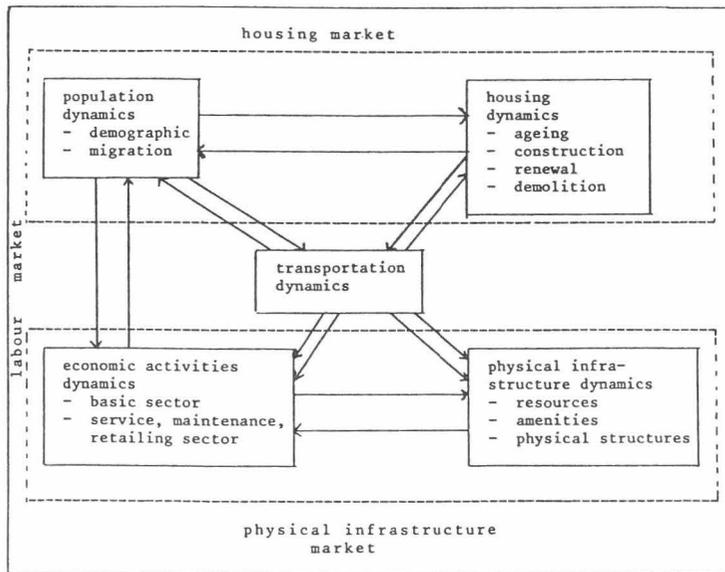


Fig. 6. General structure of the dynamic model for Amsterdam.

- It is *dynamic*; it should serve to describe and analyse the development of Amsterdam from 1950 onwards.
- It is *complete*; different subsystems such as the housing market, labour market and infrastructure as well as their mutual interrelationships will be taken into account as detailed as possible, given the time horizon of the project.
- It is *zonal* and covers both the city of Amsterdam (10 zones) and the agglomeration of Amsterdam (8 zones excluding the city). (See Fig. 5 for a map of the city of Amsterdam and its agglomeration.)
- It is *micro-based*; it starts at a disaggregate level in order to incorporate explicit assumptions concerning household and individual behaviour. The relations between the micro, meso and macro level are dealt with by means of (dis)aggregation procedures.

It is *realistic*; given the data available, a combination of estimation and simulation techniques based upon empirical data (constrained simulation) will be used to explain and forecast the development of Amsterdam.

The general structure of the dynamic model for Amsterdam is depicted in Fig. 6. In this configuration 5 subsystems can be distinguished, viz. (1) population, (2) housing, (3) employment, (4) (economic) infrastructure and (5) transportation. It has to be emphasized that each subsystem is a dynamic subsystem, describing the trajectory of the relevant elements over time for each zone of the urban system. Clearly, these subsystems may exhibit different time trajectories (so-called differential dynamics).

Part I

Population, Housing and Land Use Interactions

The paper by Korcelli organizes metropolitan population dynamics into three categories: (i) the age composition–fertility syndrome, (ii) the mobility evolution syndrome which is related to demo-economic processes such as the interaction between economic change, industrial restructuring and spatial policy, and (iii) the spatial polarization–integration syndrome. The third covers two conflicting aspects of demo-economic change. On the one hand, location of households with respect to skills and occupation implies segregation and real specialization. On the other hand, the composition of employment categories and concentration of knowledge intensive labour force is an important factor in the renewal of the metropolitan economies of industrial nations. One overall result in the comparative analysis is that certain change patterns are common to the metropolitan regions. Two such examples are the rapid convergence to medium household size, and a divergence in age distribution between cores and peripheries. The three case studies contain two capital cities, Helsinki and Warsaw, and one industrial region, Turin. In the 1960s all three regions had a positive population growth. Only in Warsaw did this growth continue in the 1970s, but also in this case at a reduced pace.

Population Dynamics of Metropolitan Regions

PIOTR KORCELLI

*Institute of Geography and Spatial Organization, Polish Academy of Sciences,
00-927 Warsaw, Krakowskie Przedmieście 30, Poland*

INTRODUCTION

Some fifteen years ago, when interregional concentration of population and economic activity were manifested in the universal expansion of large metropolitan areas, the matters of urban theory, and urban policy, were much more straightforward than they are today. Reinterpretation, due to Lasuen, Pred, Boudeville and other authors, of the classical theories of settlement networks and regional economic growth, allowed one to fit comfortably the observed trends into available conceptual frameworks, while urban and regional policy continued to be preoccupied with problems of old, peripheral regions and of the new, resource frontier regions.

When confronted with recent patterns of urban change, these established concepts and policies have widely been questioned, although so far they have not been replaced by alternative approaches of comparable stature. As to the patterns themselves, the change is most clearly visible at the global scale. The highly and the less developed countries diverge with respect to their recent urbanization experience, with the former demonstrating a shift in internal migrations away from the large metropolitan areas and towards smaller towns and peripheral regions, while the latter continue to feature accelerated population concentration in the primate cities and increasing densities within their core areas.

Such general trends, however true at the highly aggregate level, tend to conceal substantial diversity which appears as soon as the scale of analysis is lowered to account for intermetropolitan comparisons. A survey of trends in the highly urbanized countries during the 1970s (Korcelli, 1983) concludes that although the largest metropolitan regions have generally lost their growth momentum characteristic of the previous decades, the incidence of absolute population contraction is typically confined to those areas that are situated in older, industrial regions. Long-term interregional shifts in the distribution of population and economic activity are frequently seen as the major contributors to the growth and decline of the population of individual metropolitan areas. However, the nature of this interdependence is not totally clear, since a poor growth performance of a large regional metropolis may be interpreted as a factor, as well as a consequence, of regional stagnation.

As an aggregate, the large metropolitan regions in a number of urbanized, developed countries have been growing slowly, or declining, relative to the other components of the respective settlement systems, but the rates of population change for individual areas extend over a broad range of values. In fact, in a number of countries, patterns of large-city contraction coincide with those of relatively rapid growth. In order to be able to interpret these variations one would

have to account for a number of factors in addition to the interregional component. One such factor is demographic development which in itself reveals considerable spatial and temporal variation. The following quotation from a summary statement by the Economic Commission on Europe is a good illustration of a non-transparent nature of current trends. The document in question refers to demographic developments in those countries from which most of the metropolitan regions in the IIASA project are selected. Hence its relevance for the present analysis:

The period since 1974 has been one of substantial demographic change in most of the member states of the Commission and in the region as a whole. In the case of some demographic variables new trends seem to be emerging, for other changes which were only incipient at the time have acquired a more definitive character, and for still others past trends have become more widespread or gained further momentum. In many aspects these developments imply a degree of uncertainty regarding the interpretation of the recent demographic evolution and its medium and long-term prospects.

The long-term decline of population growth, characteristic of the region as a whole, continued in most countries and there were signs of the onset of such a decline in those where growth has traditionally been high. As a result, in an increasing number of countries population growth has fallen to low levels and in some has even become negative. There are, however, also indications of a stabilization of growth rates particularly where rapid declines occurred in the past.

(United Nations, 1983: 11).

A number of authors have recently attempted to interpret interurban variations as a function of time. The concepts of stages of urban development, and city life cycles are based on the premise that experience of some cities is likely to be replicated by other cities. Hence, presently observed diversity is interpreted in terms of time lags between cities. Of course, diversity may only be explained when its underlying factors and components are subjected to analysis. Some of these, in particular demographic and technological change, may indeed reveal a cyclical character, while other factors, for example spatial policy, may not. The identification of cycles as measured by aggregate variables, such as population growth rates, is possible only when their underlying components are arranged in a mutually additive way, have similar wave lengths, and are stable over time. However, short-term divergencies do not rule out a convergence in a longer-term perspective, a condition which is often of limited help in an empirical analysis based on concrete observations. A practical conclusion from the metropolitan studies perspective is therefore to focus more on specific interdependencies in, rather than aggregate characteristics of, metropolitan regions.

DIMENSIONS OF METROPOLITAN POPULATION CHANGE

One can identify three aspects of metropolitan population dynamics which are important from both a research and a policy perspective. They include:

(a) *The age composition-fertility syndrome.* The rapid change in this domain as observed for metropolitan populations universally has not only crucial social and economic implications within metropolitan regions, but also brings about major impacts in national demographic development.

(b) *The mobility evolution syndrome.* Migrations towards and residential moves within metropolitan areas have for a long time been among the main aspects of spatial population mobility. More recent developments include expanding inter-

metropolitan migration and outmigration from large metropolitan areas towards smaller cities and towns. This dimension of population change is explicitly related to economic change, industrial restructuring, and spatial policy.

(c) *The spatial polarization-integration syndrome.* Metropolitan regions have traditionally constituted fields of action for social forces. The sorting-out of people by skills, occupations or family status within such regions proceeded parallel to areal specialization in economic activities. Within a planning context attempts were made to resist or counteract such trends. Now, when they seem to be gaining momentum at a national and international scale, the role of metropolitan regions as poles of attraction of certain groups, and of repulsion with regard to others, or, alternatively, of social integration, is seen in a new perspective.

The present article focuses on the first of the three aspects listed above. At this stage we shall attempt to explore some interrelations between the evolution of age structure and population redistribution patterns. While working with a preliminary data set we are able to present some basic population trends and associations for a group of ten to thirteen metropolitan regions (as well as for their inner and outer zones). Such comparisons will mostly be done using an interval rather than nominal scale. We shall also present some more detailed analysis for a smaller group of four to six regions for which more specific data have been provided.

POPULATION GROWTH AND DECLINE AND THEIR CORRELATION

Out of 13 metropolitan regions covered by data currently available, 11 have been gaining population throughout the last twenty years or so, and only two have been losing since 1970. This proportion does not quite agree with the prevailing image of contracting metropolitan populations in highly industrialized nations. However, in addition to the two declining regions (Vienna and Leeds) three other regions (Amsterdam, Dortmund and Prague) had an almost constant population size during the 1960–1980 period.

Among core areas, seven had more inhabitants around 1980 than in 1960 (and six—in comparison with 1970) and six had less (seven had less than in 1970). In a peripheral pattern of metropolitan growth, often accompanied by an outward drift of the population, the proportion of the population living in the core is expected to gradually decline. This trend is actually observed. The rate of central city relative decline is not related significantly to its absolute population change; no clear interdependence is visible between rates (and direction) of change and the metropolitan region's total population size.

Since the individual metropolitan regions represent components of various national urban systems, it is justified to weight their population trends against respective national trends rather than to compare their growth rates with each other. Our working hypothesis, based on recently observed urbanization transitions, tells us that an increasing number of large metropolitan regions fall behind the national rate of population growth. Table 1 A confirms this expectation. Only three metropolitan regions (Helsinki, Budapest and Warsaw) have experienced higher-than-national rate of growth during both the 1960s and 1970s. The number

Table 1 A. *Population growth rates in metropolitan areas (MA) against national (N) rates*Trend stability index (Sokal index): $\frac{a+d}{a+b+c+d} = 0.69$

		1970-1980			
1960-1970	$\frac{MA}{N} > 1$	$\frac{MA}{N} \leq 1$			1980-1990
$\frac{MA}{N} > 1$	(a) Helsinki Budapest Warsaw	(b) Turin Nagoya Stockholm Melbourne			Projection ¹ Nagoya Helsinki Turin Melbourne Budapest Warsaw
$\frac{MA}{N} \leq 1$	(c)	(d) Vienna Prague Chicago Leeds Amsterdam Dortmund			Chicago Dortmund Vienna Amsterdam Stockholm Leeds

¹ 1980-1990 projection source: United Nations (1980).

of areas with lower-than-national rates has increased from six to ten between the former and the latter decade. Projections for the 1980s, borrowed from the United Nations material, are not quite consistent with trends, as noted above.

A clearer pattern is shown in Table 1 B. During both the 1960s and the 1970s, all except two core areas had slower population dynamics than the respective metropolitan areas had. Warsaw and Prague are the two exceptions, the former attributable to reconstruction after the Second World War, and, to somewhat overbounded core boundaries. Still, even in these two metropolitan areas the rate of change of the core had only nominally exceeded that of the ring.

Table 2 presents a cross classification of population growth rates and population density in the core area. According to a working hypothesis, higher initial densities should lead to a deconcentration (low or negative growth rates) during the subsequent period. A caveat relates to two limitations: (a) cultural and occupancy differences, (b) varying proportions of non-residential land. If these factors are taken into account, the pattern as observed seems rather convincing. Those cities situated in fields *a* and *b* in the respective tables represent counterintuitive cases. Although their number had increased from 3 to 6 between the 1960s and the 1970s, this reflects a general drop in population growth rates in the core areas of regions included in the study.

An urban life cycle concept would claim that various phases of metropolitan growth and decline are associated with different regimes of natural population growth, and household formation. Table 3 and Fig. 1 arrange our data from that point of view. The decrease of the household size is a remarkably universal

Table 1 B. *Population growth rates in core (C) against metropolitan area (MA rates)*

Sokal index value 1.0

1960-1970	1970-1980	
	$\frac{C}{MA} > 1$	$\frac{C}{MA} \leq 1$
$\frac{C}{MA} > 1$	Prague Warsaw	
$\frac{C}{MA} \leq 1$		Vienna Helsinki Turin Nagoya Dortmund Amsterdam Stockholm Chicago Leeds Melbourne Budapest

development, irrespective of overall population trends. These cities and metropolitan regions characterized by high growth rates also seem to experience a relatively more rapid contraction of the average household size. Due to a normal time delay between the two trajectories, this suggests that these cities may soon experience a slow-down of their total population growth. Such a conclusion, however, needs to be adjusted by taking into account that portion of the house-

Table 2 A. *Interdependence between population change and initial density in the core: 1960-1970*

Sokal index value 0.23

Density	Growth	
	Positive	Negative
Above median	Turin Nagoya	Vienna Amsterdam Chicago Stockholm
Median and below	Helsinki Dortmund Melbourne Budapest Warsaw Prague	Leeds

Table 2 B. *Interdependence between population change and initial density in the core: 1970-1980*

Sokal index value 0.54

Density	Growth	
	Positive	Negative
Above median	Nagoya Budapest	Vienna Turin Amsterdam Chicago
Median and below	Warsaw Prague	Helsinki Dortmund Leeds Melbourne Stockholm

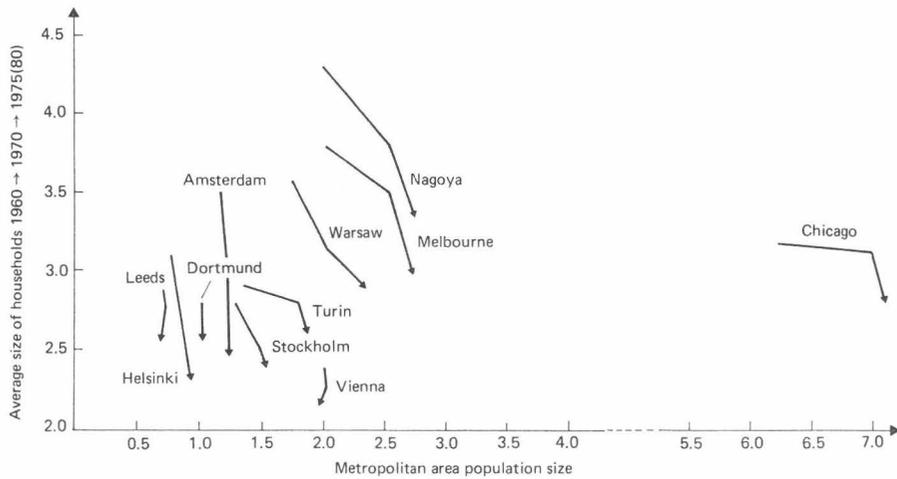


Fig. 1. The changing household size in the metropolitan regions.

hold size contraction that is related to general improvement of the housing and living conditions within cities and metropolitan regions over the last twenty years or so.

Since the decrease of the size of households in developed countries is primarily a consequence of a dramatic fall in birth rates and an equally spectacular rise of divorce rates (that also contribute to a lower natural increase), we have looked for a lagged interdependence between household size and the total population growth in metropolitan areas. These areas in fields *a* and *d* of Table 3 conform to the initial hypothesis. They represent 0.64 of the total during the 1960s as much as 0.75 during the 1970s. The latter ratio is particularly high.

Table 3A. Association between median household size (1970) and mean annual population growth rates for 1960–1970

Sokal index value 0.64

Household size	Population growth	
	Above median	Median and below
Above median	Nagoya Melbourne Warsaw	Turin Amsterdam Chicago
Median and below	Helsinki	Vienna Dortmund Stockholm Leeds

Table 3B. Association between median household size (1980) and mean annual population growth rates for 1970–1980

Sokal index value 0.75

Household size	Population growth	
	Above median	Median and below
Above median	Turin Nagoya Melbourne Warsaw	Chicago Leeds
Median and below	Helsinki	Vienna Dortmund Amsterdam Stockholm Budapest

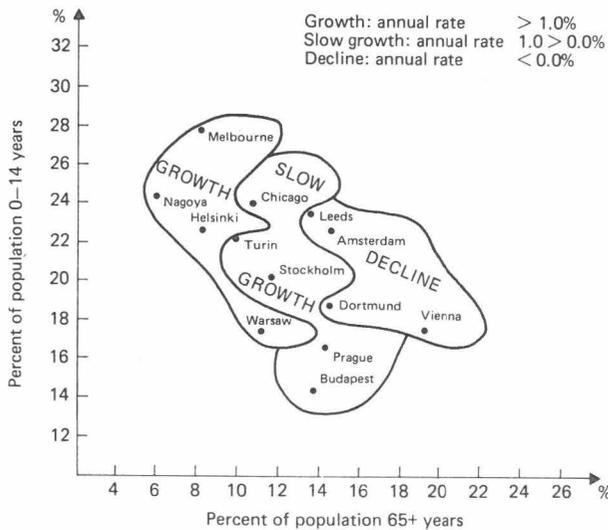


Fig. 2. Metropolitan population change versus proportions of 0-14 and 65 plus age groups. Note: Annual growth rates given for periods subsequent to the date for which age structure is given.

THE PATTERNS OF AGEING

The age structure is a rather straightforward determinant of population growth rates, even in those cities that base their growth primarily on immigration. Fig. 2 reveals the expected interdependence, although two or three metropolitan regions behave somewhat atypically, i.e. they experience growth (or decline) despite small (respectively large) share of the 0-14 age group. The deviant cases are those of Budapest, Leeds and Warsaw. This relationship, however, is secondary compared to the link between growth rates and the proportion of young adults (20-29) among the total population. The latter data are currently available for some of the metropolitan regions under discussion and will be presented later.

Against the corresponding national shares, a metropolitan region can represent one of four alternative patterns of the 0-14 and 65 plus age group proportions. One pattern typical of the growing metropolitan areas, in particular those in developing countries, features a high share of children, and a low percentage of the elderly. Only one metropolitan region in the set represents such a combination (see Table 4A). The second case, one with the preponderance of both the 0-14 and 65 plus age categories is exemplified by those large cities in highly urbanized countries that have experienced heavy immigration (i.e. inflow of young adults with relatively high fertility rates) during the recent past. This category is also represented by a single case. Hence, the clear majority of our metropolitan regions fall into the two remaining fields in the table. One pattern with low percentage of children and high percentage of the elderly among the total population, is considered as typical of older, stagnating metropolitan regions. Not all the units found in that field actually possess such features in the exact sense but they still comprise of regions in which the ageing processes is more advanced than in the countries of which they are a part. Finally, those metropolitan regions with relatively low shares in the total population of both the

Table 4 A. Shares of individual age groups: metropolitan (MA) versus national (N)

Most recent figures available

	0-14	
	$\frac{MA}{N} > 1$	$\frac{MA}{N} \leq 1$
65 plus		
$\frac{MA}{N} > 1$	Chicago	Amsterdam Vienna Prague Melbourne Warsaw Budapest Leeds
$\frac{MA}{N} \leq 1$	Nagoya	Helsinki Turin Stockholm Dortmund Melbourne

Table 4 B. Shares of individual age groups: core (C) versus metropolitan area (MA)

Most recent figures available

	0-14	
	$\frac{C}{MA} > 1$	$\frac{C}{MA} \leq 1$
65 plus		
$\frac{C}{MA} > 1$		Vienna Helsinki Turin Nagoya Dortmund Stockholm Melbourne Prague Warsaw Amsterdam
$\frac{C}{MA} \leq 1$		

0-14 and 65 plus age groups are also lagging in their demographic growth compared to respected average national patterns. Locational preferences and constraints of the elderly citizens in the countries concerned seem to be tilted towards smaller, nonmetropolitan communities.

When one confronts the cores (inner zone) with the total metropolitan regions, the patterns of age distribution emerge as totally uniform (Table 4 B). In all the ten regions for which data were provided, the core areas feature an underrepresentation of children and an overrepresentation of the elderly. This finding is indeed congruent with the prevailing image of the relatively old central city, as well as with the concept of residential family life-cycle (Johnston, 1969), according to which young families with children tend to migrate to the outer zones, while contracting families and single persons predominate among the stayers, as well as among those moving back to the city.

In order to explore the dynamics of age distribution one requires a rather detailed decomposition of the population in addition to some temporal perspective; the minimum requirements seem to be 5-year age group and at least three time periods. Data for Stockholm, Leeds, Melbourne, Amsterdam, Helsinki and Warsaw basically meet those standards and allow for a comparative analysis to be carried out. At the present initial stage, attention will focus on the age groups of 0-4, 20-29, and 65 plus. Their mutual proportions and interrelations are critical if one attempts to speculate on the theme of how fast and how varied is the process of ageing of the metropolitan populations, which, in turn, normally provide early indicators of national and global demographic transition.

Fig. 3 documents the rapid contraction of the share of babies and small children (0-4 years) in the total population of metropolitan regions. While in Melbourne,

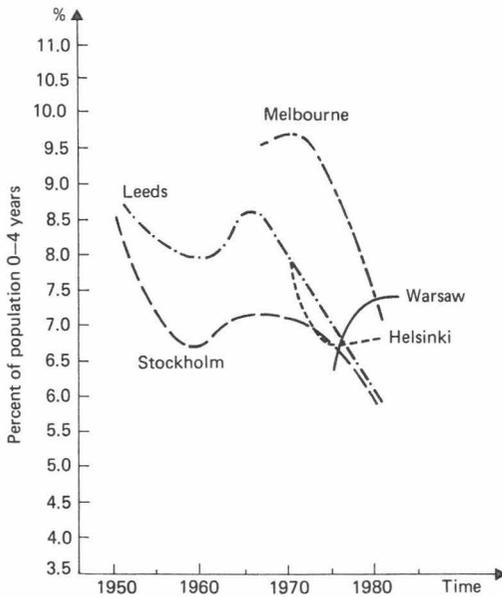


Fig. 3. Proportions of 0-4 age group in the total population.

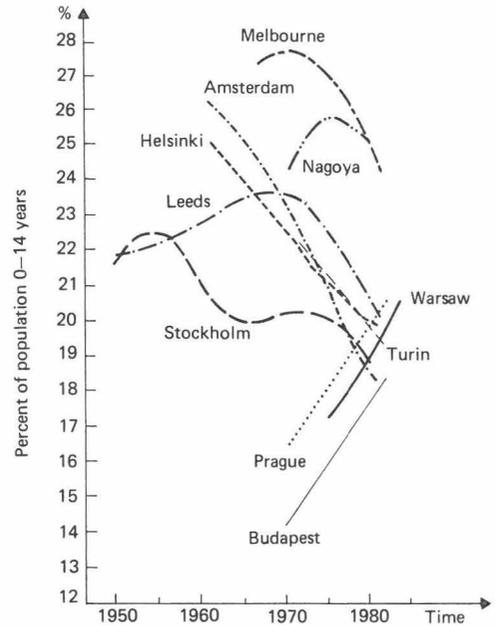


Fig. 4. Proportions of 0-14 age group in the total population.

for example, this age group was the most numerous still in 1971 (as compared to other 5-year age groups from 5-9 until 65 plus), its rank dropped to 8th by 1981. In the Stockholm region the corresponding rank was 4th in 1950 and 11th (out of the total of 14); on the later date even the share of the 55-59 age category, with its long mortality history, was greater than the number of children between 0-4 years of age.

The general downward trend does not preclude short-term upswings which occurred in Stockholm and Leeds in the early 1960s, in Melbourne in the late 1960s, and the Helsinki and Warsaw in the late 1970s. These are mainly caused by fluctuations of birth rates at the national and continental level (due to variations in the cohort size, variations in age-specific fertility or both), as well as by evolving interregional migration rates. There also seem to be a "bottom-line effect" whereas the share of children increases after a long and sustained decline, sometimes as a result of pronatalist policy measures. Such is the case of Budapest and Prague, although more precise comparison with other regions is hindered by data limitations. Interestingly enough, the evolution of the share of the 0-14 age group shown in Fig. 4 for a larger group of metropolitan regions gives evidence of a convergence trend of the respective proportions by the late 1970s.

A convergence trend also represents the dominant feature of intermetropolitan evolution of the shares of the 20-29 age group (Fig. 5)—the category with both highest reproductive potential, as well as highest propensity to migrate (see Rogers and Castro, 1981). During the 1960s and early 1970s the 20-29 age group

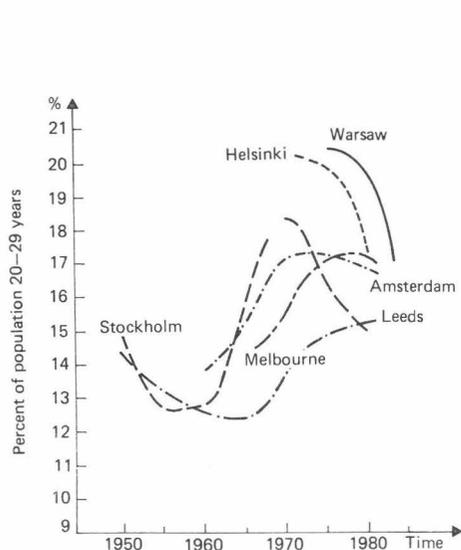


Fig. 5. Proportions of the 20–29 age group in the total population.

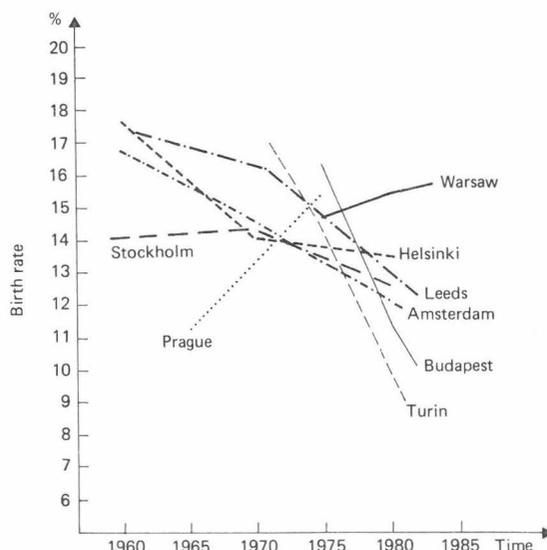


Fig. 6. Evolution of crude birth rates in metropolitan regions.

typically comprised the largest proportion of the metropolitan population (with 10-year disaggregation). This was attributed to two interacting factors: the shift of the post-war baby boom cohort into the twenties, and the expansion of immigration towards metropolitan regions caused by both the raising age-determined mobility propensities and the generally favorable employment prospects at that time. Since then the main baby-boom cohort has moved into their thirties, and for many metropolitan regions in industrial countries the immigration has become accompanied by substantial outmigration.

Although the net effect varies from region to region in the majority of them the gap between the shares of the 0–4 and 20–29 categories becomes ever wider. For such regions as Melbourne and Leeds the discrepancy denotes a growing incompleteness of the intergenerational replacement, while for remaining regions it implies at least poor prospects for the arresting of the decline, or the sustaining the growth, of birth rates.

Since 1960 crude birth rates have fallen by between 15–40 percent (see Fig. 6) and in almost all regions under discussion they have dangerously approached the level of death rates; actually in Turin and Budapest the natural increase was negative in early 1980s and in Leeds it was practically zero. (This is of course not the first time when such developments occur: in the 19th and early 20th century most large cities had negative natural increase rates and expanded on account of net immigration.) Prague is the only case for which we have evidence of substantial revival of birth rates since the mid-1960s when their level was much below of what it was in other metropolitan regions. If data allowed, one could measure the extent to which that shift was due to an age-composition effect and how much was contributed by increasing age-specific fertility.

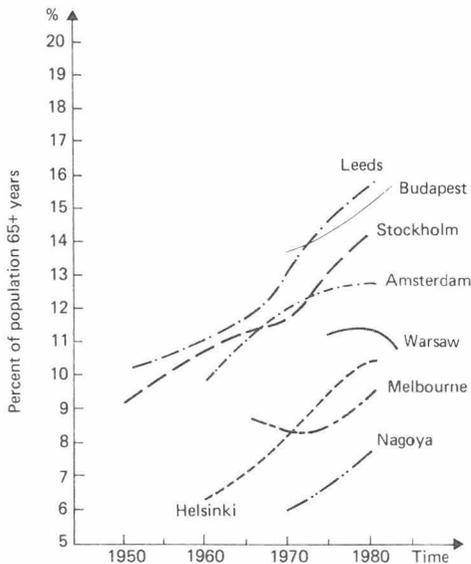


Fig. 7. Proportions of 65 plus age group in the total population.

The configuration of data for Warsaw seems paradoxical at the first glance: at a rising level of births, the relative size of the 0–4 age group expanded from 6.4 to 7.4 per cent between 1975–83. At the same time the parent category of 20–39 years old declined from 36.8 to 34.1 per cent of the total population. The only possible explanation is an increase in age-specific fertility which is a rather exceptional phenomenon in Europe nowadays. The gross reproduction rate for the region of Warsaw grew from 0.797 in 1976 to 0.907 in 1983—the level still insufficient to prevent a decline of the total population, at zero net migration, within a 50–60 years perspective.

The steady increase in the proportion of the elderly population (Fig. 7) undoubtedly constitutes the most critical feature of age profile evolution for the metropolitan regions under discussion. Although the growth of life expectancy is a major explanatory variable, other factors are also at work. Stagnation of the total population of a metropolitan area caused by fertility below replacement level and/or poor migration performance brings about the ageing process even when life expectancy remains constant. Actually, the proportion of the metropolitan population over 65 years of age which basically coincides with economically post-active category will experience a further increase during the next decades when numerous cohorts of post-war immigrants, now in their fifties arrive at retirement age.

To what an extent are those aggregate patterns differentiated among individual zones of metropolitan regions? Data for Melbourne, Stockholm, Helsinki and Amsterdam (summarized in Table 5) provide some interesting, although non-counterintuitive answers. First, the outer and, to a smaller extent intermediate zones represent a much higher concentration of the population at younger ages than the inner zone does. Second, the inner zone is characterized by a strong

Table 5. *Intra-metropolitan age distribution patterns*

	Sections of the age profile dominated by		
	Core	Intermediate zone	Outer zone
Melbourne			
1966	20-29 50 plus	35-50 15-19	0-14
1971	20-29 55 plus	15-19 40-55	0-14
1976	20-29 60 plus	15-19 40-60	0-14
1981	20-29 65 plus	15-19 40-65	0-14 30-40
Amsterdam			
1960	35 plus	-	0-34
1971	15-19 45 plus	- -	0-14 25-44
1981	55 plus	15-44 45-54	0-14 25-44
Stockholm			
1950	20 plus	0-19	-
1960	20 plus	0-19	-
1970	20 plus	-	0-19
1980	65 plus	20-64	0-19
Helsinki			
1970	20-29 50 plus	0-9 30-49	10-19
1975	25-29 50 plus	30-49	0-24
1980	20-29 50 plus	30-49	0-19

overrepresentation of population in the early labour force ages and in the late and post-labour force ages. Such a pattern, partly evident already from Table 4B, becomes reinforced over time: hence, in a non-growth situation one could speak about spatial polarization in the distribution of population by age. A closer inspection of individual age profiles reveals a more complicated pattern of change. Populations in inner zones do become extremely "specialized" by age, but intermediate zones assume over time a "normal", i.e. close to the average for a metropolitan region, age distribution. Spatial population diffusion towards the periphery and the changing proportions between individual zones may ultimately bring about similar effects to outer zones of metropolitan regions.

In an earlier study Korcelli and Just (1983) have found significant differences in the age composition between metropolitan and other urban populations, as well as total national populations for a number of countries. Large metropolitan regions revealed a higher concentration of population in the early labour force ages and had a low proportion of their population in the childhood and teenage ages. The present analysis allows to extend these findings by pointing to an analogous variation between zones within metropolitan regions. Thus, the inner

zone represents a sharper image of what the total region represents nationally. In a temporal perspective, inner zones are seen to set early patterns of population ageing for the whole metropolitan regions in a similar way as metropolitan regions are considered leaders in recent demographic development at a national and continental scale.

CONCLUSIONS

The ageing process of contemporary metropolitan populations, as generated by dynamic interdependence of declining fertility, contraction of the younger age groups and growing life expectancy, has gained considerable momentum over the last decades. In some of the metropolitan regions included in the IIASA project this process has already produced negative growth rates, while in the remaining regions it is clearly heading in the same direction, although time-distance to the cross-over point of birth and death rates differs considerably among individual regions. Important factors which have been omitted in the discussion, and which may, and occasionally have, influenced the process of ageing, include population policy and migration. Reversal of birth rate decline for Prague seems to be related to the former factor, but more detailed analysis would be needed to measure its effect against other factors.

What has been found so far, with the limited data on hand, can be described as a measure of order in diversity. Despite considerable variations in the overall rates of population growth, and in the nature of the underlying economic, social and policy factors, the demographic patterns in the metropolitan areas under study seem to follow certain common rules. The rapid convergence of the median household size is one example, and the age distribution between cores and peripheries is another.

The next step in the analysis of metropolitan population dynamics should focus on evolution of mobility patterns: the contribution of migration to the total population change its structure, directions of in- and outmigrations, the composition of migrants in terms of demographic and social characteristics.

A comparative analysis of migration flows should answer the following questions: Are migrations fields (regions of origin) of the metropolitan areas stable in territorial sense, and what measure of the demographic potential do they represent? What is the impact of the increase in the share of interurban moves on the migratory balance of individual metropolitan areas? How do the socioeconomic characteristics of in- and outmigrations (age, education level) evolve against general national standards? How does the pattern of inter-zonal migrations evolve and what influence has it had on social and economic composition of the population in the inner city?

Other important issues are the correlates of labour migration and of intraregional residential relocation. These aspects represent linkages with the housing and economic sector studies which are both of general, and specific nature. Starting with an analogy, it has been suggested (Andersson and Johansson, 1984) that industry-product trends in a metropolis may provide early signals about the direction of industrial change at a national, or international scale. This is at least

as much true in the case of population dynamics, with large metropolitan areas representing both forerunners and contributors to national and global demographic change. As this change does not usually entail what social and spatial planners would define as desirable development, it is very important that its course is better understood.

REFERENCES

- Andersson, Å. and B. Johansson (1984) "Knowledge Intensity and Product Cycles in Metropolitan Regions". Laxenburg, Austria: IIASA, Working Paper WP-84-13.
- IIASA Project on Metropolitan Processes and Policies. Background Papers on the following metropolitan areas: Amsterdam, Budapest, Chicago, Helsinki, Leeds, Melbourne, Prague, Stockholm, Turin, Warsaw (see Short Papers in this issue).
- Johnston, R. J. (1969) "Some Tests of a Model of Intra-urban Population Mobility: Melbourne, Australia", *Urban Studies* 6(1): 66-82.
- Korcelli, P. (1983) "The Turnaround of Urbanization in Developed Countries". Paper prepared for Expert Group Meeting on Population Distribution, Migration and Development, International Conference on Population, Hammamet, Tunisia 1984.
- Korcelli, P. and P. Just (1983) "Metropolitan Growth and Population Development at the National Level", *Regional Development Dialogue* 4: 1-38.
- Organization for Economic Cooperation and Development (1983) *Urban Statistics in OECD Countries*. Paris: OECD.
- Rogers, A. and L. J. Castro (1981) "Model Schedules in Multistate Demographic Analysis: The Case of Migration". Laxenburg, Austria: IIASA, Working Paper WP-81-22.
- United Nations (1980) *Patterns of Urban and Rural Population Growth*. New York: UN Department of International Economic and Social Affairs, Population Studies 68.
- United Nations (1983) "Report of the Meeting on Population, Sofia, 6-12 October 1983". Geneva: Economic Commission for Europe.

The Development of Helsinki Metropolitan Region and Its Current Planning Problems

JUHA SAVANDER

Helsinki Regional Planning Association, Helsinki, Finland

INTRODUCTION

Helsinki, the capital of Finland, is situated on the south coast of the country by the Baltic Sea. The city has grown rapidly, attracting people to migrate from all parts of the country. Today, every sixth Finn is living in the Helsinki Metropolitan Area, which comprises the Helsinki city-dominated coherent built-up area with immediately connected local communities.

Helsinki is the only metropolis in Finland—the world's smallest metropolis or largest small town—as they say. What matters is its being the capital, i.e. a political, economic and cultural power centre. It is also a node of contacts with access to the rest of the country and to the world. Helsinki area can be described as the largest crossroads of Finland: the network starting radially from the city links the rest of the country via direct and fast connections with Helsinki, which has the largest harbour and the only important international airport in Finland.

On the other hand, Helsinki is also a local built-up area, a native locality for its inhabitants, grown beyond the administrative boundaries of the town to the surrounding countryside. The way of life in Helsinki, influenced by foreign trends from both east and west, by the large migration from the rest of the country, and by the metropolitan culture, differs to a significant degree from the life in the countryside or in small towns.

FROM TRADING PLACE TO CAPITAL

An advantageous location at the junction between “the great eastern commercial route” on the coastline course of the Baltic Sea and the Vantaa river flowing from inland may have caused the Swedish King Gustav Wasa to order a town to be set up at this estuary in 1550. However, at first the town did not flourish even though it was a hundred years later transferred to its present site, to a peninsula nearer the open sea. This small trading town, scarcely developed, was almost totally ruined in the wars between Sweden and Russia in the early 18th century.

It was not until the latter half of the 18th century that Helsinki got its first thrust to grow when the Swedish authorities began to exploit it for fortifications. Although the sea fortification of Viapori (Sveaborg) set up on the islands in front of the town was never completed, the actual Helsinki town was almost left under the shadow of this construction. A real turning point in the development of Helsinki was its appointment as the capital of the autonomous grand duchy at the beginning of the 19th century by order of the new ruler of the country, the Russian czar. From the ashes of the small town, devastated by war and fires, a

brave new administration town emerged in order to symbolize the absolutism of the new ruler. Gradually Helsinki also became to be regarded as the centre of economic and cultural life in Finland, providing a "window" of the Russian power into the outer world.

A new transition period in the development of the capital was created by the rise of industry beginning from the 1860s. It shook the whole city structure and gave Helsinki its basic shape and image which is still clearly recognizable. The city scape that had earlier reflected the ruler's power and class society was quickly changed to serve a new master—the industrial culture.

The industrial plants were situated in circles around the grid plan of the old administrative town, attracting workers along them. Wood-structured working-class quarters soon began to rise outside the actual town area. At the same time the low wooden houses in the so-called Empiric-style centre had to yield and give way to the commercial centre or densely built "stone town" which was constructed in a very short time.

The strongly developed administrative and commercial centre and the lines of housing settlements set up along the routes going radially from the centre, especially the railways and later also the main roads, formed a star-like pattern which is typical of industrial towns. The location by the seaside directed this regular star form towards a hand-like configuration.

The position of Helsinki as Finland's leading town got its final confirmation when it became the capital of an independent nation in 1917. The period between the two world wars was a time of stabilizing and reinforcing the industrial structure of the town. In urban planning, factors emphasizing the townscape, aestheticism and spatial elements were important. It was a period of humanistic functionalism. After the Second World War, planning found its ideals in the neighbourhood principle which recommended independent, multifunctional neighbourhood units to be constructed within a good communication distance from the main centre, preferably along suburban railways. The outspoken goals were humanistic and social in a pronounced manner. The results, however, were the opposite.

In different parts around the urban fringe single-family house communities of veterans and evacuees first emerged. Later, a rapid change in the structure of economic and industrial life in the 1950s and 1960s triggered off a big migration wave into the area. This resulted in construction of uni-functional residential neighbourhoods—so-called "forest towns"—scattered around far from the urban core.

AREA DESCRIPTION

Today Helsinki city together with the adjoining towns of Espoo and Vantaa and the town of Kauniainen situated inside Espoo form an integral housing and labour marketing area, called a Metropolitan Area, which reaches beyond the above mentioned municipalities, particularly in the direction of the main railway line (see map).

The built-up area of Helsinki consists of the central city area and of suburbs

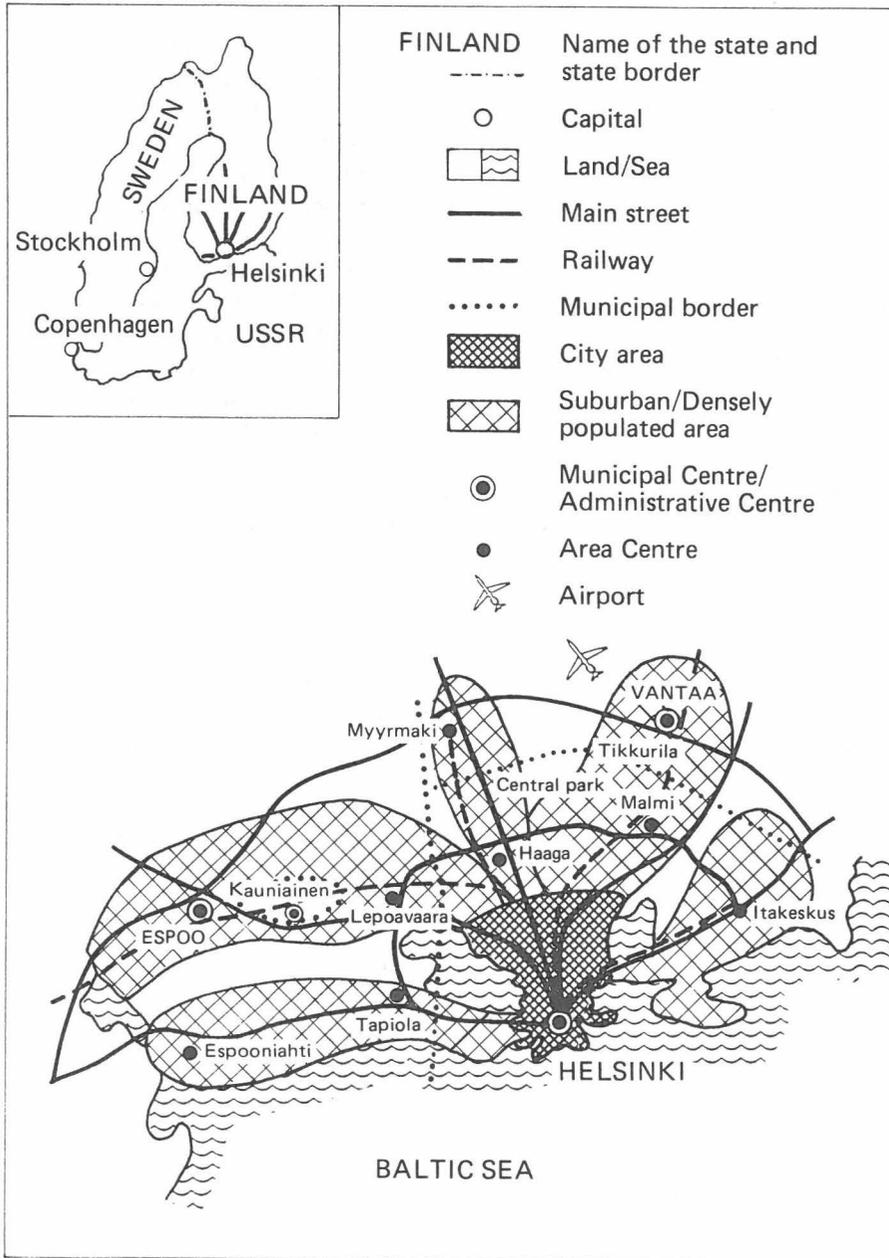


Fig. 1

which have grown along the radial main traffic routes, embedded far into the neighbouring municipalities. The conurbation reaches its utmost width in the direction of the coastline and railways. Large sea bays separate the core area of the actual city. The core is situated on a peninsula where the city has been

located ever since the 17th century. This inner city area is still the heart of Helsinki, daily pumping tens of thousands of people between homes, jobs and services. The steady concentration of functions on the peninsula of Helsinki has created a constantly growing need for more traffic and space, which is about to pose a real challenge to the old respected environment. However, the imperial heritage of Helsinki, its mental core, the Empiric-style centre still defines time. In one corner only it has had to yield to the economic power of the modern world—to a bank.

The areas more closely surrounding the central area such as Tapiola, Leppävaara, Haaga, Malmi and Itäkeskus are mainly residential neighbourhoods built in the 1950s and 1960s, now developing into district centres with a comprehensive structure. They are all situated at the intersections of main traffic routes coming radially from the centre and of the inner ring road. The built-up areas around the junction of the outer ring road and of radial routes are also planned to become district centres. Of them Espoonlahti and Myyrmäki are residential neighbourhoods dating from the 1970s, Espoo Centre is an old municipal centre, and Tikkurila is an old industrial area and residential area of workers along the main railway.

HAND AND FINGERS

The quality of land use and its density reflects in a comprehensive manner both social relationships and interaction between nature and culture, production modes and production relations. The most dominant feature in the development of Helsinki area structure after the Second World War is its division into two parts: 1) intensive central area and 2) the surrounding scattered fringe zone, which has been very quickly developed, being divided into several workplace and personal business journey sectors. These sectors or "fingers" are directed to the centre of Helsinki running parallel with the main traffic routes.

The growth of Helsinki area being centered on the inner city and the fact that its structure encompasses only one centre has brought about overcrowding, which is a phenomenon typical of metropolitan centres. One has to go shopping in Helsinki centre, while local shops are dying and the development of the planned district centres is detained.

Due to the growing share of services in the structure of economic life, workplaces are also centered on Helsinki inner city: it comprises more than half the workplaces of the area whereas only less than a quarter of the inhabitants. The service equipment standard and self-sufficiency in workplaces are quite unique in Helsinki city when compared with the rest of the area.

While the city continued its rapid growth, the business centre became dense and crowded, expanding to the surrounding residential areas and filling them with offices. At the same time the rising prices of plot land tended to push both inhabitants and industrial establishments out of the centre. The activities requiring abundant space could not afford staying on the expensive plot land blockaded by transport unless it was necessary for contacts.

Industry started to move off the overcrowded centre along the main traffic

routes as early as the 1960s. Thereafter outward migration from Helsinki inner city has included to a great degree also such "central activities" for which the location in the centre used to be of crucial importance, such as main offices of corporations, research institutions and storehouses of trading companies and other similar macro units. These "central activities", however, have not formed new "subcentres" but are situated pell-mell in the area, mainly along the traffic routes. Consequently, the actual production of goods has disappeared from the city life while the transportation, sale and consumption of goods has seized a greater part of the public space.

CONDITIONED BY TRAFFIC

The daily beat of Helsinki inner city, the heart of Helsinki area is most clearly seen in the main flows of transport, in the rush-hours every morning and evening. The expansion of motor traffic, especially that of passenger cars after the Second World War drastically changed the whole traffic system, influencing the area structure no less than did the construction of railways since the 1860s. The fact that moving became easier created an area structure which meant more and more dispersion and functional segregation. It enabled detachment from dense conurbation and rail transport, which was particularly manifest in the activities of developing sites for residential neighbourhoods. In the 1960s and 1970s residential and workplace agglomerations quickly began to stand up on the barren watershed ridges where there were no former settlements. These agglomerations lay cut off from the rest of the built-up area and from previous traffic routes. At this stage of development the old central area and built-up areas along the railway remained next to unchanged.

People work and live in traffic sectors or "fingers". There are five such sectors. The rail transport connects all traffic directions with Helsinki centre, excluding the western coast direction. Helsinki differs, for example, from other Nordic capitals in that its rail traffic network was initiated later and never extended as far as in the other capitals. This has weakened the position of Helsinki's rail transport system which has to compete with nearby motorways for the same passengers. During the period of site development a great number of new residential neighbourhoods had to depend on a poorly organised bus transportation system. Even today the mass transit in the area does not provide an integrated system. The worst phase of rush-hour commuting between the centre and the urban fringe seems, however, to be passed since the rail traffic and self-sufficiency in workplaces and services in suburbs have been developed in recent years.

Transport has become the most discernible element in the cityscape: motorways, ring roads, gigantic at-grade junctions and parking areas play a more and more central role in the scenery. There is no more room for building areas of blocks of flats on wooded watershed ridges the way it used to be at the time of site development. Instead, one has begun to construct on fields in the name of dense and integrated development. So, the spaces between the "fingers" start to fill in during a recent period of extensive development. The growth in the size of

units is noteworthy. While the number of population and jobs remains the same or even decreases, the space needed for buildings, dwellings, industrial halls, offices and service centres, as well as for connecting roads is growing faster than ever before.

LIVING IN HELSINKI

In spite of the gradually reduced growth of the population, housing shortage is still a major problem and housing is expensive. There is great variation in prices and rents of dwellings in different zones, especially depending on the distance from the centre and on the status or social esteem. The neighbourhoods hurriedly erected in the 1960s and 1970s are areas with diminishing attraction, whereas the blocks of flats in the inner city are—contrary to the trend in many other industrialized countries—regaining unexpected esteem. However, the differences between zones are relatively seen small and there is no real segregation or slum-formation as in bigger cities. This may be partly based on the fact that immigration into Finland has so far been very restricted, making the rise of prominent ethnic minorities impossible.

There is also a difference in the social structure between the West (Espoo) and the East (Vantaa). Since Espoo lies by the sea it has obtained a higher status as a residential area than Vantaa which is located north of Helsinki. This difference may also have been maintained by means of planning. Espoo authorities want to get wealthy taxpayers who will keep the political power unchanged. Therefore the policy has been to build “somewhat costlier”. People of smaller means have directed their attention to the east and north, where they can find more suitable dwellings and local atmosphere corresponding to their political views. Helsinki city is also interested in attracting good taxpayers, so it has allowed a rapid construction of dwellings and offices in the areas that were left vacant by the industry leaving the city. Housing production in the area has significantly diminished as compared with the “crazy years” of extensive development in the 1960s and 1970s. The neighbourhoods constructed at that time will soon be needing renewal investments.

ADMINISTRATIVE AND PLANNING PROBLEMS

A scattered area structure dates originally back to postwar housing settlement activities in the area. The pressure for building was focused on the rural municipalities outside Helsinki city. These communities neither had much legislative planning obligations nor appropriate resources for it. For this reason construction was quite free. The situation continued and got even worse in the migration years of the 1960s and 1970s: big building companies had purchased large pieces of land and were allowed to construct whole suburbs with exceptional building permissions.

Suburban settlements expanded beyond the centre of Helsinki already before the turn of the century. This dilemma of the centre and urban fringe was not solved by the Greater Helsinki idea until after the Second World War, when the

areas which had tried to become independent were merged as part of Helsinki city. The development in the 1960s and 1970s created a new suspense between the centre and fringe areas: in fact by site development Espoo and Vantaa were preserved as independent municipalities, since the contractors wanted to escape the pressures of the planning policies of the dominant Helsinki city.

Solutions to administration and planning problems of the Helsinki region are still being sought after, both from the Greater Helsinki ideology and from the independent small municipality model. Instead, the inhabitants have not been much consulted. Their possibilities of having a say in the formation of their own living environment have been quite poor, their role has been to adjust. Especially during the years of fast growth, the inhabitants were only seen as "population base and labour force" to be located in the town structure as dictated by markets and traffic.

As long as the regulation of location of workplaces and the co-operation between the municipalities of the region are halting, there will be no coordination between the location of new workplaces and the location of existing residential areas. As a result the need for commuting will continue to increase which will raise the costs of developing and operating the traffic system of the region. At the moment this may be the most acute planning problem at regional level. The municipalities in the region are threatened by segregation due to a change in the socioeconomic profile of population. Helsinki city is menaced in particular by the weakening of the municipal economy due to the growing burden of services to be supplied to the ageing population.

A certain turning point has been reached in the development of the Helsinki region into a metropolis. The process of growth that has continued almost unbroken since the early days of industrialization now seems to have been reduced. The focus of planning has shifted from new development into the conservation and development of the built environment.

However, there are relatively few problems in the Helsinki region as compared with many other metropolitan regions in the world and also other areas in Finland. Helsinki is a typical city with one centre, facing the problem of workplaces concentrating on inner city and segregation of housing and employment causing in further problems of commuter traffic. The undevelopment of the regional mass transit system thus makes the commuter traffic problems even more acute. On the other hand, many crises threatening other metropolises such as decay of inner city, problems of renewing old working class quarters and the crisis of municipal economy do not apply to the Helsinki metropolitan region of the nearly 1980s.

The Spatial Dynamics of the Turin Urban System

An Analysis of the Last Three Decades and Possible Future Developments

CRISTOFORO S. BERTUGLIA,¹ SILVIA OCCELLI,¹
GIOVANNI A. RABINO¹, CARLO SALOMONE² and ROBERTO TADEI¹

¹IRES, via Bogino 21, I-10121 Torino, Italy and ²CERIS, via Avogadro 8, I-10123 Torino, Italy

INTRODUCTION

The Turin urban system represents an example of metropolitan development caused by processes of industrial growth and concentration. It is a case which is remarkable for both the speed of growth and the mono-sectorial nature of the economic system. Turin is the home of FIAT and manufacturing industry still dominates the economic life of the system (almost 50% of total number of jobs). During the study period population, boosted by massive immigration, increased from 1 230 000 in 1950 to 2 120 000 in 1980.

Three fundamental factors have triggered the growth of the Turin urban system since 1950:

- a political factor, concerning national decisions on where to locate the post-war development;
- an economic factor generating labour demand, based on the presence in the Turin area of a well established production system (metal-working car industries) and on the building industry which offered a first employment opportunity for many immigrants;
- a demographic factor, which produced massive immigration into the area.

The resulting process of growth can be outlined as follows:

- (i) socio-economic growth of the city,
- (ii) subsequent socio-economic growth affecting the surrounding zones of the city along with the transfer of industrial jobs from Turin to the inner rings,
- (iii) the relative socio-economic decline of the marginal (outer) zones.

Two main effects of the above process were:

- (i) expansion of the Turin conurbation in an “oil-spot” form;
- (ii) rarefaction of population and jobs in outer marginal areas.

SOCIO-ECONOMIC AND SPATIAL PROCESSES OF DEVELOPMENT IN THE TURIN URBAN SYSTEM

Introduction

Although simplified, an explanatory analysis of these processes can be provided in terms of “open city”, “transient city” and “closed city” which are concepts referred to by Papageorgiou (1983) in his interpretation of the urbanisation process (cf. Bertuglia et al., 1983). Briefly, these concepts relate to abstract urban

situations in which: (i) land-values and urban density become higher as a result of the immigration produced by the economic take-off in the city (open city); (ii) immigration slows down, utility increases, and both urban densities and land values begin to increase also in the urban fringe (transient city); (iii) immigration stops, whereas the increase in utility and the suburbanisation continue (closed system).

First phase: an open system (1951–1960)

1951–1960 was the period of “take-off” in Turin. The rapid economic growth generated a strong immigration flow (both from outside the study area and from the marginal areas of the system itself) which created profound modifications in the socio-economic structure of the system; the population and number of jobs rose by around 400 000, respectively (cf. Fig. 1 *a* and *b*).

This socio-economic development, which was concentrated mainly in the city of Turin, triggered the spatial expansion of the system. This initially occurred along two main exit directions from Turin (towards the south-west and north-east, where two new large manufacturing plants were sited). This can be explained to a large extent by: (i) the strong inter-industrial links in the industrial sector which in this phase were essentially “mono-sectorial” (manufacturing industries, in particular metal-working), and (ii) the radial structure of the communication network.

The residential development basically followed that of industrial activity although its spread outwards from the city seems to be slower than that of the economic activities (cf. Fig. 1 *b*).

Second phase: a transient system (1961–1970)

In this phase the spatial spread of population and economic activities reached its highest level, and the rate of change slowed down. The result was a fast and chaotic process of urbanisation, initially in the first and then in the second ring. The process of industrial location in this period had a strong impact on the spatial development in general. It acted directly through the siting of new industries (in the major towns of the first ring and later in the second) and the induced residential growth (i.e. the housing necessary for workers). Indirectly this process of polarisation produced development around the towns and diffusion along the main communication routes along with filling up the remaining free space (see Fig. 1 *c* and *d*).

In addition to the growing importance of road as opposed to the rail-based transport, the building of new routes out of the city in the north and east, influenced industrial location significantly—although all the main exit routes from the city were affected by both economic and residential development practically concurrently. The building dynamics was also very strong and was favoured by the lack of incisive control over land-use. (Housing investments were 24% higher in the second than in the first phase.)

In 1971 the city and the first two rings had a rate of vacancy very close to zero, whereas the zones in the third ring had a significantly higher value (this was due

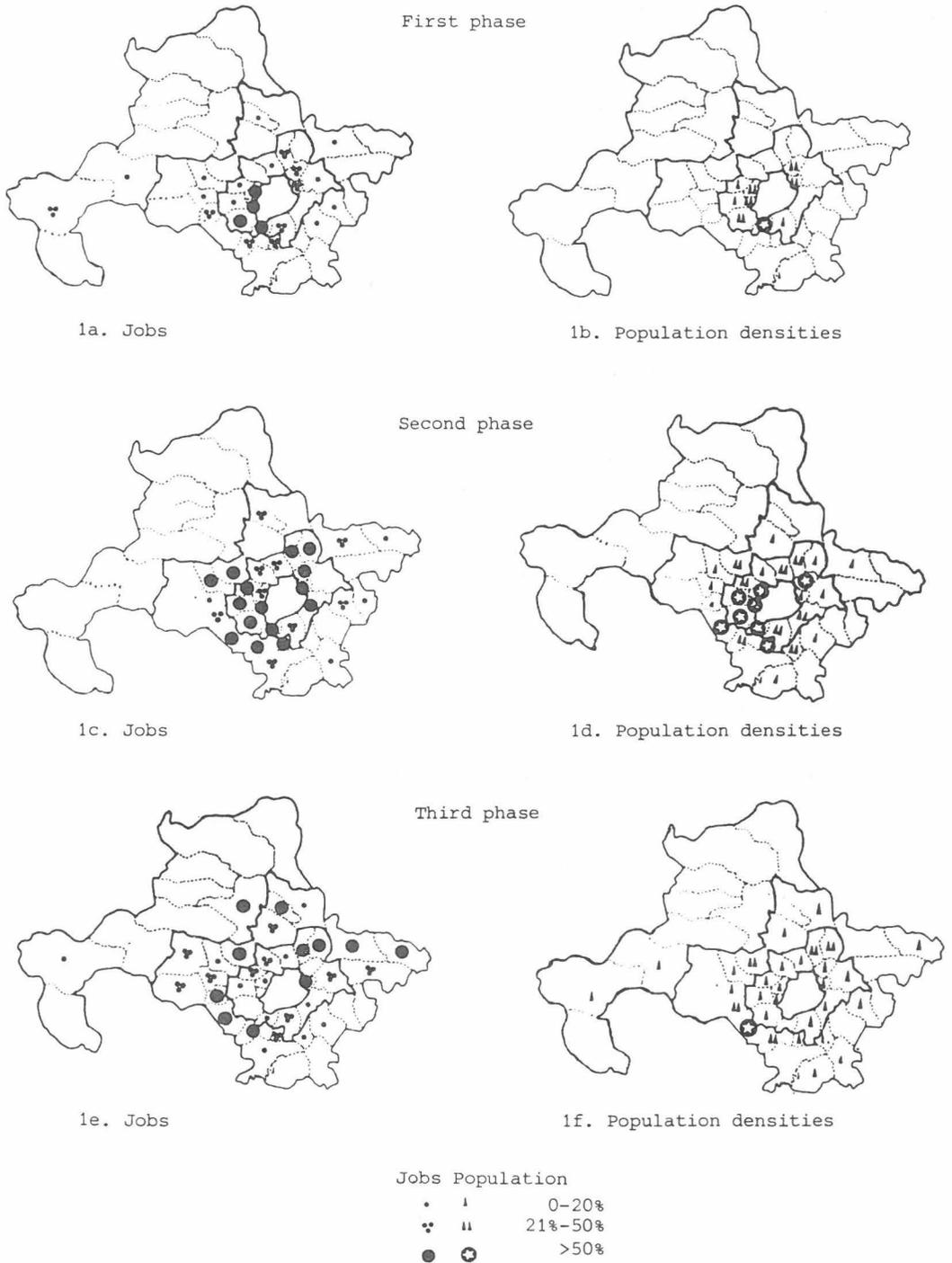


Fig. 1. Percentage increase of jobs (percentage values) and population densities (weighted values) in the study area during the three phases of development, illustrating the speed of growth of these phenomena.

to the depopulation of these zones as well as to the building of second homes in certain of them).

Third phase: a closed system (1971–1980)

In this phase the socio-economic development slowed down while spatial expansion continued. Immigration ceased and the birthrate began to fall. This development affected the zones in the second rings more than previously. The economic growth occurred prevalently in the service sector. However, the service expansion did not benefit as much as might be expected from the scale of industrial growth, due to the negative effects of the too fast and chaotic development of the past decades (in the city, service jobs increased by about 57 000 of which 50 000 were in the high-level services). (See Fig. 1 *e* and *f*.)

The principal problems originating from these negative effects are:

(i) disequilibrium of social services in the city and certain peripheral areas—both in terms of the kind of services provided and their spatial distribution;

(ii) shortage of housing—mostly in the first ring— (represented by a gap between demand and supply, which was aggravated by new regulations in the rental sector) along with a deterioration in the condition of existing housing (physical and functional obsolescence);

(iii) traffic congestion—arising from the inefficiency of the radial system of communication—and a reduced accessibility from the outer areas to the services located in the city;

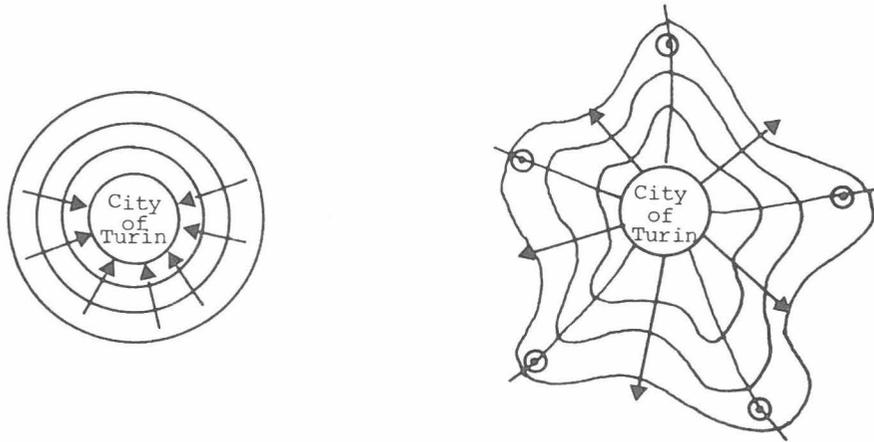
(iv) a disorganised pattern of land-use in the areas affected by the “oil-spot” pattern of urban sprawl.

FUTURE SPATIAL PATTERNS FOR THE TURIN URBAN SYSTEM

The next step of the analysis is to put forward hypotheses about the possible future socio-economic and spatial structures of the Turin urban system. This exercise requires an approach which provides the key elements for an interpretation of the processes being studied and permits reasonable forecasts of their future evolution. For this purpose a large scale simulation model of the Turin urban system has been built. The model which consists of several interlinked submodels (for industry, services, population, housing, transport and residential location) determines the spatial distribution of activities for each time interval, given exogenous rates of change of activities and policies, by varying the attraction of the zones. There are an activity component taking account of the socio-economic relationships and a spatial component describing the effects of space in the system (capacity constraint of zones and spatial interaction relationships) from the basis of the theoretical structure of the model. The dynamic aspect of the model is formalized using Forrester's simulation technique.

The simulation model will be used to provide answers about to what extent the current process of spread is determined by:

(i) the present socio-economic changes (contraction of industrial jobs, increase of service jobs and a fall in the population) which once reversed might cause,



2a. Monocentric shape

2b. Polycentric shape

Fig. 2. Possible future shapes of the Turin urban system.

once again, a process of urban concentration (open system, with a monocentric shape, cf. Fig. 2a);

(ii) a spontaneous natural process of development linked to the growing importance of certain peripheral towns. Thus, even if the socio-economic changes settled down the process of spread would continue (closed system, with a polycentric shape, cf. Fig. 2b).

REFERENCES

- Bertuglia, C.S., S. Occelli, G.A. Rabino, C. Salomone and R. Tadei (1983) "The spatial dynamics of the Turin Metropolitan Area: an analysis of the last three decades". Turin: Istituto di Ricerche Economico Sociali, Working Paper No. 27; Entry Ticket paper to the IIASA Research Project, "Nested dynamics of metropolitan processes and policies", in Laxenburg, Austria, April 22-23.
- Papageorgiou, Y.Y. (1983) "Theoretical aspects of urban economics with emphasis on the relationship between transportation and spatial structure", in Bertuglia, C.S., G. Leonardi, S. Occelli, G.A. Rabino and R. Tadei (eds.), *Nuove teorie e metodi per l'analisi delle relazioni tra localizzazioni e trasporti*. Turin: Research Report, Contract CNR-IRES, No. 82.004.50.93.

Dynamics of Metropolitan Processes and Policies in the Warsaw Agglomeration

PIOTR KORCELLI and GRZEGORZ WĘCŁAWOWICZ

*Institute of Geography and Spatial Organization, Polish Academy of Sciences,
00-927 Warsaw, Krakowskie Przedmieście 30, Poland*

HISTORICAL AND REGIONAL SETTING

Warsaw's history goes back at least to the 13th century, but as a center of regional importance the town emerged only some hundred years later. During the 16th century Warsaw became a place of elections, and, subsequently, the seat of the royal court which was moved from the peripherally located Cracow in 1596. Around 1750 the population of Warsaw passed the 100 000 mark, but its further growth was interrupted at the end of the 18th century when Poland became partitioned between the three powers of Austria, Prussia and Russia.

In the second half of the 19th century the demographic revolution coupled with the emancipation of peasants (1864) and industrial development led to a rapid increase of immigration to Warsaw. The large population growth caused considerable congestion since spatial development of Warsaw was restricted by the 19th century fortification lines. Those barriers were eliminated shortly before the First World War. Subsequently, when Poland regained independence in 1918, the vigorous population growth of the capital was being accompanied by its rapid territorial expansion. In early 1920s Warsaw reached one million inhabitants and its urban agglomeration was beginning to take shape.

Development of the suburban and satellite communities was facilitated by a relatively dense railway and road network. The first railway line (Warsaw–Vienna) connected the city with the Upper Silesian coalfields as early as 1848 and the first bridge across Vistula was completed in 1863. Three other railway lines were built between 1862–1877.

The Second World War brought an almost total destruction to the city and the annihilation of its population. More than half of the inhabitants perished and 72 per cent of the housing stock and 90 per cent of industrial buildings were destroyed. The population of the city was reduced to 162 000 by 1945 (Fig. 1).

Although the boundaries of Warsaw voivodship fall short of encompassing some areas of intense commuting to the central city, they represent a reasonable approximation of the spatial extent of the Warsaw urban agglomeration. Within this area reference is made to three concentric zones: the core (inner city), the inner ring, and the outer ring. The latter zone is aggregated into eight sectors, each characterized by a specific development pattern. This division is presented in Fig. 2.

POPULATION CHANGE AND HOUSING POLICIES

Typically for a large city, Warsaw displays levels of birth rates considerably lower than the national average. Although the natural increase has been consist-

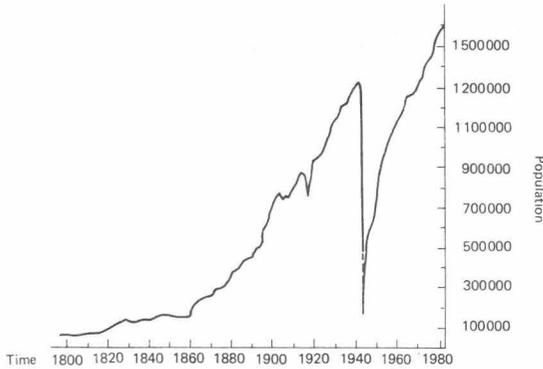


Fig. 1. Population change in Warsaw, 1800–1982.

ently positive since 1945, it is only one-third of Poland's total. In the case of the outer ring of the Warsaw agglomeration, however, the corresponding ratio is as high as 4:5.

The population growth of the city depends mainly on immigration, whose contribution amounts to 60–80 per cent of the total change. The joint trajectory of the two components shows a drop of immigration since 1977, and a parallel decline of both immigration and the natural increase after 1979. For the region as a whole the pattern of change has basically been similar to the one for the central city. A slow, but consistent decrease of the natural growth rate increasingly diverges from the corresponding national rate which has basically remained stable since the mid-1970s.

When looking at net migration rates for Warsaw versus the rest of the region one discerns a sharp contrast between the two areas. Except for one year (1975)



Fig. 2. Zones and sectors used to analyse population change.

Table 1. *Population trends in the Warsaw agglomeration 1950–1980*

Spatial unit	Population size		Population change in percent		
	1950	1980	1950–60	1960–70	1970–80
Agglomeration	1 264 600	2 319 200	36.5	15.7	16.1
City of Warsaw	832 800	1 596 100	39.2	16.1	18.6
Core	148 600	178 400	35.9	0.8	–12.4
Inner ring	683 800	1 417 700	40.0	19.3	24.2
Outer ring	432 200	723 100	31.2	15.1	10.8
Inner ring sectors					
West	376 000	958 800	57.6	29.2	25.3
East	307 800	458 900	17.4	4.1	21.9
Outer ring sectors					
Kampinos	42 900	58 300	23.1	11.9	–1.4
7 remaining sectors	389 300	664 800	32.3	15.2	12.1

Source: Rocznik Demograficzny GUS (Demographic Yearbook, GUS), Warsaw.

the outer ring has had small migration gains, and in 1980 and 1981 it turned into a net loser. The city of Warsaw is a clear-cut gainer in the migration exchange with its surrounding territory, in this case—the rest of the capital voivodship. The outer ring receives approximately three times as many immigrants per 1000 population as the city of Warsaw does. However, the ring's outmigration rate is about ten times the city rate. For every ten immigrants Warsaw loses only two or three outmigrants, the phenomenon which is partly explained by administrative control over immigration which, in turn, has a side effect of discouraging outmigration.

This interaction of migration and natural increase patterns results in relatively small variations of the rate of total population change within the region. As Table 1 demonstrates, only the agglomeration core (zone 1) and the northwestern sector of Kampinos recently experience an absolute population contraction. The rates of change evolve in such a way that the highest increases move over time from the more to the less intensely developed sectors in the agglomeration's outer ring.

The main task of housing policy in Warsaw during the early post-war period was to safeguard the remaining stock of dwellings and to provide for their equitable utilization. From 1947 on state-owned housing-building enterprises were formed, and uniform (in terms of space and equipment) allocation standards introduced. During the early 1950s housing construction became basically a state monopoly. After 1957, however, housing cooperatives were revitalized and since then have gradually assumed the principal role in the development of new housing, as in the maintenance of the existing stock.

The volume of housing construction in Warsaw fluctuated along with more general socioeconomic trends and policies. A low level in residential construction was reached in the late 1960s; the long-term housing development program which started in 1970 resulted in a considerable improvement of the residential standards in Warsaw (the number of inhabitants per room decreased from 1.58 to 1.02

between 1960 and 1980) before it broke down in 1979–1980. Subsequently, disparities between the rate of household formation and the number of new dwelling units per 1000 inhabitants have started to increase.

The dominance of the criteria of technological rationality has resulted in a large spatial scale of new housing estates (the district of Ursynow-Natolin is ultimately to have some 140 000 inhabitants) and a considerable uniformity of the building style. In spite of this, processes of spatial selectivity (choice) based on occupational and professional status, the education and income, have been noticeable. Socio-ecological variations within the city and the urban agglomeration as a whole produce mosaic-like patterns with locational and environmental quality of individual subareas appearing as principal explanatory variables.

EMPLOYMENT, TRANSPORTATION, COMMUTING

From the early 1950s on, the economy of Warsaw has been dominated by manufacturing industries. Investments in manufacturing were expanding faster than the capital outlays for infrastructure, including housing and services. The industrial labor demand exceeded the local supply and led to a large-scale commuting from the agglomeration ring to the city of Warsaw. Urban planning theory of the 1960s emphasized a positive interdependence between city size and development costs. These concepts provided a rationale for the so-called deglomeration policies that were carried on in Warsaw, and five other large cities of Poland, in the late 1960s. Such policies involved mainly administrative control over employment expansion in individual enterprises. As a result, the share of the capital in the total national employment declined from 8.5 to 7.3 per cent from 1964 to 1970.

After 1970 the industrial expansion resumed a high level and was accompanied by a massive housing development program. However, both of these processes lost their momentum by 1978–1979. The most notable employment change between 1975 and 1980 is a drop in the share of the construction sector, accompanied by a smaller decrease of the percentage of labor force in manufacturing industries.

Employment proportions within the region give evidence to the dominance of the city of Warsaw in trade and other service activities. They also show an industrial specialization of a number of smaller urban units situated in the agglomeration ring. These satellite towns are in fact clearly polarized into categories of industrial and residential communities. Since the service sector development in the outer ring lagged behind the growing number of inhabitants, the commuting to Warsaw from the rest of the region is typically accompanied by daily shopping trips, and a large proportion of trips are of dual purpose.

The initial shape of the Warsaw agglomeration was to a large extent determined by the radial railway patterns with the Vistula river acting as a barrier to movement in the east-west direction. The more recent pattern of roads, while also following the radial principle, tends to fill-out the interstices between individual sectors served by suburban railways. Unlike the railway lines, however, the

regional bus network converges in a number of local nodes situated in the outer ring of the Warsaw agglomeration.

On the regional scale, the railways have maintained the role of the main transportation mode and carry annually some 120 million passengers compared to 60 million that travel by bus. These figures point to the magnitude of daily movement within the Warsaw agglomeration; they do not include passengers of Warsaw's public transit, some sections of which also extend beyond the administrative boundaries of the city.

POLICY, PLANNING AND RESEARCH ISSUES

During the coming decades the region of Warsaw faces a continuous although rather moderate population increase. Immigration is likely to slow down, its magnitude being regulated principally by economic forces rather than administrative measures. Among former factors the shortage and high cost of housing space in Warsaw come to the fore. Although demand for labor may continue to exceed its local supply, the bulk of job vacancies will probably be in the service occupations rather than in industry which faces restructuring and increasing emphasis on labor efficiency. As heretofore, the service sector jobs will tend to be occupied predominantly by commuters rather than by the resident labor force. The anticipated decrease of immigration will be compensated for by the natural increase during the 1980s. At the national level, the low point in birth rate was passed in the mid-1970s and since then the excess of births over deaths has been growing. Trends for Warsaw may follow the national pattern of natural increase; the subsequent decline in birth rates is projected to occur in the late 1980s.

In many respects, housing policies hold the key to the evolution of Warsaw agglomeration during the 1980s and beyond. The number of dwelling units built, the predominant type of residential buildings and the location of new housing areas each represents an important variable of its own. For the purpose of the present discussion however it is their interdependence that really matters. Taking into account the inertia factor and structural characteristics of the building materials industry, one could predict a resumption, after the current period, of the previous development style, i.e. large, medium to high-rise residential estates on the ring of, and contiguous to, the present built-up area of the city. On the other hand, the anticipated deconcentration of the housing construction financing system, as well as of land development rights, should result in an increasing share of small-scale and individual housing projects. The difficulties and cost of extending centralized utility systems also point in the latter direction. The locational pattern would in that case certainly be different from the one prevailing during the 1970s. Such development projects would have to rely primarily on the local infrastructure and would be more sensitive to the cost of land. Hence, they would probably become attracted towards the outer ring of the Warsaw agglomeration.

The second cluster of policy issues focuses on the transportation sector. The dominance of public transit over the private automobile is so far undisputed and has actually been strengthened during the early 1980s. Throughout the 1970s, the bus has come to be the dominant transportation policy option, while the tram

network has been kept basically constant. The first subway line, now under construction, will go into operation within 6 to 8 years and only then will the role of buses start to shift from a cross-city to a feeder-line function. The subway will improve the access within the city, which is currently a basic issue. However, if housing development follows the deconcentrated pattern as suggested above, the new emerging issue is surely to be the regional transportation system.

The policy issues so far identified may easily be translated into a long list of research questions. Among the latter, two problems are of particular concern to the present authors. The first one relates to the evolution of place-of-residence to place-of-work linkages. However, the location of a new dwelling unit with respect to the place of employment has typically been considered, by the potential occupants, as a secondary factor compared to the unit's size, technical standard and, above all, current availability. Another question refers to perspectives of urban renewal. What is the "life expectancy" of the housing cohorts built in the consecutive decades characterized by different overall standards as well as construction technology? Although urban renewal seems a distant issue in a city with some 90 per cent of the housing stock built since World War II, its importance grows rapidly over time due to a massive scale which it will eventually involve.

Part II

The Housing System and Housing Market Regulations

In all metropolitan regions the mechanisms that bring about the allocation of households to dwellings, the construction of new dwellings, and the renovation and demolition of old dwellings deviate from what might be called free market mechanisms. A basic reason for this is that the housing sector dynamics involve indivisibilities, extremely durable structures and land use allocation—factors which by necessity distort the operation of ideal market mechanisms. In some regions only minor parts of the exchange system are allowed to include market type of exchange. In most regions the supply of new houses is more or less influenced by controls exercised by authorities.

A proper identification of the above mechanisms is necessary for a reliable analysis of housing sector dynamics. In the paper by Anas et al. the housing market in Swedish metropolitan regions (Stockholm, Göteborg, Malmö) is examined and compared with more market-oriented regions like Chicago. Descriptions of the type provided in the paper has two major and related objectives. First, it is a basis for comparisons of cities; similar studies for the other regions in the IIASA study are on their way. Second, the analysis is also a basis for the construction of a realistic housing market model of the Stockholm region; a large part of this modelling work is already on its way. Similar theoretical work is also starting in some of the other regions, and this will provide a further platform for comparisons.

The case studies in Part II describe (i) the rapid post-war expansion of new housing and the recent urban renewal in the Oslo region, (ii) the complicated and extensive control system used in the region of Vienna, and (iii) the spatial relocation of households and dwellings in the contracting region of Leeds.

The Swedish Housing Market: Structure, Policy and Issues*

ALEX ANAS,¹ ULF JIRLOW,² JAN GUSTAFSSON,³
BJÖRN HÅRSMAN² and FOLKE SNICKARS⁴

¹Northwestern University, Evanston, Illinois, USA, ²Stockholm Regional Planning Office, Box 12557, S-10229 Stockholm, ³Stockholm Research and Statistical Office, Box 2242, S-103 16 Stockholm and ⁴Swedish Department of Industry S-10333 Stockholm, Sweden and University of Umeå S-901 87 Umeå, Sweden

INTRODUCTION

This paper is an examination of the Swedish housing sector institutions with particular emphasis on the public control measures on the demand and supply sides. Our observations are relevant to the metropolitan housing markets of Greater Stockholm, Greater Göteborg and Greater Malmö, although main points also apply to the non-metropolitan part of Sweden.

In the literature on the Swedish housing sector, a single comprehensive statement of how this sector is structured, how it operates and how it is controlled by various government policy instruments, does not exist.¹ It is hoped that the current paper provides the first comprehensive view that can be a starting point for future, more detailed investigations.

The Swedish housing sector is based on social values and attitudes quite different from those prevailing in purely free-market oriented societies such as the United States. It is therefore useful to many societies that the Swedish situation be evaluated from the vantage point of free market urban and housing economics. The free market perspective helps identify "distortions" which are induced by various government controls. From the Swedish perspective, these are not distortions, but policy interventions justified for the sake of distributive justice and entitlement. Rent controls and the institution of rationing new dwellings are among such policy interventions. Nevertheless, there are some important similarities (and differences) between the Swedish and American policies with regard to the deductibility of home owners' interest payments, the taxation of capital gains and the levying of a "property tax" proportional to assessed value.

We identify a number of policy issues which are of concern to Swedish economists and politicians. These are the interactions between government subsidies, housing sector performance and macro-economic policy, planning the expansion of the stock by region and municipality, and the rationing of new dwelling more efficiently.

Reforming the Swedish housing market is also discussed by considering how

* An earlier version of this article was presented at the *International Workshop on the Building Sector*, cosponsored by the Center for Energy and Environmental Studies, Boston, Massachusetts, USA, and Center for Regional Science Research, Umeå, Sweden, held at Boston, May 16-19, 1984.

the market and the institutions can be reorganized in major ways. While such reorganization may appear very appropriate from the free market viewpoint, it may be only partly desirable from the Swedish viewpoint.

The paper also discusses the need for a mathematical, empirically workable and policy-oriented dynamic model of the Swedish housing market. The policy perspectives developed in the paper are candidates for empirical testing with such a model.²

Intentionally, the paper is kept free of tables and figures even though much quantitative data has been examined in preparation. We wish the reader to gain an accurate conceptual framework for thinking about the qualitative structure of the Swedish housing market and do not wish an extravaganza of numbers to cloud this objective.³

STRUCTURE OF THE SWEDISH HOUSING SECTOR

Sweden is the fourth largest country in Europe in land area. Only 10 per cent of its land is cultivated and 50 per cent is forest. The population is 8.3 million and the density only 20 inhabitants per square kilometer. The populations of the three largest metropolitan areas are: Stockholm (1.39 million), Göteborg (0.69 million) and Malmö (0.45 million), amounting to 16.7 per cent, 8.4 per cent and 5.5 per cent of the national population, respectively (Sweden, 1983).

The low population density and the abundance of timber resources may suggest that large Swedish cities would be sprawled and primarily consist of spacious wooden single family homes. A number of factors have contributed to the opposite; thus, Swedish metropolitan areas have a large share of compactly built large multifamily buildings and complexes. The important factors in this regard are the need to conserve energy in heating and transportation, strong government control over building activity since World War II and a national goal of making social services easily accessible to most inhabitants.

The State, the counties and the municipalities⁴

Sweden's national or central government (hereafter, the State) consists of twelve ministries, one of which is the Ministry of Housing and Physical Planning, which is responsible for physical planning, housing provision and building. The country is divided into 24 counties which constitute a regional form of government. The County Administrative Boards coordinate State planning within the county and act in a supervisory capacity, hearing appeals and ratifying plans adopted by the municipalities. County Housing Boards come under the National Housing Board and administer State loans and grants for housing provision.

The country is divided into about 280 municipalities. Since 1945, there has been a gradual reduction in the number of municipalities by consolidating them and thus improving efficiency in public service provision. In the county of Stockholm, for example, the number of municipalities has been reduced from 109 in 1945 to 25 in 1980. Greater Stockholm now consists of 22 of these, excluding three peripheral municipalities. The largest municipality in Greater Stockholm is Stockholm city which comprises the core of the region. For a study of the

interactions of State and municipal politics in the Stockholm region, see Anton (1975).

There is a division of responsibility between the State and the municipal governments. The State sets out the financial extent of new housing construction and rehabilitation, provides aid in the form of housing allowances and loans, interest subsidies for new construction and rehabilitation, enacts legislation and formulates taxation policy in relation to housing goals. The municipalities are responsible for physical planning and land policy, assessment of local housing needs, granting housing allowances with partial state funding, and receiving and forwarding to the central government application for loans and grants.

Key legislation which regulates the planning process and building activity consist of a number of acts. The Building Act contains regulations on the supervision of the planning process and of development procedures. The Building Ordinance regulates building permission and design standards. The Swedish Building Code regulates the detailed design and construction of buildings. The Pre-Emption Act enables the municipality to take over the buyer's place, acquiring real estate changing hands in an ongoing transaction by paying to the seller the price agreed upon between buyer and seller. The purpose of this law is to enable land acquisition in advance of urban development. The Expropriation Act makes it possible for the municipality to acquire land which is required for development. The Nature Conservancy Act regulates adverse effects from water and air pollution and noise.

Drawing its powers from these legislative acts, Swedish municipal governments have strong control over land use and the housing stock. Municipalities own or can acquire substantial lands within their domain. Thus they are the chief supplier of land to developers and can designate the type and extent of development in binding master plans. Another means of control is that municipalities own the non-profit housing companies which build and manage a large part of a municipality's rental housing stock.

Land use and the ownership, supply and pricing of land

The municipality's master plan is the ultimate means which determines land use. A master plan normally specifies the type of land use and amount of floor space to be built in each area. Private landowners must request a plan for developing their land in a desired manner. If the municipality denies them such a plan the private landowners do not generally have the right to go to court. Municipalities can refuse development requests for various reasons, including, for example, high costs of supplying the land with public infrastructure, utilities and public services.

Swedish municipalities have been buying, selling and leasing land for many decades. As a result they now generally own most of the land to be used for urban development within their jurisdictions. They are in a strong monopoly situation with respect to housing developments since these are heavily subsidized by the State subject to a "land condition rule" which states that a builder cannot in general get a subsidized loan unless the land on which he builds is acquired from the municipality. The most important exception from this rule concerns construc-

tion of detached single family houses. Commercial and industrial development in Sweden is not subsidized and builders must obtain a loan at the market interest rate. Builders of such developments are free to build on nonmunicipal land but must, of course, abide by municipal approval based on the master plan.

When selling land to developers, municipalities charge the cost of acquiring comparable land at the current time plus the costs of any land improvements and administration. In the case of housing developers, the principle that the municipality should make no profit guides the transaction. In the case of nonresidential developers, there is no law against attempting to extract the highest price the buyer is willing to pay. If the municipalities do not sell the land at very low prices, i.e. to increase the employment possibilities for municipal residents, they try not to exceed a conservatively estimated price. One reason for this is, of course, that any sale price paid to the municipality can be used by private landowners selling to the municipality in the future, or by others whose land is being expropriated by the municipality, to argue that they are entitled to the same price or compensation.

Expropriation with adequate compensation is a power of the municipalities, but they choose to exercise it with caution since it can be challenged in court with the municipality being liable for the legal cost of the property owner at the preappellate level.

Often, municipalities choose to maintain land ownership by leasing land to be developed according to plan. This arrangement is known as a lease-hold system. The Stockholm municipality, for example, operates a large lease-hold system. Lease values can be changed at fixed time intervals which over the years have been gradually reduced from sixty to ten years. This enables the municipality to extract from the lessee the current value of the land, although lease holders can have legal recourse.

The primary effect of these Swedish land ownership institutions is that land speculation is severely discouraged and successfully curtailed. Developers can obtain land at low prices when buying from the municipality for purposes of subsidized developments such as housing. A segmented land market exists since commercial-industrial developments are free to occur on private land and at unrestricted prices as long as they are consistent with the municipal land use plan. Municipalities rarely change their land use plans. This is in sharp contrast with American zoning specification which are frequently changed in times of development pressure. Since Swedish land use plans are so stable, it is rarely possible for private landowners to profit from anticipating changes in these plans; and, conversely, it is equally rare that municipalities have to compensate landowners who stand to lose from changes in the land use plan.

Since landownership is so highly centralized, the land "market" is not a competitive one. Municipalities can force housing developments to occur in places where competitive market land prices would be too low to allow development. This type of pattern has appeared in some suburbs of Stockholm. A consequence of this is that turnover and vacancy rates in such places are observed to be unusually high.

The type, quality and ownership of the housing stock

First of all it must be emphasized that houses in Sweden are built by private firms. The main exception is BPA, a construction firm owned by the trade unions. However, the orderers of new construction as regards multifamily housing are, in most cases, non-profit companies owned by the municipalities or cooperatives.

The housing stock in Sweden can be grouped into three categories:

(a) *Single family housing.* These dwellings are generally owner-occupied by families and they are mostly constructed by private builders, to be bought and occupied by families. A striking aspect of these dwellings is that a large part of them is often planned into subdivisions in which they are spaced closely. There are precise building standards which apply to design and construction and careful attention is paid to their proximity and relation to public facilities, shopping, open space and public utilities.

A substantial part of the single family stock is of older vintage and does not necessarily conform to current building standards.

(b) *Cooperative multifamily buildings.* These dwellings are individual flats in multifamily buildings and they are tenant owned. Owners have the same right as single family dwelling owners in purchasing and selling these units, except that they are subject to some control by the cooperative association in the areas of repair and renovation. Also, the maintenance of common facilities in these buildings is financed by means of an assessment levied on the tenants by the association. The Swedish cooperative market is to some extent dominated by large cooperative associations. The largest are HSB and Svenska Riksbyggen which are nationwide associations with branch associations in counties, municipalities and individual buildings.

(c) *Rental multifamily buildings.* A large part of the stock in Sweden consists of rental flats in multifamily buildings. Approximately half of these buildings are owned and managed by private landlords. However, since World War II, the bulk of multifamily buildings have been ordered by non-profit housing companies. These companies generally retain ownership and management of the buildings. Each municipality owns at least one non-profit company. The Stockholm municipality owns a number of such companies, the largest being AB Svenska Bostäder which has a holding of over 50 000 flats.

Tenants who obtain a flat hold an irrevocable lease and have the right to remain in flat indefinitely as long as they conform to the conditions of their lease and continue to make rental payments.

It is sometimes the case, and increasingly so in recent years, that some privately owned rental buildings are converted to the cooperative mode and turned over to a cooperative association for management. This is usually possible if the owner wish to sell and a majority of the tenants in a rental building vote in favor of conversion.

Swedish multifamily buildings are generally compactly built and contain small flats. There is visible differentiation in architectural features and in the number of stories by vintage. A great deal of this differentiation can be explained by changes in the building code and changes in construction costs over time. Building

complexes constructed since World War II are generally carefully situated near transit stations and contain within them shopping facilities, recreational grounds and schools.

At this point, it is useful to cite some aggregate statistics. In the year 1980, 44 per cent of Sweden's dwellings were single family and 56 per cent were multifamily. For Greater Stockholm, the corresponding percentages were 24 per cent and 76 per cent, for Greater Göteborg, 32 per cent and 68 per cent, and for Greater Malmö, 31 per cent and 69 per cent. While a nearly uniform 93 per cent of all single family dwellings around the nation was owned by private persons, the ownership of the multifamily stock exhibits more diversity among the three metropolitan areas. Non-profit companies (controlled by the municipalities) owned 35 per cent, 42 per cent and 18 per cent of the multifamily stock in Greater Stockholm, Göteborg and Malmö respectively with cooperative associations owning 25 per cent, 23 per cent and 40 per cent of the multifamily stock in the respective metropolitan areas, and private persons and companies owning 39 per cent, 32 per cent and 39 per cent respectively (Statistics Sweden, 1983). These figures show that despite the great growth of cooperatives and nonprofit rental dwellings after World War II, large parts of the total multifamily rental stock and predominant portions of the older stock continue to be owned by private landlords. The figures also show that there are significant differences among the metropolitan areas which are not entirely explained by the size of these areas. The large proportion of cooperatives in Malmö is one such difference.

Finance of new construction and modernization⁵

As a rule, the Swedish State subsidizes nearly all new construction in the housing sector. In contrast, other construction such as commercial and industrial is not subsidized. The subsidies take the form of State mortgage loans and guaranteed interest rates on first mortgage loans. The interest rates for both kind of loans are much below the market rate.

Developers are free to build with market loans but the State subsidy is so large that any such construction is unprofitable. To qualify for a State subsidy a private builder or non-profit company must fulfill the following requirements: (a) it must build on municipally owned land and according to the master plan, (b) it must conform to the building code and (c) it must apply for approval by the municipality demonstrating that its estimated construction cost will not be much in excess of the "approved construction cost" for that locality.

To fulfill the last requirement the builder files an application which shows the calculation of the "approved construction cost" for the proposed building by using unit prices published frequently by the government. In addition to this, the builder also estimates the actual construction expense that will be incurred, this number being generally higher than the approved cost. If the difference is deemed too high, a State loan cannot be obtained.

The subsidized loan structure is as follows: For rental dwellings built by non-profit companies: 100 per cent of the "approved construction cost" receives a subsidized loan. For cooperatives and single family dwellings and privately owned rental houses the corresponding percentages are 99 per cent, 95 per cent

and 92 per cent respectively. The unsubsidized portion and any excess over the approved construction cost must be covered by a market loan.

A mortgage loan equal to 70 per cent of the approved construction cost is obtained from a bank, the State subsidizing this bank for the difference between market and loan interest rates. Recently, the market rate on these bank loans has been 12 per cent and it is adjusted at five-year intervals. The subsidized loan interest rate for multifamily construction is 3 per cent in the first year and rises indefinitely by an increment of 0.25 per cent a year. For single family homes the loan interest rate is 5.5 per cent in the first year and rises at 0.5 per cent yearly until it catches the market interest rate.

The remaining 30 per cent, 29 per cent, 25 per cent or 22 per cent of the approved construction cost (for non-profit rental, cooperative, single family dwellings and privately owned rental, respectively), comes directly from the State. The subsidized interest rates and annual increments for this portion of the loans are the same as for the bank loans. A peculiar aspect of this subsidization scheme is the method of amortization for these loans. The government has stated the goal (or expectation) that the State portion of the loan be paid off in 30 years. However, for multifamily houses this may or may not come about. The reason is that the payments on the State loan which gradually increase are not applied toward capital amortization until the interest rate catches the annually adjusted normal rate. Thereafter, any difference between the interest rate on the loan and the normal rate is applied toward amortization. If the normal rate goes over the subsidized rate, then amortization ceases. The peculiarity is that, conceivably, the subsidized rate may never exceed the normal rate and thus amortization may never begin. For single family houses the amortization of the State loan starts immediately after the house is constructed and goes on for 30 years.

The bank portion of the loan for multifamily houses is subject to more rigid rules of amortization. It is guaranteed to be amortized in 50 years with principal payments graduated in ten-year intervals. The equivalent time for single family houses is 40 years.

The State and subsidized bank loans are in principle assumable by all future owners. However, the first buyer of a single family home normally relieves the builder from the market loan and pays the difference between the price and first mortgage plus state loan as a down payment. The same procedure applies to cooperative associations. In a next step the down payment is distributed among the members, i.e. the households living in the building.

In recent years, new construction activity in Sweden has diminished substantially, becoming replaced, in large measure, by reconstruction and modernization activity. Modernization refers to major upgrading of a building, addition of facilities and repairs and, frequently merging flats within the building to create a smaller number of larger flats. The State subsidizes modernization by loans to be repaid within a maximum of 30 years. These are also subject to approval by the municipalities and excesses over approved cost must be covered by market loans.

Starting in 1984 the State also subsidizes loans for repairs and maintenance in multifamily houses. The loans are given by certain banks and the subsidy has the

form of an interest guarantee. The subsidy is available for non-profit companies, cooperatives and private owners of multifamily rentals. The subsidy system is quite different from the general interest subsidy system and it is effective for 10 or 20 years due to the different measures for improvement in the building.

Pricing, rent control, rent pooling and rent negotiations⁶

In Sweden, the pricing of the housing stock follows the principle that municipality owned companies should not make a profit or, in the case of private landlords, not more than a small margin of profit.

For single family (owner-occupied) dwellings, this principle is enforced by regulated pricing. A builder sells these dwellings at the approved price which is set at the time of the subsidized loan application. These prices are set to cover precisely the builder's estimated construction cost, assuming these estimates are not high enough to result in rejection of the application. When a builder sells at this price, the buyer, usually a household, makes a down payment equal to the unsubsidized portion of the builder's loan and assumes the subsidized State and bank loans. If such a buyer (the first-owner) wishes to resell the dwelling within three years, he cannot sell at any price, if the state loan is to be kept. Thereafter, prices are entirely free and subject to the forces of supply and demand. As regards cooperative dwellings the tenant can sell anytime at any price.

Rent control is a very important feature of the Swedish housing market and has been the focal point of study, debate and reform (Kemeny, 1981; Turner, 1982). The principle is again to set rents throughout the lifetime of a dwelling in such a way as to cover the construction, maintenance and operating cost of the dwelling so that the owner, a non-profit company or private owner, makes no profit.

We now turn to an examination of the non-profit company, which is essential to understanding the concept of rent pooling. A non-profit company contracts a building firm to construct rental housing and thereafter owns and manages the rental units. The principle of no profit applies at the company level. Annually, each company totals the costs of its entire stock. These costs include that year's loan payments plus an estimate of maintenance, operation and any new construction cost. Also included are any funds needed to replenish the company's reserves. Dividing this total cost estimate by the number of rental dwellings in the company gives the average rent per dwelling in the company. This average rent is then adjusted for various dwellings in the company according to size, age, standard and other factors. This process of rent pooling and adjustment is resolved in annual negotiations between representatives of each non-profit company and representatives of the tenants of that company, who are members of the national tenants' association, and regional or municipal representatives of the tenants' association. During these negotiations, the tenants' association examines the company's bookkeeping and requires to see income from interest and other investments of the non-profit companies.

Tenants are often opposed to pooling and new construction by the company, because in times of rising construction costs, pooling increases the rents of existing tenants. The companies' efforts to adjust rents by size and standard do not resemble a market adjustment. In 1972, a national committee composed by

representatives of the non-profit companies association (SABO) and the tenants' association recommended the use of a point system which assigns points to buildings by their age and then makes adjustments for location, social services, commercial services, etc. This point system is not used in any formal way nor does it seem to have any scientific or statistically valid rationale. In any event, such a point system would only work in bringing relative rents within a company more in line with a free market rent structure, but cannot correct the discrepancy in rents among companies.⁷

Clearly, different non-profit companies must charge very different average rents if they have significantly different construction profiles over time, namely different vintage mixes. For example, new companies which were set up in the 1960s to build in the new suburbs of Stockholm would charge rents much higher for flats identical to those held by older companies which built in Stockholm during the 1940s and 1950s. A reflection of this rent pooling scheme is that the rent for the same type of flat increases with distance from the city center, contrary to what would be normally observed in a free market.

Another effect of rent pooling is observed in Stockholm where the municipal companies of the city of Stockholm have, in the past, built housing on land bought or leased from suburban municipalities. The costs of these relatively new outlying buildings are pooled with the older and centrally located buildings owned by the same company. Thus, tenants in these buildings can end up paying rents which are much lower than the rents paid by tenants in the stock built by the suburban company.

Another issue which features prominently in the negotiations is the cost of vacancies in the stock of a company, particularly any newly built stock. A position formulated by SABO is that the municipalities should subsidize the cost of vacancies in excess of 1.5 per cent of the potential total rent income. This is negotiated with each municipality and most have agreed to follow this practice.

Negotiations are held once a year to set the rents of the following year. The tenants' association negotiates separately with each company and also with the local association of private landlords. If a specific set of negotiations with a non-profit company is deadlocked, the case is appealed to the "national committee on the rental market", which consists of officials elected from SABO and members of the tenants' association. This committee then decides on a compromise rent level for the coming year. The associations of private landlords cannot appeal to this committee, but instead can seek recourse in the courts.

It appears that there is substantial variance in the negotiating powers of different non-profit companies and their respective tenants. Even though non-profit, a few companies have accumulated reserves, while most of them have survived on much tighter budgets.

The public queue: The case of Greater Stockholm⁸

Throughout Sweden there is a policy, followed with various degrees of consistency, to ration new dwellings in municipal queues. In this paper we will focus on how this is done in Greater Stockholm where the 22 municipal housing agencies have been consolidated into the Stockholm Federation of Municipal Housing

Agencies (KSB), thus creating a single public queue at the metropolitan level, into which all dwellings available for rationing are pooled.

There is a complicated set of rules that govern how KSB rations dwellings. By law, all dwellings built since 1968 with government loans (this includes rental, cooperative and single family homes) are available to be claimed by KSB every time they are ready for letting. However, KSB chooses to exercise this right differentially. KSB does not exercise the right to sell single family homes the first time, but will let them if they are rental single family homes. In the case of cooperatives, there are special agreements between KSB and particular cooperative associations. The agreement with HSB is that this association should sell all of its new cooperative flats. Riksbyggen, on the other hand, gives all of its cooperative units to KSB for rationing. Agreements with other associations provide, for example, that they assign 50 per cent of their new cooperative units to specific banks which in turn ration these units to their customers who raise the down payment by participating in the banks' savings programs for cooperative tenant ownership.

In addition to all the newly built rental dwellings, KSB also handles around 50 per cent of the vacancies in the existing stock. The remaining half is available for rental directly from private landlords.

It is estimated that approximately 15 per cent of the total mobility in Greater Stockholm is handled through KSB. On the supply side of the queue there is a rule that KSB has approximately three months to fill a flat. If a flat is not filled in this period, it is returned to the landlord or non-profit company who generally prefer to do their own letting unless the flat in question is in a difficult-to-rent location.

To obtain a flat from KSB, a household fills out an application describing its current dwelling and its desired dwelling, and a maximum rent it is willing to pay for it. This application must be renewed annually if the household remains in the queue that long. A household receives a maximum of three rental offers and is ejected from the queue if it rejects those offers. In few cases it happens that a landlord or non-profit company will object to a tenant assigned by KSB. In such cases, KSB can go to court on behalf of the tenant, but this rarely happens.

Another rule is that if a current tenant is assigned to a dwelling by KSB, then that tenant's vacated dwelling must be turned over to KSB for reletting.

Out of the total number of flats that KSB handles, roughly around 20 per cent is allotted to households with severe medical or social problems and households which must be evacuated because their flats are being reconstructed.

For the remaining 80 per cent of the flats KSB uses a six priority classification of households according to assessed need. Priority one includes households dislocated because of various emergencies such as fire etc. and families in heavily overcrowded flats. Priority two consists of households with children, but living for instance with their parents or in substandard flats. Priority three covers households without a flat but with children that can stay elsewhere (as occurs after a divorce when children can stay with one parent). Priority four includes mainly households without children and with a substandard flat. Priority five covers households which want to swap their flats. Also in this priority are those

who have a cooperative and want to move to a rental unit. Finally, priority six consist of households which do not currently live in Greater Stockholm but need to move in.

The above assessments of need take precedence over the time an applicant has been waiting in the queue. However, when need is equal, then the time one has been waiting in the queue is a deciding factor. The time a household spends waiting in a queue can vary enormously depending on the location, type and price of the desired flat.

Swapping, black markets, mobility and household formation

Although the public queue is extremely important because it is the only means by which new rental dwellings are let and a very vital means of entering the market for some households, it amounts to only about 15 per cent of mobility in Greater Stockholm.

The predominant and legal means of relocation is the swapping of one dwelling for another without any side payments. Such swaps can occur between two tenants or an owner and a tenant and are generally believed to be responsible for perhaps 75 per cent of total household mobility. Swappers find each other through newspaper columns, through the services of realtors or through friends and acquaintances. Two households getting married will often swap their two units with the one unit of a household that is undergoing a divorce. There are generally no restrictions on the nature of the swaps that can be undertaken.

It appears that Swedish regulations are unclear about what constitutes legal pricing during a swap. For example, it is legal to swap one's cooperative unit with a tenant's apartment. If the apartment is attractive and well located, the owner of the cooperative may substantially lower the selling price. Does this constitute a fair transaction or a black market transaction?

Swapping differs from what might be called a direct black market transaction, which is clearly illegal. While it is not illegal to pay to get a rental contract it is illegal to receive payment. Financial penalties and jail sentences may be enforced. Black market transactions are believed to be significant but not very large.

It is obvious that these institutions of swapping, black markets and the public queue have a pronounced impact on household formation and mobility. New households with young members do not have a flat to swap nor the income to buy and are thus restricted to entering the public queue. Since this queue is not as efficient or fast as a free market can be, it is reasonable to conclude that it retards household formation, forcing these young households to remain longer with their parents or to join into other forms of co-tenancy.

Swapping and the black market also retard mobility because they involve processes of matching and search which are much more cumbersome and risky than those of a free market where vacancies can be rented directly from the landlords on a first-come, first-served basis at the going rent.

Housing allowances⁹

The Swedish State and municipalities jointly administer a system of housing allowances designed to improve the housing consumption of certain household groups. The percentage of rent to be covered by the housing allowance is determined on the basis of household income and wealth, the rent or price to be paid by the household, and number of children. There is also a special municipal allowance system for pensioners. Households are eligible for allowances regardless of dwelling type and tenure.

In 1981, total housing consumption expenditures amounted to 20 per cent of total private consumption, a percentage which has remained stable over the years. In the same year, about 9 per cent of total housing consumption expenditures were paid as rent allowances and another 12 per cent of housing expenditures was paid in interest subsidies. Thus 22 per cent of total housing expenditure was subsidized in allowances.

In summary, even though the purpose of rent control in Sweden is intended to keep down the average cost of housing, the State and municipalities recognize the need of many groups and contribute significantly in an effort to improve their housing consumption relative to the rest of the population. A large number of households receives such allowances, although the bulk of the payments are concentrated on pensioners and those underconsuming housing.

Housing and the income tax¹⁰

Sweden is a country with extremely high income taxation. Thus, income tax subsidies to homeowners, landlords and non-profit companies which own housing are of special significance. The State income tax is progressive for individuals. The municipal tax is not progressive and although it varies somewhat by municipality and is set annually, it is generally around 30 per cent of income and is divided roughly equally between the county and the municipality. The total income tax rate for the average industrial workers is about 40 per cent and the marginal income tax rate is about 65 per cent. For companies the income tax is around 52 per cent of net taxable income.

The treatment of housing within the Swedish income tax system relies on "assessed (or taxation) value". In Sweden, buildings are assessed every five years and the assessed value is defined as 75 per cent of the estimated fair market value.

Housing is an asset to which income is imputed. Non-profit companies and cooperative associations impute a flat 3 per cent of assessed value. Owners of single family homes must impute as income a percentage which increases with assessed value. At present, this percentage starts at 2 per cent and increases to 8 per cent. From the imputed income, the owner subtracts interest payments. If, in this calculation, the dwelling generates a loss, as is usually the case for owners of single family housing, the loss can be netted against other income.

Starting in 1983, there is a new rule which will go into full effect in 1985. This rule will limit the taxes saved from the ownership of single family housing, by the deduction of loss due to interest payments, to no more than 50 per cent of taxes. This rule applies in fact to all losses due to interest payments.

Independently of the imputed income calculations, all housing owners pay a "property tax" to the municipality. This tax is computed by adding 1.5 per cent of the assessed value to the income taxable by the municipality.

A second aspect concerns the treatment of capital gains and losses in the income tax system. In Sweden, income from the sale of an asset is ordinary taxable income, but housing is afforded special treatment as in the United States. In this case, the taxable capital gain is the "real capital gain", i.e. an adjustment is made for inflation. Starting in 1981, the State introduced a change in this method in order to discourage short-term speculation in home ownership. This change prohibits the use of the inflation factor for sales that occur within five years of the purchase of housing. Thus, unlike the U.S. tax system which taxes only nominal capital gains, the Swedish system taxes nominally only short-term capital gains. As in the U.S., capital gains for homeowners are postponable under certain rules. These are that the gain exceed a minimum amount, that the owner must have been the occupant for at least three out of the five years immediately preceding the sale, and that a more expensive house be bought within one year of the sale. A capital gain realized from a cooperative dwelling is fully taxable only if the dwelling was held less than two years. The percentage of the capital gain which is taxable falls to 25 per cent when the ownership period exceeds five years. Assessed values for cooperative buildings are prorated to specific units on the basis of their share in floor space. Interest is paid directly by the association and deducted in its income tax calculations, whereas capital gains and losses are taken by the individual tenant-owner.

An income tax feature which concerns owner-occupiers and renters alike is that housing allowances are tax-free.

The deductibility of interest payments has a substantial effect on the net housing expenditures of the owners of single family homes. In the year 1981, the total "foregone tax revenues" for owners of single family houses corresponded to 20 per cent of total housing consumption expenditures by all households in that year.

Since 1983 a special tax is levied on rental and cooperative houses built before 1975 with the exception of those built or reconstructed with the support of State loans after 1957. The tax for 1983 was 1 per cent of the assessed value and is raised to 1.5 per cent and 2 per cent for 1984 and 1985 respectively. The tax is somewhat inaccurately called the "rental-house-fee" and is motivated on parity grounds since the guaranteed interest rate for the subsidized housing is continuously raised by 0.25 per cent per year, compared to 0.5 per cent per year for single family housing.

According to a recent government proposition the rental-house-fee is to be replaced in 1985 by a new state property tax motivated by fiscal needs. For privately owned rental houses the tax rate is 2 per cent of the assessed value and the tax is deductible. For non-profit companies and cooperatives the rate is 1.4 per cent of the assessed value and the tax is non-deductible. For single family houses the tax rate for 1985 is 0.5 per cent of $\frac{1}{3}$ of the assessed value. For 1986 and 1987 the tax rate for these houses increases to 1 per cent and 1.4 per cent respectively. For single family houses the tax is not deductible.

The parliament passed legislation on this new property tax in December 1984.

The minister for housing simultaneously proposed an adjustment (decrease) of the guaranteed interest levels for subsidized housing in order to avoid the extra burden on these dwelling which will occur otherwise.

Starting in 1984 a new state tax is introduced in Sweden called the "profit-sharing tax". The revenues of this tax are funnelled into five wageearners' funds. As to the housing market the new tax is levied upon private house-owning companies (non-profit companies and cooperatives are excluded and so are also private persons). The tax amounts to 20 per cent of a calculated "profit" since the assets on liabilities have been adjusted for inflation according to a complicated formula. It is still unclear how high the profit-sharing tax will be as a percentage of profit in these companies calculated in a normal way.

Building contractors and the building materials industry¹²

Although the pricing of all new housing is subject to the stringent controls discussed above, the Swedish industry of building contractors is competitive and free of government controls. There are between 10 and 15 large building contractors which dominate the multifamily market, and a vast number of smaller contractors operating in the single family sector. In the multifamily market during the 1970s the firms either carried losses or made small profit margins. Larger profit margins could be made in the building of commercial and industrial developments which were not subject to rent control measures.

In contrast to the contractors, the industries for most building materials are highly monopolized. Rates of return on working capital in various building materials industries seem to be higher than the average for all of Swedish industry. For example, the ready-mix concrete industry (in which firms have great spatial monopoly power because of distance constraints in the shipping of this material) and the wall paper industry, which is highly monopolized, have shown recent returns on working capital of 20 per cent and higher.

A working hypothesis for the recent price inflation in building materials (which exceeds the general inflation) is the decline in new construction and the increase in modernization and reconstruction. This shift has greatly shrunk total building volume, forcing these industries to raise prices to cover fixed costs incurred in the past.

One disturbing aspect of the high degree of monopolistic market structure in the Swedish building materials industry is that price-setting in this industry can defeat the purpose of cost-covering rent control to keep rents low. Profits, which in a free market would accrue to landowners, could to a great extent pass on to the suppliers of building materials whose price setting behavior is unregulated.

SWEDISH POLICY ISSUES AND ALTERNATIVES FOR REFORM

In this section we first discuss some policy issues within the institutional status quo. These issues center on various means of fine tuning the performance of the

housing sector. Next we discuss, from the free market viewpoint, major alternatives for reforming the current institutional structure.

Swedish policy issues

One area of major policy concern in Sweden is the interaction between macro-economic policy and the housing sector. The State and municipalities induce major changes in supply and demand as a result of their assistance and control policies. The induced changes in turn influence municipal and State revenues and thus have a direct bearing on fiscal balance at the local and national levels. Furthermore, Swedish subsidy structures are not at steady state and changes are continually introduced. There is, as well, the more routine problem of annually adjusting housing allowances, and tax rates. A major problem, therefore, is the macro-economic impact of the government's own housing policy as well as the impact of such policy on the housing market and the housing stock and the building contractors and building materials industries. Can these interactions be controlled and predicted in such a way that changes in the current public assistance structure can be introduced consistently and with stability?

An area of particular importance is the volume of building activity that should take place, and the distribution of it by region and municipality. During the one million dwelling program, which came to an end in the mid-1970s, Sweden achieved its goal of 100 000 new dwellings per year, but overbuilding occurred in some regions. During this program, the State planned the distribution of the new stock among the municipalities for each budget year. Since then, targets are down to about 35 000 dwellings per year and the State is allowing municipalities to act with greater autonomy on the issue of how much to build. There are questions about the relative distribution of the planned stock between, say, Greater Stockholm and the rest of the nation, at a time when planners are predicting new growth in metropolitan areas after a period of stagnation.

Another issue is the rationing of new dwelling in a metropolitan area such as Stockholm. Even though only 10 per cent of the mobility is determined through this rationing process, the stock being rationed and the households accommodated (mostly new or dislocated households) are important parts of the market. What is the effect in terms of equity and efficiency, of the currently used priority system and how would this compare with alternative systems such as first-come, first-served?

The structure of government intervention is so complex in Sweden that it is difficult, if not impossible, to know what the combined effects of all the policies are. Is the government, on the whole, subsidizing ownership relative to tenancy, or vice versa? On the whole, are government policies stimulating the growth of cooperatives relative to other dwelling types? Are government subsidies increasing or reducing the gap in the disposable incomes of rich and poor household groups? The answers to these questions ought to be known, but Swedish government policies are so complex and their overlapping effects so difficult to disentangle that the answers are not known.

(A summary of policy-oriented research issues for the 1980s can be found in Swedish Council for Building Research, 1983; pages 71-74.)

Alternatives for reform

From the free market point of view, the Swedish institutions are extremely cumbersome and inefficient and thus in pressing need of reform. There is a scenario of total reform which should be discussed first. This scenario is rooted firmly in the basic principles of competitive general equilibrium theory. At the same time, it deals fully with the Swedish ideal of the communal and collective ownership of part of the housing stock as a resource or an intergenerational merit good.

Under this scenario, the non-profit companies and cooperative associations would be decentralized into small and independent firms competitive with each other. These firms would decide freely the quantity and type of housing they should supply and they would charge free market prices, selling or renting to the highest bidder. Institutions of public queueing and swapping would be eliminated with households renting and buying directly from the suppliers by paying the going price. The government's role will be in carefully monitoring the profit of each company and then levying taxes, whereby these profits would be collected and redistributed as a social dividend to the tenants and those who bought housing. Thus, the social objective of no-profit in housing development is achieved without restricting mobility and simultaneously with an efficient allocation of households to dwellings. Under this free-market scenario, households would live in their most preferred location and dwelling and the market would be induced to supply the quantity and type of dwellings according to demand. Of course, there is room within this scenario for a system of housing allowances and homeowner tax subsidies to assist special groups. There is also room for a policy to subsidize construction and modernization in order to protect the supply of housing from the fluctuation of interest rates and to enable a steady state expansion of the stock, regardless of cycles in the general economy.

If such reform were to be introduced overnight, there might be chaotic adjustments and great upheaval. It is possible, of course, to introduce it gradually and according to a predetermined and preannounced plan so that adjustments by market participants will be also gradual, anticipatory, and well planned. A major legitimate concern under this scenario are the great changes which may occur in the locations of various groups in an area such as Greater Stockholm. It is a certainty that the price of dwellings in central Stockholm would greatly increase, with those in the suburbs lowering in value. In the long run, there could be intense redevelopment in central Stockholm. Low income groups could drift out to the suburbs in the short run, reconcentrating back in the center in the longer run after the stock has had time to adjust to higher densities.

Within the doctrines of free market economics, all these changes will be for the good of all except for one perplexing question. What would be the mismatch between the location of various groups and the accessibility of specialized public services to them? What would be the public sector costs of reestablishing such accessibility? These questions require careful investigation since the supply and distribution of public services is the pride and most successful aspect of Swedish urban planning.

There are other scenarios of piecemeal (or partial) reform which may also be

seen as steps in a gradual fulfillment of the total reform scenario. The simplest of these may be to do away with the public queueing mechanism, allowing all suppliers of housing to directly let vacancies. Another step is to legalize all second hand (and currently black) transactions in the rental apartment market, thus reducing greatly the need to swap dwellings, and improving mobility for all by making it legal to directly rent any vacancy in this stock.

It is wise for Swedish politicians to show some interest in the benefits and costs of such piecemeal reform measures. It is not at all clear that the values of Swedish society are opposed to all such measures or that they would be badly compromised by them.

The cost of adjustment and transition (both social and private costs) need to be carefully evaluated and weighed against the benefits of greater private wellbeing and lower bureaucratic complexity. It is possible that Swedish institutions have deviated so drastically from a free market state that any major reform is too costly to undertake now. We feel, however, that this is unlikely and that Swedish society could greatly benefit from at least some major reform efforts.

It is not very likely that Sweden's politicians will follow the suggestion of deregulating the housing sector even though it may sometimes be tempting to do away with the existing patchwork and start afresh. One might say that for a housing system so highly influenced by rules, regulations, and institutions, uncommon to a free market, that situation is not really relevant as a point of reference.

In Sweden, the justification for the public regulation of the housing stock has been primarily one of equity and distributive justice among different social groups and generations. This justification, however, is greatly tied up with other frequently discussed justifications stemming from the potential failures of a free market to supply and allocate housing. It is important that we consider these briefly. One justification is that there are market failures in the supply of housing: building capital is longlived and free market expectations of the future are inevitably inaccurate resulting in inefficient supply patterns. Even though government expectations of the future may be no better, public controls can enforce a more efficient pattern of supply reducing the need for inefficient free market speculation. Such government policies may be seen as acceptable second best strategies. Municipal land controls may be a sensible strategy from this point of view, as might the system of construction subsidies which differ by dwelling type. A second justification is that the web of housing contains elements of the public infrastructure networks or is closely associated with such networks. This provides the rationale for master plans which treat housing supply in conjunction with public goods provision.

A third justification is that the externalities (social and economic) which arise from the supply of housing are very significant. Again, this view justifies the presence of careful master planning and some supply side subsidies. A fourth justification is the argument that the longevity of housing makes it an intergenerational private good. Since the preferences of future generations cannot be adequately represented in current markets, the government should step in to enforce a second best intergenerational Pareto efficiency. A fifth argument is that hou-

should mobility in a free market because of lack of information is an inefficient process which retards overall housing market efficiency. Government mobility controls and rationing mechanisms are therefore introduced partly in the belief that they are more efficient than market transaction processes.

The above arguments may have a limited role in justifying the current regulations of the Swedish housing market but we believe that the equity considerations are much more dominant. The central policy questions, therefore, are two: (1) what are the Swedish decision makers' objectives regarding equity and redistributive justice? (2) are the current housing market regulations the most efficient way of achieving these objectives or are they too complicated and costly?

ACKNOWLEDGEMENT

The research that led to this paper is partially supported by a United States National Science Foundation grant to Alex Anas. The first author is indebted to the Royal Institute of Science and Technology of Stockholm and to the Stockholm Regional Planning Office for making desk space available, for providing the opportunity for several lectures and for helping with the gathering of significant background material.

Numerous individuals contributed information, guidance and opinion on various topics with which this paper is concerned. Their assistance is gratefully acknowledged and explicitly recognized throughout the paper. None of these individuals, however, are responsible for the contents of this paper, nor are the authors' statements a reflection of their opinions.

REFERENCES

- Anas, A. (1982) *Residential Location Markets and Urban Transportation: economic theory, econometrics and policy analysis with discrete choice models*. New York: Academic Press.
- (1983) *The Chicago Area Transportation Land Use Analysis System: A dynamic model for analyzing the effects of transportation improvements on mode choices, property and land values and residential land development*. Washington, D.C.: United States Department of Transportation.
- Anton, T. (1975) *Governing greater Stockholm: a study of policy development and system change*. Los Angeles and Berkeley: University of California Press.
- Brownstone, D., P. Englund and M. Persson (1983) "A Microsimulation Model of the Swedish Housing Market", preliminary draft. Stockholm: School of Economics.
- de Leeuw, F. and R.J. Struyk (1975) *The Web of Urban Housing: Analyzing Policy with a Market Simulation Model*. Washington, D.C.: The Urban Institute.
- Gustafsson, J.R., B. Hårsman and F. Snickars (1977) "Housing Models and Consumer Preferences: Applications for the Stockholm Region". Papers of the Regional Science Association, 38.
- Hårsman, B. (1981) *Housing Demand Models and Housing Market Models for Regional and Locational Planning*. Stockholm: Swedish Council for Building Research, Document D13: 1981.
- Kain, J. and W.C. Appgar, Jr. (1977) "Simulations of the Markets Effects of Housing Allowances". Research report, Harvard University.
- Kemeny, J. (1981) *Swedish Rental Housing: Policies and Problems*. Birmingham: Centre for Urban and Regional Studies, University of Birmingham.
- Snickars, F. (1982) "Constrained Rent Equilibria in an Applied Housing Market Model". Paper presented at the IIASA workshop on "Spatial choice models in housing, transportation and land use analysis: toward a unifying effort", in Laxenburg, Austria, March 29-April 1.
- Statistics Sweden (1983) *Yearbook of Housing and Planning Statistics 1983*. Stockholm: Official Statistics of Sweden.
- Sweden (1982) *Housing, Building and Planning in Sweden: Preliminary Version*. Stockholm: Ministry of Housing and Physical Planning.
- Sweden (1983) *Human Settlements in Sweden: Current Situation and Related Trends and Policies*. Stockholm: Ministry of Housing and Physical Planning.
- Swedish Council for Building Research (1983) *The Swedish Building Sector in 1990: The Need for Research and Development in the Eighties*. Stockholm: Swedish Council for Building Research, G3: 83.

- Turner, B. (1982) "The Future of Public Rental Housing in Sweden: Rent Pooling and Production". Gävle: The National Swedish Institute for Building Research (mimeo).
- Wigren, R. (1982) "Housing Policy and the Owner-Occupied Sector". Paper presented at the British-Swedish seminar on Housing Policy, the National Swedish Institute for Building Research, Gävle, September 13-16.

NOTES

- 1 The brief list of references at the end of this paper bears no indication of the extensive unpublished material, the carefully documented public statistics and the wealth of specific information that can be obtained by interviewing public official and experts.
- 2 In large measure this model is envisaged as an adaptation of CATLAS (The Chicago Area Transportation Land Use Analysis System; Anas, 1983) to the Swedish situation. Also see (Anas, 1982).
- 3 The sparse figures presented in this paper have been extracted from the official statistics of Sweden (Statistics Sweden, 1983).
- 4 Much of the information reported in this section is partly based on the material in (Sweden, 1982 and 1983).
- 5 This section relies in part on interviews with Bengt Turner and Rune Wigren of the Swedish Council for Building Research, Gävle, and Torsten Landgren of the Swedish Association of Municipal Housing Companies (SABO), Stockholm.
- 6 This section relies in part on interviews with Bengt Turner and Rune Wigren of the Swedish Council for Building Research, Gävle, Torsten Landgren of SABO and Sven Bergenstråle.
- 7 Sven Bergenstråle's recent independent research project on the effects of rent pooling sponsored by the Tenants' Association has documented the presence of significant rent differences for similar flats in different companies.
- 8 This section draws in part on an interview with Olle Svensson of the Stockholm Federation of Municipal Housing Agencies.
- 9 The figures in this section have been extracted or constructed from (Statistics Sweden, 1983).
- 10 The figures have been extracted or constructed from (Statistics Sweden, 1983).
- 11 The figures have been constructed from (Statistics Sweden, 1983).
- 12 This section relies in part on an interview with Bo Lindörn (and presentations by his staff) of the Swedish Price Control Board.

Urban Development and Planning Problems in Oslo

GEIR THORSNÆS, DAGNY GÄRTNER HOVIG and KIRSTI NØST

The Housing Administration, City of Oslo, Akersgt. 55, 0180 Oslo 1, Norway

INTRODUCTION

The industrialization of Oslo and the strong growth that followed from the mid-19th century was the reason why Oslo soon showed signs of an industrial city. This characterized Oslo far into the 20th century. Stagnation in the manufacturing industry and above all the growth of service industries (trade, transport, private and public services), resulted in a change in this picture of Oslo. The Second World War and rebuilding afterwards represents a turning point. After the war the manufacturing industry has declined absolutely and relatively at the same time as service industries have shown an increasing employment.

Today manufacturing industry occupies only 15% of Oslo's employees, and only 6/10 of these work in production, the remaining being office employees.

The basis for the growth of the service industries is to be found in the city's geographical position, its connections to the surrounding region and the country on the whole, plus its function as the capital of Norway. This has brought Oslo into a development which, in spite of a few temporary setbacks, has mainly been a self-reinforcing element.

Oslo today stands as the dominating economic and administrative center of Norway. This is obvious, in spite of the fact that Oslo has little of the country's manufacturing industry, and that the oil industry is located in other parts of Norway.

Regional development after World War II

The period after the war up to 1970 is characterized by a strong population flow to the Oslo region (Oslo and Akershus county). The reason for this was a strong economic growth and a subsequent demand for labour caused by the rebuilding after the war. A surplus of labour was found in the rural areas after five years of war and the economic crisis which had led to an artificially high agricultural population in large parts of the country in the 1930s. The population flow to the Oslo area continued after the actual rebuilding period was completed, and did not cease before the end of the 1960s.

Around 1970 we saw a change. The population growth in the Oslo area was strongly reduced during a few years. While the yearly growth during the 1950s and 1960s was approximately 9 000 (1.48% and 1.2% respectively) per annum, it was reduced to about 2 000 during the 1970s (0.2%). In this period the growth was so minute that the region's part of the country's total population decreased.

This development was not mainly due to the situation in Oslo but was to be

found in the rest of the country, and was due to various reasons. General economic policies had a more distinctly regional profile. A considerable growth in government employment both local, county and regionalwise emerged, as for example a development in the school system. The founding of the National Health insurance system also made it possible for more people to live in the rural areas. The increase of the agriculture subsidies must also be mentioned.

In addition better communication systems made it possible more than before to live outside the city area but still work within the city.

In the beginning of the 1980s Norway was also hit by increasing unemployment, the larger cities being least affected. In the Oslo region this has led to a new increase in the population. While 1980 and 1981 had no growth in the Oslo region, 1982 and 1983 showed an increase of 2 300 per year and 1984 the total of 5 900. The population in Oslo city in 1984 was constant for the first time after 17 years of continuous decline.

We have reasons to believe that in the near future Oslo will continue to increase its population. Employment seems to have increased after some years of stagnation, and there is no indication of growth potential in the surrounding districts that could disturb this theory. The State seems to make small efforts in strengthening employment in the rural areas such as happened during the 1970s.

Housing development

At the end of World War II and the following years there was a large demand for new dwellings in the city.

An enormous effort was made by the municipality to meet the demand for new housing. More than 115 000 dwellings were built in the years 1945–75, mainly in new suburbs north-east, east and south of the existing urban areas. During this time the municipality put most of its efforts and resources into developing the new suburbs. The development included not only dwellings, but also schools, kindergartens, shopping centers, social services etc.

Nearly all the new dwellings were situated in blocks of flats. Large blocks

Table 1. *Population development in the Oslo region 1950–84*

Date	Oslo	Akershus	Oslo/ Akershus	Average growth p. a. in %	Oslo/Akershus share of the country's population
01.12.1950	434 047	183 011	617 058		18.8 %
01.11.1960	475 562	233 247	709 309	1.4	19.8 %
01.11.1970	477 898	322 321	800 219	1.2	20.7 %
31.12.1980	452 023	369 193	821 216	0.3	20.1 %
31.12.1981	450 386	372 347	822 633	0.2	20.0 %
31.12.1982	448 775	376 202	824 977	0.3	20.0 %
31.12.1983	447 257	380 258	827 515	0.3	20.0 %
31.12.1984 ^a	447 100	386 300	833 400	0.7	20.1 %

^a Preliminary figures.

dominated the 1950s, 60s and the beginning of the 1970s. The last ten years, however, show a tendency towards smaller blocks, semi-detached houses and single-family houses.

The cooperative housing association OBOS (Oslo Bolig og Sparelag) was, with few exceptions, responsible for the new suburban building. The flats are organized as cooperative housing societies under OBOS.

Urban renewal

Late in the 1970s attention was drawn to the central eastern areas of the inner city, an area including 35 000 dwellings, mainly in 3, 4 and 5 storey buildings. These were dwellings set up for industrial workers when Oslo was industrialized in the 1870s to 1890s.

The city council adopted an ambitious programme of urban renewal of all dwellings, privately and municipally owned, in these areas. The motivation was partly a political wish to create better living conditions for the inhabitants of these parts of the city, partly a search for possible sites for building new blocks.

Until now, urban renewal has to a large extent taken place through rehabilitation of old buildings. In the years to come, however, more demolition and building of new blocks will probably take place.

Oslo's demographic development

Oslo had a population growth up to 1967, but has since declined except for 1984. The total decline in this period was 42 000 from 489 000 in 1967 to 447 000 in 1984.

The difference between the housing development of Oslo and Akershus (the surrounding county) is both a matter of quantity and quality.

Towards the end of the 1960s the most demanding need for housing seemed to have been met, and it turned out to be more a question of different types of housing, something which Akershus could supply with its varied development. A better communication system also improved the possibilities of living in Akershus and working in Oslo (commuting). In addition, an improved economic situation accounts for a larger demand of self-owned housing. Both these factors have led to the development of urban sprawl which is so typical of the Oslo region.

An increase in the number of smaller households in Oslo, due to an increase in the divorce rate, higher age level and reduced birth rate has caused a decrease in the population.

All these factors counted for the strong population reduction in Oslo from 1967 to 1983 in spite of a considerable housing construction. We are now probably confronting a period of stable or weak growth in the population.

Problems in the planning of today's Oslo

Due to the reduced population in Oslo during the last few years, and a change in the population structure towards more elderly people, the tax foundation has

been impaired. Despite this there has been an increased demand for municipal services due to demographic changes in the population and increased social problems in general.

This vicious circle in which the city now finds itself, demands special measures. In the near future it is unrealistic to imagine a change in the economic transfers between municipalities and counties in the region or radical changes in the State's subsidies to Oslo. Therefore Oslo must solve its economic problems on its own, and by doing so secure the city's source of income. But this development must take place in a way that excludes large investments. We have to build new dwellings, but doing this, we must make use of the existing infrastructure and municipal services.

The lack of building land is an important element in judging the city's further development. Oslo wants to maintain its large forest areas surrounding the urban area, an area that amounts to 2/3 of the total municipal area. There remain therefore only quite small areas for development and building. This, together with a wish for the most economic solution, makes it necessary to complete as much housing construction in form of infill development and urban renewal as possible. This leads to an increased pressure for more demolition of old buildings and for in-between building in the urban areas. There is a political agreement that development shall not be at the expense of established recreation areas in the building zone.

But this alone will not solve Oslo's development problem. It might be necessary to a certain degree to touch the forest areas, but only marginally, in areas not needing large basic investments. Together with development in the built-up area this should cover the proposed needs for a slight population growth up to the year 2000, and besides a certain expansion in the industry.

During the 1980s a lot of uncertainty about housing in Oslo has arisen. In 1982, the government increased prices on grants for housing and opened up for uncontrolled trade. Until then, there had been regulations for sale of dwellings in old

Table 2. *Family structure in Oslo, Akershus and the whole country at the end of 1974 and 1982. Per cent*

County	Married couples		Mother/father with unmarried children	Single persons	Total
	With unmarried children	Without children			
1974					
Oslo	24.8	20.1	6.5	48.6	100.0
Akershus	47.0	18.3	6.1	28.6	100.0
The country	39.7	18.9	6.8	34.6	100.0
1982					
Oslo	19.3	17.6	7.6	55.5	100.0
Akershus	41.4	17.9	8.4	32.2	99.9
The country	35.6	18.0	8.3	38.2	100.1

blocks of flats and for dwellings in cooperative housing societies. Within a few months, this led to a “buyer’s” market, the first time ever in the modern history of Oslo.

Finally, there is a political wish today that the housing market shall function as independently as possible without municipal management and subsidies. This involves among other things that housing construction must to a larger degree than before take into consideration the populations wishes and needs.

Urban Development in Vienna—Summary

MANFRED FISCHER, HERBERT PURSCHKE and UWE SCHUBERT

Institute of Geography, University of Vienna, Universitätsstrasse 7 A-1090 Vienna, Austrian Institute for Regional Planning, Franz-Josephs Kai 27, A-1011 Vienna and Institute for Urban and Regional Planning, University of Vienna, Augasse 2–6, A-1090 Vienna, Austria

INTRODUCTION

Vienna is the capital of the neutral federal state of Austria. It is situated in the central part of Europe between the West-European EC countries and the East European COMECON. Up to 1918 Vienna was the capital as well as the economic and cultural center of the multi-national Austro-Hungarian monarchy with a population of over 50 million inhabitants. Vienna is today, in a much smaller country, by far the biggest city in Austria with approximately 1.5 million people, or about 20% of the total population of Austria. The next city in the urban hierarchy of Austria is Graz, with about 250 000 inhabitants.

About 735 000 employees (1983) produce more than ¼ of the Austrian GNP. Due to the high productivity of Viennese firms and the relatively high share of the tertiary sector the average wages in Vienna are the highest in the country; they are about 8% above the Austrian average. Due to the comparatively large population and the economic dominance, Vienna is also the uncontested traditional cultural centre of Austria—despite its extremely peripheral situation in present-day Austria.

THE PHASES OF URBAN DEVELOPMENT

In the last 30 years of the 19th century up to World War I population expanded rapidly (1869: 0.9 million, 1910: 2.1 million), the provision of a large public transportation network (tramways, subway system) as well as of technical and economic infrastructure (sewage system, gas, electricity) and the regulation of the Danube, the necessary conditions for large scale urban expansion at high densities, in the west and in the south as well as in the areas north of the Danube, were created. In 1918 the immigration from the countries of the former Austro-Hungarian monarchy stopped—the population of Vienna actually declined to 1.9 million. Political and economic difficulties prevented private investment. In order to get a handle on the continuing degree of scarcity in the residential market the city administration of Vienna, at this time dominated by social democrats, developed a concept of public housing, which gained high international esteem. Between 1921 and 1934 63 000 units of housing—almost exclusively built in closed form at the periphery of the settlement area—were constructed.

In the period from 1934 (establishment of the totalitarian, fascist regime) up to 1938 (integration into the “German Third Reich”, start of the Second World War) and even up to 1945, Vienna’s urban development stagnated.

During World War II 19 000 residential units (approximately 15% of the total

stock of housing) and a large share of the technical infrastructure (railway stations, bridges, etc.) were destroyed. The decade up to 1955 was mainly characterised by reconstruction and repair of war damages. In the 1950s approximately 10 000 to 12 000 apartments were constructed annually, predominantly by the city of Vienna, later to an increasing extent by non-communal investors (such as residential co-ops, etc.).

This reconstruction phase was more or less finished at the end of the 1950s and a phase of suburbanisation started. As a further expansion of the city to the west into the region of the Vienna woods (actually being very well suited for residential construction) was not legally possible due to an ordinance dating from 1905, the settlement area expanded predominantly to the south and to the north, in the region across the Danube. Residential construction reached its climax in 1966 (in this year 17 000 units were finished).

Since the second half of the 1960s residential construction in general decreased remarkably, predominantly caused by the decline of communal investment. In 1975 it had fallen to just over 6 000 apartments per year.

The place of residential construction in the investment budget of the city was taken up largely by cost intensive infrastructure projects (UNO-city, hospitals, extension of the sewage system, further expenditures for flood protection—“Donauinsel”). Since the end of the 1970s the suburbanisation trend is slowing down. Public investment is greatly hampered by the lack of financing possibilities by the city of Vienna as such, caused by the above mentioned expenditures for large infrastructure projects. In the residential market the quantitative demand for housing is greatly reduced by this time, but the lack of high quality residential possibilities is still prevalent (there are still an estimated 200 000 substandard apartments in Vienna). In the ring of the Viennese agglomeration, residential investment has greatly increased. There are estimates that $\frac{1}{4}$ of the population of Vienna owns a second home in this region.

THE HOUSING MARKET

The housing stock of the city of Vienna is approximately 800 000 units. Taken at face value there should not be any serious problems in this respect as the residential population of Vienna is presently approximately 1.5 millions. This is however, not the case, as the structure of the housing stock is unsatisfactory in many respects: many apartments are too small (more than 30% have an area of less than 45 m²), are substandard in internal infrastructure (approximately 20% are without inside toilet or water), and for a large share residential use is too dense (approximately 25% with less than 20 m² per inhabitant). Additionally the immediate environment of many housing units stemming from the end of the century is lacking in many respects, such as insufficient green areas, pollution, noise etc. Summing up one could say that the housing stock is over-aged and urgently needs renewal. It should furthermore be mentioned that only 10% of the total stock are one- or two-family houses.

It is hence clear that in the urban development plans in the 1980s give priority to the improvement of the housing stock and thus favour urban renewal vis-à-vis

the former policy of construction of new housing units and urban expansion. Such measures were greatly hampered by the specific legal conditions prevailing in the housing market: there are still laws stemming from the period after World War I in power today which provide strong protection for the tenant, in terms of rents as well as the conditions necessary to terminate a contract. This situation has led to a very low mobility in the residential market: the tenant of an apartment has practically the same rights an owner would have. (Not only the tenant himself but with a few restrictions the children of the tenant enjoy this protection as well, the apartment can practically be inherited.) On the other hand these very reasons lead to a very low rate of private investment in urban renewal or new housing, as it is impossible for the owners of a house respecting the legal constraints, to make a profit on the investment. A result of this situation is that many apartments are renovated by the tenants themselves, but that the condition of the house as such is gradually deteriorating. Another effect of the low mobility in the residential market should not be overlooked. Vienna so far has not been exposed to any serious slum development nor has there been a significant spatial separation of urban functions, such as working, living, recreation, education, etc. as observed in some other cities.

THE ECONOMY

In terms of the number of jobs, the primary sector in Vienna is not significant. Productivity, however, is very high, as 40% of the total demand for agricultural products of the Viennese population is covered by local producers. The productivity by area (the total area used is 94 km²) is very high due to the share of specialised cultures, such as vegetables, fruit and wine), being five times the Austrian average.

More than 30% of total employment is found in the secondary sector. Important sectors are especially the iron and metal industry, electric appliances, the textile and construction industry. The share of the secondary sector in the GRP is gradually decreasing in favour of the tertiary sector. Local government, however, tries to combat this trend by various subsidy and incentive schemes. About 70% of the GRP stems from the tertiary sector. It is predominantly those jobs which can be found in the historical core, almost 20% of all jobs in Vienna are situated in the first district. In other parts of the city, small retail stores as well as other services and small scale manufacturing enterprises can still be found, as the usually observed filtering process is much less pronounced than elsewhere, the land market forces behind this process are strongly weakened by the legal framework imposed, as mentioned above. Larger and especially rapidly expanding enterprises tend to suburbanise, however. This statement is not only valid for productive enterprises being forced to look for alternative locations in the ring of the agglomeration to meet their increasing demand for area, but also for firms reacting to the increasing intensity of environmental protection measures which drive them from the core. The same holds for large service firms, such as management centres of large firms or, most recently, even the federal chambers of commerce organisations.

A similar trend could be observed in the establishment of shopping centres in the suburbs. There is, however, an important difference. The traditional shopping streets in the CBD as well as along the radial main transportation lines have practically lost no customers. In addition to these centrally located services large shopping centers have increasingly been established in the ring of the agglomeration, where the accessibility by private automobile is very high. The largest center of this kind was built approximately ten years ago south of Vienna ("Shopping-City-South"), with a total area covering 17 000 km².

TRANSPORTATION AND TECHNICAL INFRASTRUCTURE

At the end of the 1970s a ratio of 300 automobiles per thousand inhabitants has been reached and has stayed more or less at that level since. But even before that time it was realised that a historically grown city like Vienna cannot be turned into an automobile based urban system and as a matter of fact should not be sacrificed to the private automobile. The intention of building an urban freeway network was abandoned, only a freeway tangent in the south of Vienna and a route along the Danube were actually constructed. Major parts of the inner city and several other centers of districts of Vienna were turned into pedestrian malls or measures were taken to drastically reduce traffic in these areas. The western part of the so-called "Belt" remains to be a problem, a circumferential road situated in a densely populated area of Vienna which at a daily rate of 80 000 vehicles passing through is still the route with the highest traffic burden in all of Austria.

The public transportation system (railways, subways and tramways) was mostly built at the end of the last century. Planning at that time was reckoning with a population of 4 million inhabitants, and thus the network structure was planned accordingly, a fact which implies that it has remained intact until rather recently. At the end of the 1960s an extension of the subway system was started, the basic parts of which (a circular line around the CBD as well as radials to the west, south, north west and across the Danube to the north east) are now completed. At approximately the same time the establishment of a rapid transit system on the already existing railway routes was started. In 1984 an integrated public transportation system was finally agreed upon, including all modes functionally, and practically all of the agglomeration spatially.

Similarly the remaining parts of the technical infrastructure of the city (sewage system, water, electricity and gas) were planned and constructed at the turn of the century in such a generous way that it was only in the last 20 years that major renewal projects and new extensions became mandatory. The last major project along these lines is now in the planning stage, an electric power plant on the Danube.

INSTRUMENTS OF PLANNING

Austria is a federal country which implies that there are three political and administrative levels of planning: the federal state, the individual state and the

community. Spatial planning is basically a responsibility of the individual states, particularly the development of a spatial planning concept for all of Austria. In practice the various large projects of the federal state (e.g. the federal highway and freeway system, the railway network, higher education, etc.) exert a major influence on spatial development. Local planning is done by the individual community (e.g. zoning). The coordination of these local development plans is the responsibility of the individual states.

The city of Vienna presents a special case in this hierarchical structure, as it is simultaneously a state as well as a community. Vienna does have at its disposal the usual zoning and land use related legal instruments, but up to now no general development concept has been created.

As suburbanisation began to play a major role in the planning activities of the city of Vienna as well as of the surrounding communities the lack of coordination between the concerned local development plans became evident. In the late 1970s the three states of Lower Austria, Burgenland and Vienna established a commission for coordination, the "Planning Commission for the East Region" (PGO).

Work on the urban development plan for Vienna started in 1977. In 1981 a draft was submitted, which was discussed publicly. In 1984 the revised version of this planning concept for the future was adopted by the city council. It consists of 3 parts: principles and priorities, a spatial development concept and sectoral tasks. The following general principles and priorities should be mentioned briefly:

- Public transportation comes before individual automobile traffic
- Urban renewal has priority over new construction
- Density should be decreased
- Conservation and further extension of functional integration in the city
- New housing and infrastructure should be concentrated along development axes along high capacity public transportation lines. Areas between these axes should be preserved as "green wedges" between the built up areas. It is particularly this last point which is in contrast with the past practice of a more or less radial, concentric ring growth.

Long-Term Dynamics of the Leeds Region

R. L. MACKETT

Institute of Transport Studies, University of Leeds, Leeds, England

INTRODUCTION

Leeds is a city in the north of England which grew very rapidly during the nineteenth century with an economy based mainly on the wool clothing industry and heavy engineering. At this period high density dwellings were built to house the workers. During the first half of the twentieth century the rate of growth slowed down. Those processes have implications for the recent changes in Leeds. It is a fairly compact city, surrounded by a rural fringe.

THE ECONOMY

During the 1960s and 1970s Leeds has been shifting from a manufacturing city to a regional service centre. As shown in Table 1 in 1951 about 50% of jobs were in secondary sectors (manufacturing); by 1981 this had fallen to just over one quarter. In 1951 the biggest industry was clothing and footwear. By 1981 over three-quarters of the jobs in this sector had disappeared. Over the same period the quinary sector (public and personal services) more than doubled in size. Total employment in Leeds has been falling for a number of years because the city is dependent on industries that are in decline. The sectoral change has been associated with an apparent outward movement of jobs, with declining firms in the inner city replaced by new factories in trading estates on the urban periphery. In the retailing sector the policy of developing suburban centres has attracted sales away from the city centre.

The sectoral shifts have been against a background of deepening recession, with unemployment increasing from 1.8% in 1951 to 4.4% in 1971, to 11.6% in 1981 as shown in Table 2. However, the rate in Leeds has tended to remain slightly below the national average through the period. The male economic activity rate has declined over the period, due to the increasing proportion of people of retirement age plus the effects of recession. In contrast the rate for women increased from 1951 to 1971, reflecting their increasing participation in the economy. However, in the following period the rate declined as the effects of recession have overtaken this trend.

POPULATION AND HOUSING

The population of Leeds Metropolitan District has been falling since about 1971 as shown in Table 3. Over the period 1951 to 1981 there has been net out-migration. However, up to 1971 the natural increase out-weighed this so the population increased. The fall in the birth-rate (particularly since 1971, shown by the percentage aged 0–9) has meant that the rate of natural increase has fallen to

Table 1. *Percentage of employment in Leeds in each industrial sector*

	1951	1961	1971	1981
Primary	0.9	0.6	0.3	2.1
Secondary	50.8	43.5	37.3	27.6
Tertiary	13.3	14.7	14.9	15.5
Quarternary	17.6	21.1	21.8	24.1
Quinary	17.4	20.1	25.7	30.7

Note: The 1981 values are for an area that includes the rural fringe and have the apparent increase in the primary sector. The other sectors are unlikely to have been affected significantly.

Source: Census of Population 1951, 1961, 1971, 1981.

such an extent that total population has fallen. The declines in the birth and death rates have led to a fall in average household size (3.1 in 1951 to 2.6 in 1981), with more people of retirement age, and more married couples with no children. However, the increase in the number of small households has not led to more sharing of dwellings, as the latter has increased substantially. In fact the number of houses built over the period 1951 to 1971 greatly exceeded the building programme. In the early part of the period this was due to the increase in the supply of materials and labour. The later growth was associated with a massive programme of slum-clearance, with many of those whose dwellings were demolished rehoused in new estates on the urban periphery. More recently this policy has been replaced by one of urban renewal. Over the period 1951 to 1981 there has been a general shift from the public sector to the private, but with fluctuations, usually in response to changes in the political party in power either in central or local government.

The house building and demolition processes have led to changes in the spatial pattern of housing, with most of the demolitions near the centre and the new dwellings on the edge of the city. This in turn has affected the distribution of population, as shown in Table 4, with the population in the core in 1981 at about one third of the 1951 level, and growth in the rural fringe. The rise and subsequent fall in the suburbs is indicative of the net outward movement of population, initially from the core to the suburbs, later from the suburbs to the rural fringe.

Table 2. *Characteristics of the Leeds labour force*

		1951	1961	1971	1981
% of population aged 15+ who are economically active	M	88.6	87.3	80.5	73.9
	F	43.2	45.7	46.5	45.5
	T	64.0	65.2	62.6	59.0
% of economically active population who are unemployed	M	2.1	1.4	5.2	14.3
	F	1.2	1.1	3.1	7.8
	T	1.8	1.3	4.4	11.6

Note: M = male, F = female, T = total. These figures are for the area of Leeds corresponding to areas I and II in the study.

Source: Census of Population 1951, 1961, 1971, 1981.

Table 3. *Population characteristics in Leeds*

	1951	1961	1971	1981
Total population	694 514	712 970	738 930	696 714
Mean household size	3.1	2.9	2.8	2.6
% of population aged 0-9	15.4	14.9	15.9	12.3
% of population of retirement age	13.1	14.3	16.9	18.9
% of households with 1 person	12.5	16.1	22.2	26.9
% of households with 2 persons	28.8	30.6	31.6	32.0
% of households sharing dwellings	5.8	2.3	2.4	1.2

Note: Retirement age = 65 for males, 60 for females. The figures other than the total population refer to the area of Leeds corresponding to areas I and II in the study.

Source: Census of Population, 1951, 1961, 1971, 1981.

TRANSPORT

As incomes have risen and the population has decentralised the rate of car ownership has risen, as shown in Table 5. The total number of cars owned has increased steadily at about 2000 per year since 1966. Two car ownership is still fairly low, at less than 10% in Leeds CB in 1981, and over half the households still do not own a car. One of the main reasons for this is the good public transport system, which is based mainly on buses. (Relatively few journeys to work are by rail.) The growth in car use for the work trip can be seen. It has grown faster than the increase in car ownership. In fact, in 1981 over a quarter of the car users described themselves as car passengers (18.4%) or car poolers (7.5%). During the 1970s bus patronage has fallen dramatically, and now represents only one third of trips while car use has been increasing. The oil crisis of the early 1970s seems to have had little effect on car usage. It may have led to the revival in the usage of motor cycles and pedal cycles since 1971. In fact the real price of petrol has fluctuated in Britain since 1946, with peaks in 1952 because of the nationalisation of British oil assets in Iran, 1956/57 because of the Suez Canal crisis and 1974/75 because of the Arab-Israeli conflict.

After each of these peaks the price has fallen in real terms, mainly because the price of other goods has risen as a consequence, because Britain's economy is so dependent on oil. Since 1980 the price has increased steadily, despite the increasing dependence on North Sea oil, because of the linking of the price of British oil

Table 4. *Spatial distribution of population in Leeds MD, 1951-81*

	1951	1961	1971	1981
I. Core	149 410	110 167	70 961	49 476
II. Suburbs	356 470	400 509	426 286	382 146
III. Rural fringe	188 634	202 294	241 683	265 092
Total	694 514	712 970	738 930	696 714

Source: Census of Population 1951, 1961, 1971, 1981.

West Yorkshire Metropolitan County Council, Fact and Figures, 1975.

Table 5. *Car ownership and modal usage in Leeds*

	1966	1971	1981
% of households with 1+ cars	32.4	35.4	45.0
% of households with 2+ cars	3.0	4.4	8.6
% of trips to work by car	18.7	25.9	43.0
% of trips to work by public transport	57.7	51.9	34.2

Note: These figures are for the area of Leeds corresponding to areas I and II in the study.
Source: Census of Population 1966, 1971, 1981.

to that of the rest of the World. Bus fares in Leeds have followed a different trend over this period. Until about 1969 Leeds had very cheap fares, possibly the cheapest in Britain. During the 1970s they were increased, with the biggest rise in 1975 when they were increased three times. In the last few years they have been kept fairly steady in monetary terms, falling in real terms.

CONCLUSIONS

During the past 35 years the economic base has shifted from manufacturing to service, with associated net decentralisation of jobs. The population has also shown net outward movement, partly because of the pattern of housing demolition and building whereby the former tends to be in the core of the city and the latter on the periphery. Over the whole period Leeds has had net out-migration. For most of the period the population increase by natural change out-weighed this so the total population grew. More recently the fall in the birth-rate has meant that the population is only just replacing itself by natural increase, and the total is falling as net out-migration accelerates. However, demand for housing has not fallen to the same extent as the mean household size has decreased, partly due to the increase in the number of one-person households, particularly pensioners. The net outward movement of population is associated with increasing car ownership which has led to greater car use, and a large decline in public transport patronage.

Part III

Structural Adjustments of the Metropolitan Economy, and Spatial Repercussions

In general the growth of an urban region depends on its ability to export an important share of its production to more distant locations. This ability to export is always founded on certain comparative advantages which may be based on innovations and a labour force with production and distribution knowledge which is more advanced than in other regions. When production becomes more standardized, the regional advantages may shift between regions. An initiating region may adjust to this phenomenon in two ways. It may gradually renew its activity structure by successively initiating new production. An extreme alternative is to expand the initial type of production and retain the earlier competitive advantage by means of increased scale, standardization and price competition. In the latter case the region will become highly specialized with resulting rigidities and weakened ability to adjust at later stages.

In the paper by Batten a world-wide interaction between initiators and followers is illustrated with aggregate data for a small set of metropolitan regions. The intraregional spatial redistribution of activities is also examined and described as an element of the overall process of economic restructuring. The following short papers describe three various cases: (i) the Dortmund region with a high degree of ageing specialization and economic decline; (ii) the Melbourne region which may be characterized as a delayed follower of adjustments in the economies of North America; and (iii) Budapest which is developing basic knowledge for production based on information technology and computer science. In the paper by Batten the clearest example of this type of region is the San Francisco Bay area.

The Changing Economic Structure of Metropolitan Regions

*A Preliminary Comparative Analysis**

DAVID F. BATTEN

Division of Building Research, CSIRO, Box 56, Highett, Victoria 3190, Australia and University of Umeå, 901 87 Umeå, Sweden

INTRODUCTION

The world economy has in recent years been subject to certain major shocks and structural changes. Some well-known examples are (a) the combination of two-digit inflation rates and increasing levels of unemployment, (b) substantial reductions in investment demand and construction activity, (c) excess capacity in steel and transportation equipment industries, and (d) widespread reversals of the urbanization trends in many developed countries.¹ That the initial effects of many of these shocks are being felt in metropolitan areas is now painfully clear.

A large share of the world's metropolitan regions are consequently experiencing relatively severe processes of decline and obsolescence. Yet revitalization of these regions is fundamental since they largely constitute the environments in which new industries, new technologies and new jobs must be introduced and developed. It can be argued that metropolitan regions are basically the "driving entities" for nations. In this respect, the leading metropolitan regions in the world constitute a scale of enquiry at least as important as nations or even clusters of nations in any comparative study of contemporary economic development processes.

On the other hand, all cities cannot be as innovative as others. Global developments have quite a different impact on each metropolis owing to the geographical, social, technological and financial diversity which exists both within and between nations. Some regions are more industrious, more advanced technologically; others are at a disadvantage and are destined to lag behind. At any single point in time, each metropolitan region of the world occupies a unique place relative to all others in terms of economic development. It is with the measurement of this comparative position, together with the relative speed of the economic change process, that this paper is principally concerned.

The foundation of the IIASA project on metropolitan dynamics is a systematic comparison of dynamic phenomena in a set of relatively advanced metropolitan regions. This comparison is intended to identify key factors and observable development paths which are shared by all regions, or at least by certain sub-

* Paper presented at the IIASA Workshop on "The Dynamics of Metropolitan Areas", Rotterdam, June 1984. The research reported herein forms part of an ongoing contribution to the IIASA project on "Nested Dynamics of Metropolitan Processes and Policies". My sincere gratitude is expressed to members of this project's international network who have generously provided the background information on which much of this report is based.

groups of regions. In this paper, we therefore begin to assess the relative stage and speed of economic structural development in a given set of such regions. A methodology based on changing employment shares is developed to examine industrial substitution (that is, aggregate technological change) through time and over metropolitan space. The relocation and restructuring of job opportunities within or outside a metropolitan region can be interpreted in terms of industrial innovation and product cycle theory. In this way, it is possible to identify the trajectory of a global cycle of economic development in terms of each city's current economic and spatial structure and its relative speed of technological change.²

One significant finding can be mentioned in advance. Although the processes of economic development and spatial dispersal of employment within different cities are rarely identical and tend to proceed at a wide range of speeds, in almost every instance the pace of economic restructuring is remarkably steady. This suggests that caution should be exercised by those who insist that the speed of technological change has increased dramatically within the last two decades.

MODELLING ECONOMIC CHANGE IN A METROPOLITAN REGION

Even the broad economic evolution of any metropolitan region cannot be understood meaningfully in terms of simple lifecycle concepts such as urbanization, suburbanization or deurbanization. These motive terms may certainly suffice for an analysis of spatial shifts in population and employment opportunities, but unfortunately they say nothing about changes in technology and industrial or occupational structure. However, if the stage, speed and type of structural economic development occurring within each region could be quantified analytically, some meaningful comparisons might eventuate.

For the purpose of such comparisons, we shall explore the usefulness of a simple logistic substitution model developed originally for the micro-analysis of market penetration and technological change (see, for example, Fisher and Pry, 1971; Peterka, 1977; Batten and Johansson, 1985). This particular model turns out to be a pragmatic simplification of a more general evolutionary model of industrial dynamics in an economic system which may be self-organizing (Batten, 1982). It may therefore be linked to cycles of innovation and the learning process (Marchetti, 1981). We shall restrict our discussion to a market share version for the analysis of economic structural change, and later develop a general framework for analysing job and household dispersal as processes of substitution over metropolitan space.³

Changing economic structure as a process of substitution

Although most of the industrialized countries still have relatively few basic needs to be satisfied—food, clothing, shelter, transportation, education, employment and the like—these economies are undergoing a rich variety of changes at the intermediate stages of production as well as in the individual choice processes of households. Irrespective of whether we consider intermediate or final users, the advancing sophistication and technological evolution consist mainly of substi-

tuting new types of customer satisfaction for old ones. The basic needs or functions rarely undergo radical change, only the ways and means of satisfying them.

Experience has shown that under certain competitive conditions the dynamic processes of market penetration and product or process substitution tend to proceed exponentially in the early years but to slow down later as the market becomes saturated. In relative terms, the substitution process follows an S-shaped curve. Quite often, the logistic distribution can provide a convenient framework for modelling this process through time. Such an approach is in keeping with the theories of innovation diffusion and the product cycle. It can also be given a theoretical foundation in terms of Lancaster's characteristic model of consumer behaviour (see, for example, Batten and Johansson, 1984).

Although the logistic function is certainly not the only one which could be adopted for this purpose, it turns out to be a very practical choice for analysing changes in relative market shares because it can be completely characterized by just two constants: the early growth rate and the time at which the substitution is half complete. Numerous studies have now been conducted which confirm the logistic property of most evolutionary (birth-death) processes.

Mathematically, the substitution process can be modelled as the differential form of the two parameter logistic function:

$$\dot{f}(t) = \alpha f(t) \{1 - f(t)\} \quad (1)$$

where $f(t)$ is the fraction of the market which the new technology has penetrated at time t ; $\{1 - f(t)\}$ is the amount of old technology still in use; and α is the rate constant—or in Mansfield's (1961) terminology, the rate of adoption. The above equation has both the property of exponential growth—that is, proportionality to the amount of growth achieved, $\alpha f(t)$ —and the property of constrained growth—that is, proportionality to the amount of growth yet to be achieved, $\alpha\{1 - f(t)\}$.

This differential equation is solved by rearranging the terms and integrating both sides (now dropping the time index):

$$f/(1-f) = \exp \{ \alpha(t - t_h) \} \quad (2)$$

or

$$\log \{ f/(1-f) \} = \alpha(t - t_h) \quad (3)$$

where t_h is the time when the substitution is half complete (i.e. $f=1/2$ when $t=t_h$) and the maximal rate of growth is achieved. This indicates a very convenient property of the logistic function for empirical analysis: when the substitution data are plotted in the form of $f/(1-f)$ as a function of time on semilogarithmic graph paper, the points should form a straight line (as illustrated in Fig. 1). This property appears to hold with extraordinary precision for a wide range of substitution processes investigated.⁴

It is convenient, in addition, to characterize a substitution by its "takeover

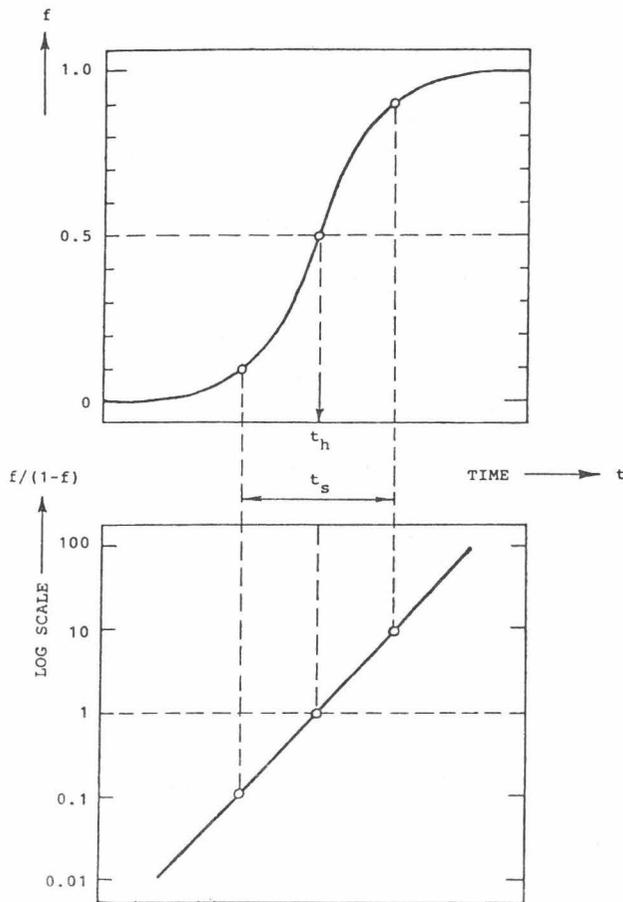


Fig. 1. General form of the logistic substitution model.

time", defined as the time required to move from $f=0.1$ to $f=0.9$ (Fisher and Pry, 1971). The takeover time, t_s , is inversely proportional to the rate constant α :

$$t_s = 2 \log 9 / \alpha. \quad (4)$$

If the dimensionless time, τ , is defined in the form

$$\tau = 2(t - t_h) / t_s \quad (5)$$

formula (3) may be written in dimensionless form. As we shall see later, this makes it possible to plot different substitution processes on the same graph.

Plots of the form depicted in Fig. 1 illustrate how the logistic function can describe technological substitution, not only at the disaggregate level for different products and technologies but also at the aggregate level for different economies. Take, for example, the changing sectoral structure of Melbourne's economy during the postwar period. Table 1 records this recent history in terms of the shares in total employment by sector of occupation. We could analyse this

Table 1. *Sector of occupation as percentage of total economy*

Melbourne Statistical Division, 1954-81

Sector of occupation	1954	1961	1966	1971	1976	1981
I. Primary (including agriculture, forestry, fishing and mining)	3.2	2.4	1.9	1.5	1.2	1.3
II. Secondary (manufacturing)	39.3	37.7	38.2	32.4	29.8	27.0
III. Tertiary (including utilities, construction and transport)	20.7	21.4	20.7	18.7	18.6	18.2
IV. Quarternary (providing all commercial services including wholesale and retail trade, finance, communications)	21.2	21.4	21.3	27.1	27.4	29.2
V. Quinary (providing public and personal services including public administration, community services and entertainment)	15.6	17.1	17.9	20.3	23.0	24.3

Source: Batten, Newton and Roy (1984).

evolutionary pattern using a multivariate version of the logistic model (Peterka, 1977), namely

$$\log \{f_j(t)/f_i(t)\} = k_{ji} - \alpha_{ji}(t - t_h), \quad j \neq i \quad (6)$$

where $f_i(t)$ is the share of total employment held by sector i at time t ($i=1, \dots, 5$) and $k_{ji} = \log \{f_j(t_h)/f_i(t_h)\}$. However, in order to simplify the analysis and facilitate comparisons between various cities of the world, we shall restrict our attention to the bivariate case (3) in which Services (sectors III, IV and V combined) are gradually penetrating the job market traditionally held by Manufacturing industry (sector II). Since the primary sector plays an insignificant role in metropolitan economies, this two-sector simplification seems reasonable. However, by calculating the ratio $f/(1-f)$ for each of these two sectors, the minor effect of the primary sector may still be perceptible.

The respective ratios for each have been plotted on a log-linear scale in Fig. 2. The good linear fit for both regression lines suggests that job substitution between these two sectors does indeed follow a logistic path. Fig. 2 indicates that this substitution was half complete (i.e. reached t_h) around 1940, and that (in principle) the takeover time is about 190 years.

In order to assess the breadth of applicability of this type of structural change model, we have examined similar phenomena in some other cities of the developed world. The preliminary results are summarized in Table 2. In all of the cases considered, the linear fit of $\log \{f/(1-f)\}$ versus time is excellent, suggesting that the model has good potential. Although the change process proceeds at a wide range of speeds, the pace is a steady one.

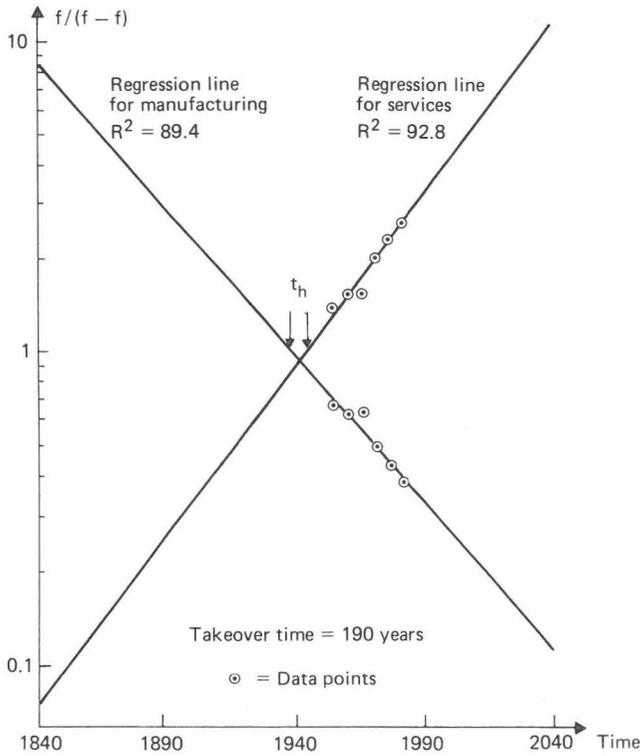


Fig. 2. Substitution of service jobs for manufacturing jobs in Melbourne.

The cycle of technological development

From the results in Table 2, we may speculate on the possible relationship between the stage of urban development, the speed of structural change and observed job losses in urban areas. For example, one may classify the various cities on the basis of their stage in a general technological development cycle as follows:

(a) *Leader* if the transition to a service-dominated economy ($t_h \geq 0.5$) occurred prior to the First World War;

(b) *Early follower* if this transition occurred between the two wars;

(c) *Late follower* if it occurred after the Second World War. If one also classifies their speed of structural change into three groups, namely *Slow* ($r < 0.5$), *Medium* ($0.5 \leq r \leq 1.0$) and *Fast* ($r > 1.0$), then the cities may be grouped as shown in Table 3. The + or - sign assigned to each city in this table indicates the current direction of absolute change in employment, and the year in parentheses signifies the point at which Manufacturing ceased to dominate each economy.

A most interesting feature of these results is that the speed of structural change appears strongly associated with job loss tendencies. In other words, those cities which have lost jobs in Manufacturing and/or gained jobs in Services at a rapid rate are also the ones who are currently experiencing absolute job losses within

Table 2. *Job substitution in some major cities*

City	Sector	t_h (year)	Speed of change (% per year)	R^2
Amsterdam	Manufacturing	1932	-0.67	99.1
	Services	1933	+0.70	98.8
Chicago	Manufacturing	1915	-0.26	94.7
	Services	1918	+0.25	92.0
Helsinki	Manufacturing	1932	-0.62	97.9
	Services	1933	+0.64	99.0
Leeds	Manufacturing	1961	-1.03	91.6
	Services	1963	+1.11	93.8
Melbourne	Manufacturing	1939	-0.38	89.4
	Services	1943	+0.42	92.8
Nagoya	Manufacturing	1960	-0.32	100.0
	Services	1978	+0.89	97.3
San Francisco ^a	Manufacturing	1846	-0.32	99.4
	Services	1850	+0.30	96.2
Turin ^b	Manufacturing	2003	-0.30	100.0
	Services	2005	+0.31	100.0

^a The t_h values for San Francisco are notional only since this city has always been service-dominated.

^b The t_h values for Turin are forecasts.

the metropolitan region as a whole (i.e. deurbanizing in the terminology mentioned in the Introduction). Further work is of course needed to substantiate this possibility. It does however suggest that those cities who are changing their economic structure at a slower rate stand a better chance of averting the deurbanization problem.

Table 3. *Stage in technological development cycle and speed of structural change in some major cities*

Rate of structural change	Stage in development cycle		
	Leader	Early follower	Late follower
Fast ($r > 1.0$)			Leeds - (1961)
Medium ($0.5 \leq r \leq 1.0$)		Helsinki - (1932) Amsterdam - (1932)	Nagoya + (1960)
Slow ($r < 0.5$)	San Francisco + (1846) Chicago + (1915)	Melbourne + (1939)	Turin + (2003)

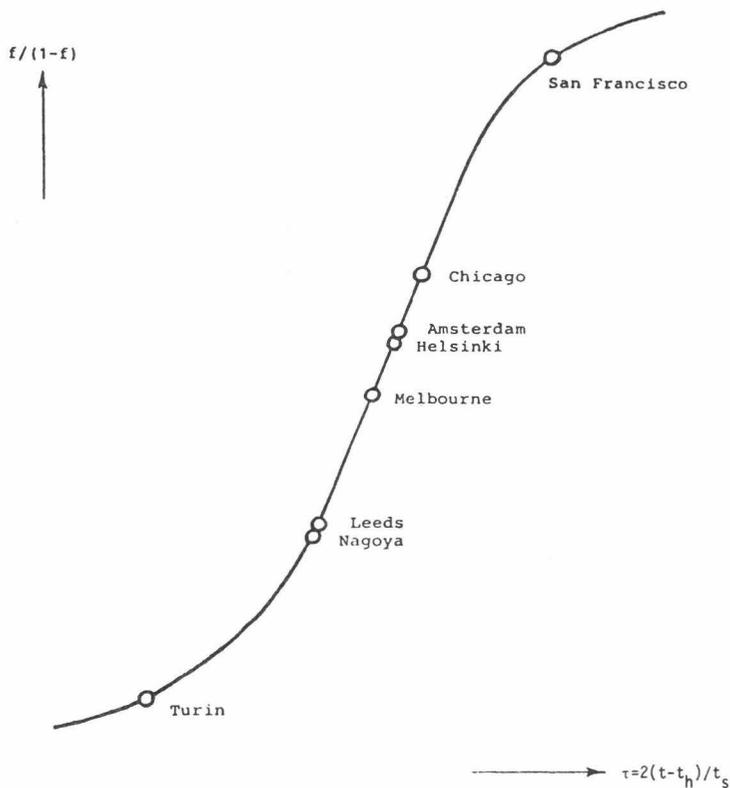


Fig. 3. Global "snapshot" of the technological development cycle and each city's stage of development.

In order to understand the lifecycle of technological development implied in the table, and each city's relative position in a hierarchical sense, we can plot them together on the same graph (Fig. 3). The abscissa in this figure is the dimensionless parameter τ defined in (5), which normalizes all of the data to a single mathematical form. The result is a global "snapshot" of technological development in terms of the stage which each city has reached. We shall elaborate further on the theory underlying this lifecycle pattern below.

To see how the structural change model can be used for forecasting purposes, we recall that only the historical data between 1950 and 1983 were taken to estimate the model parameters for each city. The projections obtained in this way are given as general trends for the past and the future in Fig. 4. This type of economic structural development fits most of the cities concerned, although there are certainly some interesting exceptions.

Suburbanization as a process of spatial substitution

The above analysis of economic structural change within a small group of metropolitan regions is only one part of any comparative analysis of decentralization. The spatial dimension remains. It turns out that the logistic substitution model introduced in the previous section is also a convenient tool for analysing

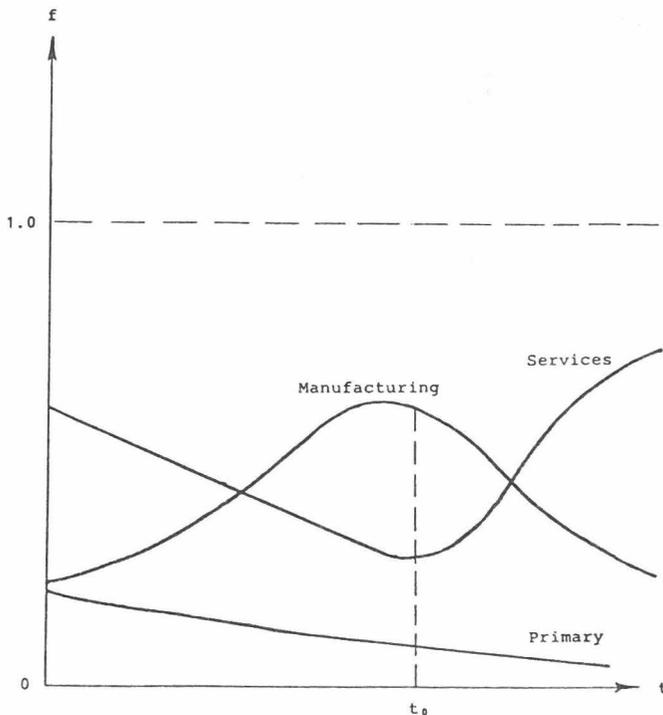


Fig. 4. General form of economic structural change in developed metropolitan regions.

the redistribution of both jobs and population over metropolitan space. We shall therefore introduce this spatial substitution version in the following paragraphs and later link it to the earlier model of economic change in order to provide a unified treatment of the change process.

For example, we may divide each city into three distinct zones: (i) the *Inner* or Core zone; (ii) the *Middle* or Intermediate zone; and (iii) the *Outer* or Peripheral zone. If we redefine the share parameter, $f_i(t)$, as the fraction of total metropolitan jobs or population which are contained in zone i at time t , then it is possible to evaluate the potential of the logistic function as the basis of a spatial substitution model.

We have done this for a similar collection of cities and the results are summarized for population and job dispersal in Tables 4 and 5, respectively.

Although the processes of spatial dispersal for population and employment proceed at a wide range of speeds and do not always spread outwards, in each case the pace of overall change is a steady one. The general pattern of spatial diffusion is depicted in Fig. 5. This basic projection fits the majority of cities with the consistent exception of the Eastern European nations (in which the Inner and Outer zones are declining simultaneously).

It is interesting to compare the relative speeds and extent of suburbanization of employment opportunities with that of population. While there is certainly considerable similarity between each with respect to the directions of movement,

Table 4. *Population dispersal in some major cities*

City	Zone	t_h (year)	Speed of dispersal (% per year)	R^2
Budapest	Inner	2089	-0.17	99.7
	Middle	2075	+0.20	99.1
	Outer	-	-0.03	82.6
Chicago	Inner	1966	-0.92	95.3
	Middle	2005	+0.49	88.2
	Outer	2015	+0.43	99.2
Helsinki	Inner	1960	-1.69	96.3
	Middle	n	+0.81	80.5
	Outer	1990	+0.88	99.2
Leeds	Inner	1920	-0.48	99.2
	Middle	1945	+0.12	91.2
	Outer	2012	+0.36	93.0
Melbourne	Inner	1921	-0.54	98.9
	Middle	n		
	Outer			
Nagoya	Inner	1926	-0.31	99.9
	Middle	2006	+0.40	98.6
	Outer	-	-0.09	94.0
Prague	Inner	-	0	80.0
	Middle	-	-0.02	87.0
	Outer	-	+0.02	89.9
Stockholm	Inner	1946	-0.87	99.5
	Middle	n	+0.25	96.2
	Outer	1997	+0.62	93.0
Warsaw	Inner	1826	-0.14	83.5
	Middle	1935	+0.23	93.0
	Outer	-	-0.09	97.9

Note: t_h denotes either a forecast or a backcast of the year (if any) when each zone contained 50% of all population.

differences in stage and speed are apparent. While population losses from many inner areas may have commenced before jobs began to decline, the faster dispersal of job opportunities in recent years suggests that any leader-follower patterns will be inconsistent.

Spatial redistribution of economic activity

In this section, we present some preliminary findings which result from a synthesis of the economic and geographical dimensions discussed in Sections 2 and 3. For this purpose, the share parameter (f) is assigned three indexes, $f_{ij}(t)$, to denote the share of employment engaged in sector i within zone j at time t . Analyses have been conducted with respect to both sectoral and spatial totals so that each type of substitution may be assessed. The sectoral definitions are those given in Table 1. Owing to a lack of comparable data at the stage of writing, the results are currently restricted to two cities only: Chicago and Melbourne.

Table 5. *Employment dispersal in some major cities*

City	Zone	t_h (year)	Speed of dispersal (% per year)	R^2
Chicago	Inner	1969	-1.13	99.6
	Middle	1997	+0.61	95.0
	Outer	2010	+0.52	99.8
Helsinki	Inner	1983	-1.15	99.8
	Middle	2034	+0.33	97.2
	Outer	1997	+0.82	99.6
Melbourne	Inner	1964	-1.42	97.5
	Middle	∅	-0.06	-
	Outer	1990	+1.48	92.1
Nagoya	Inner	∅	-0.07	-
	Middle	2057	+0.18	87.5
	Outer	-	-0.11	95.4
Stockholm	Inner	1974	-0.57	99.1
	Middle	2077	+0.17	88.9
	Outer	2030	+0.40	100.0

Note: The symbol ∅ denotes a maximum within the statistical time-series (at which $f < 0.5$).

The declining importance of manufacturing activity for each economy is depicted graphically in Fig. 6. In terms of spatial structure, Chicago has maintained a relatively even distribution of its manufacturing workers among all three zones, whereas Melbourne has favoured the Middle Zone for manufacturing activity. The latter city is generating more of its new economic activities in the periphery (Middle and Outer Zones), although the proportion of Service activity (sectors IV and V) is also rising in the Inner Zone (Table 6).

Table 6. *Spatial redistribution of economic activity, Melbourne, 1961-1981*

Economic sector	Geographical zone	t_h (year)	Speed of dispersal (% per year)	R^2
Manufacturing	Inner	1953	-0.73	95.2
	Outer	2010	+0.93	99.3
Retail sales	Inner	1960	-1.05	99.1
	Outer	1996	+1.33	99.9
Quaternary	Inner (as % of all Quat.)	1972	-0.77	98.2
	Inner (as % of all Inner)	2002	+0.49	82.5
Quinary	Inner (as % of all Quin.)	1969	-0.70	97.6
	Inner (as % of all Inner)	2050	+0.27	69.0

Source: Batten, Newton and Roy (1984).

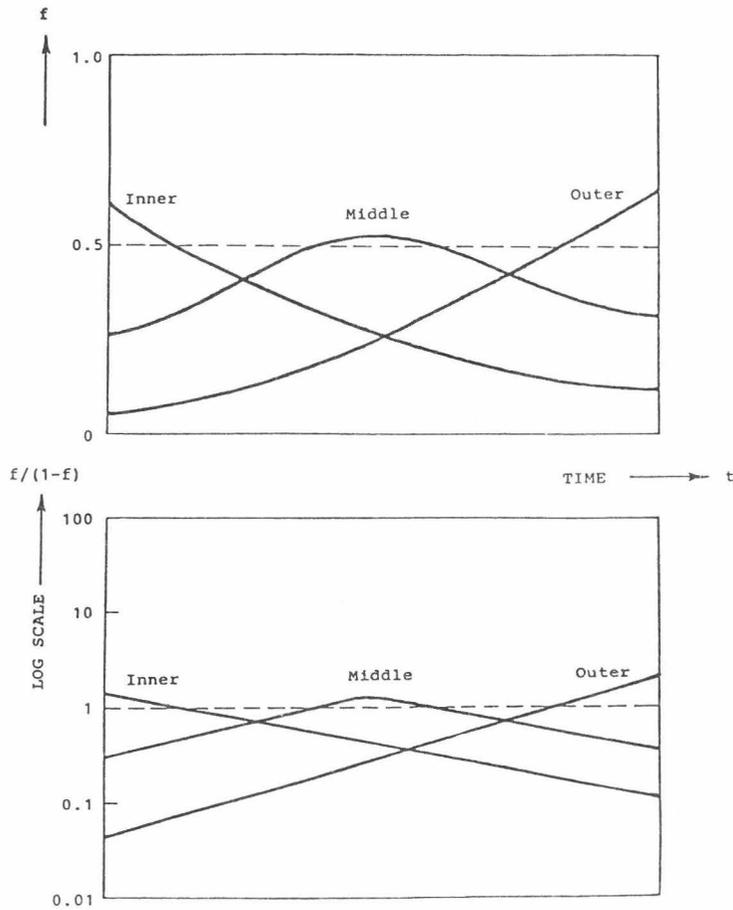


Fig. 5. General form of the spatial substitution model.

Of all economic functions, the retailing sector has usually been the most responsive to the changing location of consumers. Because of its role as a population-serving activity, it has frequently been governed by population movements. However, a glance at Tables 4 and 6 reveals that retail jobs have been leaving the Inner Zone at about twice the rate of population dispersal during the last 20 years. Although the emergence of large regional shopping centres has played an important role in this decentralization process, it is now the influence of changing technology which reasserts this trend. Automated checkout and distribution facilities are reducing the need for patronizing the city centres.

Technological changes manifest themselves in many different forms within metropolitan areas. The communication and computer revolution has facilitated large increases in the efficiency of information collection, processing and distribution. This has undoubtedly contributed to the suburbanization process. It is, however, doubtful if this revolution has had any profound impact on the development of knowledge, technical competence and creativity (Andersson and Johans-

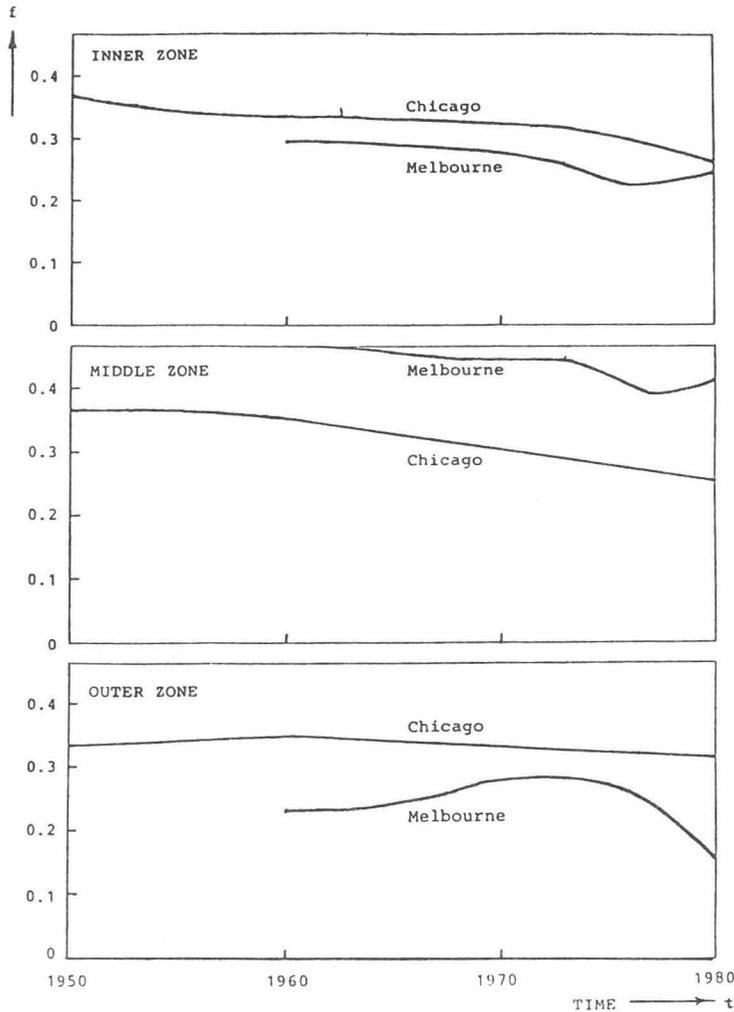


Fig. 6. Ratio of manufacturing jobs to total employment in each zone, Chicago and Melbourne, 1950-1980.

son, 1984). The social dimension of knowledge and competence communication seems to be extremely strong, with a fundamental need for face-to-face exchanges.

From the above, we might conclude that persons involved in the transfer of knowledge and technical expertise, and in other creative activities, will tend to cluster and grow in metropolitan areas and in centres of high accessibility. Examination of recent changes in Melbourne's economic and occupational structure confirms this trend (cf. the report on Melbourne in this volume). The professional and technical persons have been increasing steadily, particularly in the core area. Furthermore, the transportation and telecommunication revolution has primarily had a suburbanization effect on those occupations involved in producing and transporting goods (sector II) and in the routinized transmission of information (sector IV).

In order to understand all the economic change processes discussed above from a theoretical point of view, it is necessary to go beyond the theory of comparative advantages (typically a static approach relating to specialization based on costs alone) to a more general dynamic analysis of product cycles and innovation diffusion. In the final section, we shall briefly outline a descriptive explanation of product cycles and their influence on the location of birthplaces for new products and economic activities as well as the successive relocation of existing activities.

PRODUCT CYCLES AND TIME-SPACE HIERARCHIES OF ECONOMIC DEVELOPMENT

Much of the discussion above (pp. 212ff.) concentrated around the notion of a general technological development cycle (see Table 3 and Fig. 3). To facilitate this endeavour, economic structural change has been measured in an extremely aggregated fashion. In order to identify the real agents of change, we must descend to the more detailed level of a competitive market. As a complement to the analytical results presented earlier, we shall elaborate on the leader-follower notions associated by Vernon (1966) with the stage of a product's life cycle in the competitive marketplace.

Vernon's basic position can be understood most fruitfully in a spatial context (see Fig. 7). Each new product undergoes an initial development phase, during which it enters the most advanced regions of the world after a period of research, development and testing. The product is then primarily produced in a few regions with a comparative advantage in terms of high R & D capability and access to employment categories with the necessary profile of competence. These regions constitute the "leaders" of the product cycle in geographical space. The new product is gradually exported from these regions to other importing regions (followers). When the product has matured in terms of process development (design of production techniques) and market penetration, the original "leader" region loses its comparative advantage and production decentralizes.

The shape and speed of the development cycle of a specific product is contingent upon if and when a competitive substitute enters the scene. In the absence of *product substitution*, the development cycle may be characterized by *spatial substitution* of the following nature:⁴ As the technology is improved (through process change) and the technological knowhow spreads, it becomes easier to replicate it at other locations. With increasing scale and a corresponding technological maturity, production costs are reduced. The product becomes standardized and new production units can be placed closer to distant markets. At the stage when the production technique has become automated and standardized, its relocation to initially less favorable locations (which may now provide more advantageous economic conditions) becomes viable.

In this way, the theory predicts a time-space hierarchy of comparative advantages and sequential relocations for a given technological solution (see Andersson and Johansson, 1984). It is with the more detailed analysis of this changing hierarchy that later phases of the comparative study may be concerned.

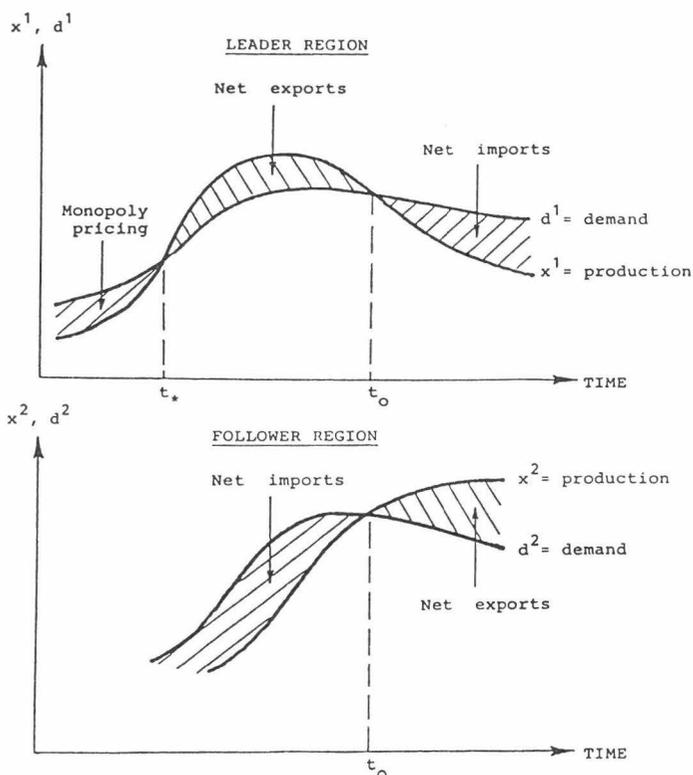


Fig. 7. Production and notional demand of "leader" and "follower" regions.

CONCLUDING REMARKS

The foregoing analyses encourage speculation on a number of scores. For example, the persistence of peripheral demoeconomic growth in all the metropolitan regions under scrutiny suggests that agglomeration diseconomies emerge in *central locations* as the metropolis matures. As soon as plants begin to decentralize, as they inevitably do on reaching maturity, the centres of (larger) cities lose their "incubator" function and begin to decline. This is related to another Vernon hypothesis (Vernon, 1960), namely that central cities are hospitable to innovation and new industrial processes only so long as they are the scene of external economies. Yet, as firms grow, they desire scale economies rather than external economies and may therefore seek the cheap land in peripheral areas. Thus they leave the centre and add to its decline by no longer providing external economies to newcomers.

One may also speculate on the relative speed of apparent economic change at different scales of industrial focus within a metropolis. The preliminary results obtained in Section 2 suggest that it can take somewhere between one hundred to three hundred years for a metropolitan region to restructure its employment base in terms of major sectoral shifts such as manufacturing to services. At the level of individual industries or markets, however, the pace of competition and substitu-

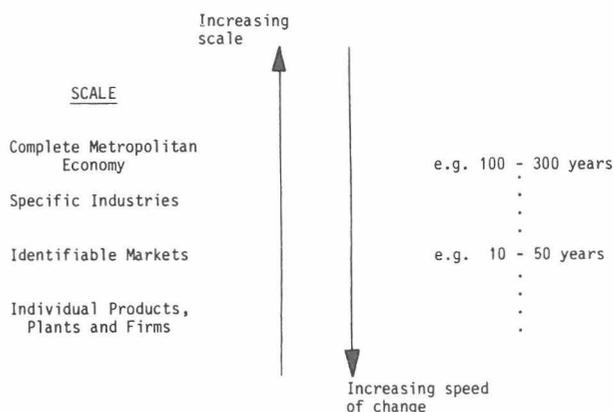


Fig. 8. The relationship between speed of structural economic change and scale of observation within metropolitan regions.

tion is much faster in relative terms (10–50 years) (see, for example, Fisher and Pry, 1971; Linstone and Sahal, 1976; Marchetti and Nakicenovic, 1979; Batten and Johansson, 1984). There appears to be a nesting of many faster substitution processes (firms entering, competing, losing their market share) within an apparently slower job restructuring process (see Fig. 8). Being largely an aggregation problem, this result emphasizes the sensitivity of apparent speed to the scale of analysis involved.

Our final speculation is both significant and controversial. Although the processes of economic restructuring and job dispersal within different regions are rarely identical, and proceed at a wide range of speeds (as noted above), in almost every case the pace of the change is surprisingly steady. It would appear that irrespective of the scale of observation, and despite the existence of external discontinuities and perturbations, many structural demoeconomic changes may proceed at quite an orderly rate when measured in relative terms. An optimistic explanation is that, structurally speaking, certain metropolitan patterns of socio-economic change operate in a fashion akin to learning systems. In the midst of a plethora of suggested economic shocks, structural instabilities, and bifurcations, it is refreshing to encounter even this small whiff of possible regularity.

ACKNOWLEDGEMENTS

The author is very grateful for the various suggestions made by Åke Andersson, Börje Johansson and Michael Wiseman during the preparation of this report. Furthermore, sincere gratitude is expressed to all members of the project's international network who have generously provided the background information on which most of this report is based.

NOTES

- 1 For a review of the possibilities of modelling large scale structural changes such as those which have occurred during the seventies, the reader's attention is directed to a special issue of the journal, *Regional Science and Urban Economics*, and its introduction by Andersson (1981).
- 2 In this and other respects, the current IIASA project differs substantially from earlier comparative analyses of urban change. For example, previous IIASA research undertaken within the Human

Settlement Systems Task concentrated on functional urban regions (that is, the changing *physical* urban settlement patterns) and aggregate population shifts (see, for example, Hall and Day (1980), Hansen (1978), Kawashima and Korcelli (1982)). Comparative work associated principally with the Netherlands Economic Institute has dwelt on the identification of lifecycle stages of urban development (urbanization, suburbanization, deurbanization and reurbanization)—principally in terms of population movements and, to a lesser extent, job dispersal (see, for example, Klaassen et al. (1981), van den Berg et al. (1982), Drewett and Rossi (1984)). Neither of these studies examined relative employment structure or speed of technological change from a comparative viewpoint.

- 3 This type of market share analysis is not foreign to regional science. For example, Beckmann (1973) developed a three-sector growth model for a region in which the decreasing share of total income held by the agricultural and transportation sectors, and the increasing share commanded by a new "growth industry", were each described by a logistic curve.
- 4 In broad terms, a product cycle can be viewed as the result of both product substitution and spatial substitution proceeding in combination.

REFERENCES

- Andersson, Å. E. (1981) "Systems analysis of structural change", *Regional Science and Urban Economics* 11: 267–268.
- Andersson, Å. E. and B. Johansson (1984) "Knowledge intensity and product cycles in metropolitan regions". Laxenburg, Austria: IIASA, Working Paper, WP-84-13.
- Batten, D. F. (1982) "On the dynamics of industrial evolution", *Regional Science and Urban Economics* 12: 449–462.
- Batten, D. F. and B. Johansson (1984) "Product substitution and spatial cycles". Paper presented at the IIASA Workshop on Dynamic Analysis of Spatial Development, Laxenburg, Austria, October 1984.
- (1985) "Industrial dynamics of the building sector", in B. Johansson, T. R. Lakshmanan and F. Snickars (eds.), *Economic Faces of the Building Sector*. Stockholm: Swedish Council for Building Research, Document 1985: 6 (forthcoming).
- Batten, D. F., P. W. Newton and J. R. Roy (1984) "Melbourne: a background study". Laxenburg, Austria: IIASA, Collaborative Paper, CP-84-47.
- Beckmann, M. J. (1973) "The isolated region: a model of regional growth", *Regional and Urban Economics* 3: 223–232.
- van den Berg, L., R. Drewett, L. H. Klaassen, A. Rossi and C. H. T. Vijverberg (1982) *Urban Europe: A Study of Growth and Decline*. Oxford: Pergamon Press.
- Drewett, R. and A. Rossi (1984) *Urban Europe: Settlement, Structure and Change 1959–1980*. Aldershot: Gower.
- Fisher, J. C. and R. F. Pry (1971) "A simple substitution model of technological change", *Technological Forecasting and Social Change* 3: 75–88.
- Hall, P. and D. Hay (1980) *Growth Centres in the European Urban System*. London: Heinemann.
- Hansen, N. M. (ed.) (1978) *Human Settlement Systems: International Perspectives on Structure, Change and Public Policy*. Cambridge, Massachusetts: Ballinger.
- Kawashima, T. and P. Korcelli (eds.) (1982) "Human Settlement Systems: Spatial Patterns and Trends". Laxenburg, Austria: IIASA, Collaborative Proceedings, CP-82-S1.
- Klaassen, L. H., W. T. Molle and J. H. P. Paelinck (eds.) (1981) *Dynamics of Urban Development*. Aldershot: Gower.
- Linstone, H. and D. Sahal (eds.) (1976) *Technological Substitutions: Forecasting Techniques and Applications*. New York: Elsevier.
- Mansfield, E. (1961) "Technical change and the rate of imitation", *Econometrica* 29: 741–765.
- Marchetti, C. (1981) "Society as a Learning System: Discovery, Invention, and Innovation cycles Revisited", *Technological Forecasting and Social Change* 18: 267–282.
- Marchetti, C. and N. Nakicenovic (1979) "The Dynamics of Energy Systems and the Logistic Substitution Model". Laxenburg, Austria: IIASA, Research Report, RR-79-13.
- Peterka, V. (1977) "Macrodynamics of Technological Change: Market Penetration by New Technologies". Laxenburg, Austria: IIASA, Research Report, RR-77-22.
- Vernon, R. (1960) *Metropolis 1985*. Cambridge, Massachusetts: Harvard University Press.
- (1966) "International investment and international trade in the product cycle", *Quarterly Journal of Economics* 80: 190–207.

The Dortmund Region

DENNIS HAY and MICHAEL WEGENER

University of Dortmund, Institute of Spatial Planning, Postfach 500500, D-4600 Dortmund 50, GFR

INTRODUCTION

The Dortmund Region forms part of a much larger metropolitan system: the heavily urbanised and industrialised Ruhr region or “Ruhrgebiet” which is located in North-Rhine Westphalia in the west-central part of the Federal Republic of Germany. The metropolitan dynamics of the Dortmund region, and indeed of much of the Ruhrgebiet, are inextricably interwoven with the development of the coal mining and iron and steel manufacturing industries which have dominated the local economy for more than a century.

In its overall pattern, the spatial development of the Dortmund region closely follows the theory of urbanisation phases. This theory suggests that metropolitan regions tend to follow similar paths of growth and change, albeit at different speeds and at different points in time, whereby the relative changes in employment and population in cores and hinterlands of “functional urban regions” move from a stage of growth through several intermediate stages to a stage of decline of both core and hinterland (van den Berg and Klaassen, 1978; Hall and Hay, 1980). It would appear that the Dortmund region has now progressed in this sequence to a point where decline in the core is still largely compensated by growth at the periphery, but where total decline of the region has become imminent.

THE SPATIAL STRUCTURE OF THE DORTMUND REGION

Dortmund is located at approximately the centre of the Land (Federal State) of North-Rhine Westphalia—the third largest in terms of area, of the eleven Bundesländer in the Federal Republic, but the largest in terms of population, with nearly 17 million people resident in 1982. Within North-Rhine Westphalia lies one of the world’s most industrialised and densely populated regions: the Ruhrgebiet, an area some hundred by forty kilometres containing no less than eleven cities with over 100 000 population. Of these, three, Essen, Dortmund, and Duisburg, have over half a million population each. No one city in the Ruhrgebiet, or indeed in North-Rhine Westphalia, is primate. Rather, individual cities perform relatively specific urban functions and together combine to form a coherent polycentric city system.

The most widely used spatial and statistical definition of the Ruhrgebiet is that of the League of Ruhr Municipalities (Kommunalverband Ruhrgebiet), which extends over parts of three intermediate level administrative units (Regierungsbezirke). However, none of the administrative capitals of these three Regierungsbezirke lies within the Ruhrgebiet thus distancing the decision making process from the largest concentrations of population and economic activity. Currently, the Kommunalverband Ruhrgebiet consists of eleven metropolitan districts (Kreis-

freie Städte) and four non-metropolitan counties (Kreise). In 1982, the population of the Ruhrgebiet was 5.35 million.

The Dortmund region constitutes the eastern part of the Ruhrgebiet. It represents a polycentric spatial system covering an area of about 1 650 square kilometres with a population of about 2.3 million and about 920 000 workplaces in 1980. Because of its polycentric character, it is difficult to define a functional urban region in this multilevel spatial system. For this short presentation, a smaller region consisting of Dortmund itself and its immediate hinterland has been selected. This smaller region in 1980 had a population of about 1.06 million and about 410 000 workplaces in 830 square kilometres.

THE HISTORICAL CONTEXT

The Ruhr coalfield comprises five main basins with varying types of coal but all of a high quality. The original locations of mining were in the hilly areas on both sides of the Ruhr river where the coal seams outcropped at or near the surface. However, the major geological feature is that the seams dip to the north so that as they were mined the workings became deeper and deeper. Historically, technological developments in the coal mining industry kept pace with the increasing depth and difficulty of extraction and output per worker has increased over five times in the period 1850 to 1977. At the same time, the number of mines has fallen dramatically: from 281 in 1860 to 32 in 1977; and so has the number of miners: from 470 000 to 99 000. Absolute output has fallen more slowly from a peak of 130 million tonnes per year in 1940 to around 68 million tonnes in 1977.

The establishment of an iron and steel industry on the coalfields was a logical extension of the industrial development of the Ruhr given that iron ore deposits were nearby in the Siegerland and in the Sauerland; that good quality coking coal was mined in the Ruhrgebiet; that it was cheaper to transport ore than coal; and, above all, that a huge, accelerating demand existed—for bridges, ships, industrial plants and machinery, and for railways.

Both coal mining and iron and steel manufacturing had a profound impact upon the settlement structure of a region which had been primarily agricultural. With the opening of the first large coal mines around 1850, the sudden influx of imported labour necessitated hastily constructed, cheap housing. This tended to be located around the pits rather than in existing settlements so that very quickly an unplanned mixture of mines, mining infrastructure, spoil heaps and miner housing ("Zechenkolonien") developed. In the Dortmund region, this resulted in initial development to the south of the present city which remained and continued to grow even as mining activity moved further northwards. After 1870, demand for labour sharply increased as iron and steel works, as well as new pits, began to open in the area to the north of the present city. This caused an inflow of workers from eastern Prussia and Upper Silesia who settled within their ethnic groups around the new industrial locations, more than quadrupling Dortmund's population to nearly 500 000 before the First World War. Between the wars, Dortmund went through a period of deep economic depression followed by hectic industrial expansion for the National Socialists' military rearmament of Germany. Because

of this strategic importance during the Second World War, damage to the settlement and industrial structure of the Dortmund region was particularly extensive with many of the basic industries rendered inoperative and the central part of Dortmund virtually obliterated (85 percent of Dortmund was destroyed).

ECONOMY AND EMPLOYMENT

In common with other western industrial nations, the economy of the Federal Republic felt the effects of the general recessions of the 1970's and early 1980's with declining domestic demand and a growing workforce both resulting in increased unemployment. At the same time, the process of the restructuring of the industrialised economies, with the trend away from manufacturing and towards the tertiary and quaternary sectors, has most affected those regions least able to adapt to the changing patterns of supply and demand. Because of its relatively monofunctional economic structure—nearly 20 percent of all jobs were still in coal mining and iron and steel manufacturing in 1980—the Dortmund region is particularly sensitive to fluctuations in these sectors and to the vagaries of economic policy at regional, national and, especially, EEC level. Moreover, the losses of workplaces in the primary and secondary sectors are more critical for the region, as, unlike in other West German agglomerations, they have not been compensated by proportionate job gains in the tertiary sectors which have been largely attracted to the large employment centres of the Rhine valley, Cologne and Düsseldorf. Tertiary employment in the Dortmund region did increase by 44 000 (or from 40 to 53 percent of all jobs) between the 1961 census and 1980, but in the same time interval primary and secondary employment dropped by 67 000, bringing total employment down to 410 000 in 1980, or 94.8 percent of its peak 1961 value.

Fig. 1 shows the basic trends of spatial development in the Dortmund region using a three-zone system. The inner core of Dortmund contains the central business district, significant blue-collar housing areas and two large iron and steel works of the Hoesch company which are located very close to the city centre. The zone called the inner ring is the remainder of the metropolitan district of Dortmund covering a relatively large area of mixed housing, industrial and mining-related development. The outer ring of the functional urban region is still partly rural in character with a mixture of dispersed residential settlement, small towns, and industrial areas. The top half of Fig. 1 presents the development of primary/secondary and tertiary employment standardised as percent of 1950 values. (For data reasons, here core and inner ring had to be lumped together.) The trends are clear. In both zones, primary and secondary employment has fallen to or below its 1950 level, having peaked in the early 1960s. In contrast, the tertiary sector grew rapidly in both zones to 1961, with the core and the inner ring exceeding the hinterland. From 1961, the rates slackened and by 1970 the outer ring had overtaken the core and the inner ring.

These coarse trends, however, conceal individual industry fluctuations. Most significant is the drop in employment in coal mining which came as a result of a shift in demand to oil and gas in the 1960s. Huge subsidies to the coal industry

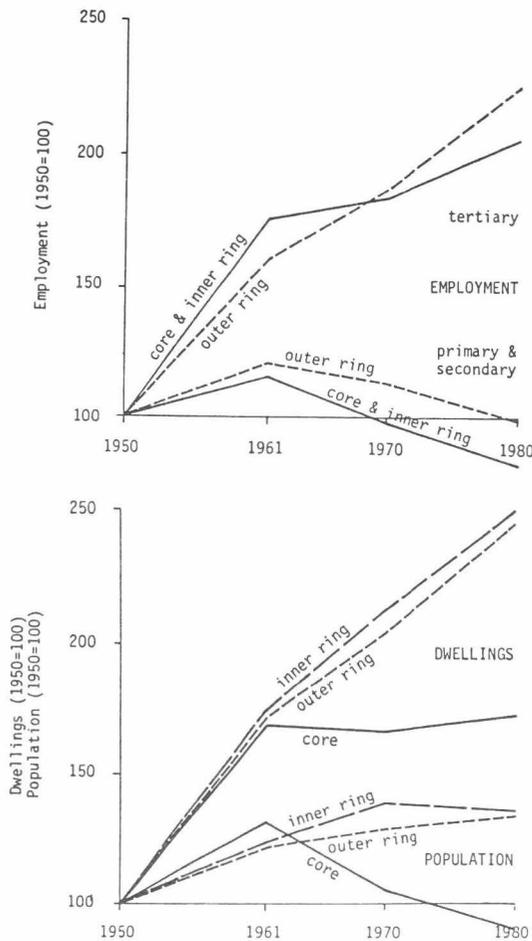


Fig. 1. Employment, housing, and population by zone in the Dortmund region, 1950–1980.

(currently around 13 000 million DM per year—the highest subsidy per worker of any German industry except the German railways) have considerably reduced the rate of decline of mining employment. However, there are now only two mines operative with some 15 000 miners left in Dortmund, and these, too will have probably disappeared by 1990.

The trend for iron and steel manufacturing, the other major industry of the region, is also downwards. Various crises over the last twenty years such as increased competition from abroad and the subsequent necessity to restructure has resulted in massive rationalisation and mergers of major companies in the 1960s. From 1966, the fortunes of the Dortmund region were very much tied to those of the Hoesch company which, apart from being a major employer in its own right, is linked to several subsidiary companies and to many more enterprises in other sectors. Between 1966 and today, rationalisation has led to the closure of several blast furnaces and Bessemer converters at Hoesch with the

effect that the company, which still employed 38 700 workers in 1958, today has only some 15 000 workers (and is expected to have only 7 000 by 1987).

POPULATION AND HOUSING

The process of economic decline in the Ruhrgebiet is accompanied by a process of demographic and social erosion. The decreasing employment opportunities in the region have exacerbated its traditionally negative image as a place to live—with the consequence that net migration into the Ruhr became negative in the 1970s and would have become so earlier if there had not been large numbers of foreign workers migrating into the region up to the first economic crisis of the 1970s and the subsequent change in the Federal government's immigration policy. In addition, the population of the Ruhrgebiet declines faster than in other, more prosperous regions due to the unfavourable age composition of those staying in the region.

Within the Ruhrgebiet, population decline is fastest in the metropolitan districts, whilst there are still a few rural counties which continue to grow. The gainers of this population shift are, in particular, the northern parts of the region, so in a sense the Ruhrgebiet moves to the North. However, population decline is also faster in the East than in the West—a clear indication of the relative lack of income opportunities in the Dortmund region. On the other hand, the exodus of people from the Dortmund region is not large enough to match the decline of employment in that region, hence unemployment in Dortmund has become the highest in North-Rhine Westphalia (1984: 16 percent) and has consistently stayed some 5 percentage points above the State average.

The spatial pattern of population development within the Dortmund region clearly follows the urbanisation-suburbanisation-deurbanisation sequence. The bottom half of Fig. 1 nicely displays these three phases. Until the 1961 census, population in all parts of the region increased. Between 1961 and 1970, population in the core declined, while the inner and outer rings continued to grow (the inner ring still at a higher rate). After 1970, the inner ring also started to decline, and growth occurred only at the periphery (although more recently the outer ring has changed into decline). In total, the population of the region increased by 25 percent between 1950 and 1961 and has since remained practically constant.

Despite this stagnation of population, the housing stock in the region has continued to grow steadily and, between 1950 and 1980, has more than doubled. This is due to the continuing trend towards smaller households, and also to the still rising incomes which have pushed housing floor space consumption in the region from 13 square metres per capita in 1950 to over 30 square metres in 1980. Fig. 1 demonstrates that, due to rising mobility and car ownership and due to the gradual exhaustion of residential land in the inner zones, this growth has been quite unevenly distributed over the region after 1961 (i.e. after the postwar reconstruction period). From then on, the number of dwellings in the inner city increased only minimally, while most residential construction occurred in the inner and outer rings. During the 1970s, the inner ring still captured more residential growth than the outer ring, but towards the end of the decade its land

reserves tended to become exhausted. So if the diagram were extended beyond 1980, it would show the inner ring falling back and the outer ring taking the lead.

CONCLUSIONS

With declining employment and stagnating population, the Dortmund region by the year 1980 seemed ready to enter the last stage of the urbanisation sequence, absolute decline of both employment and population in all parts of the region. Indeed, more recent data suggest that this is now happening, and it is foreseeable that during the 1980s, due to further outmigration and continued over-ageing of the demographic composition, population decline will be intensified in the core and the inner ring and will eventually affect also the outer ring. In that respect, the Dortmund region is perfectly normal.

Also in an international comparative perspective Dortmund is far from being an extreme case. Its loss of employment is much less than in other traditional mining or steel making regions such as South Wales, Lorraine, or Hainaut. Its population decline up to 1980 was moderate compared with that of Belfast or Manchester. Its housing conditions might be called excellent compared with those in Glasgow or Naples, whilst it still has no extensive areas of inner city blight like Liverpool or Birmingham, and has yet to see street riots as in Toxteth or Brixton. Seen from that perspective, Dortmund is also relatively normal.

And yet, knowing all this is not of much comfort to the people of Dortmund. What they perceive is that their city and region are on the brink of gradually being disconnected from the economic and social development of the Federal Republic. The real causes for this decoupling process are not easy to understand. To exclusively blame the "steel crisis" for the region's predicament, as has been done recently, would be too simple. It has been demonstrated by model simulations that even with a growing steel industry the regional economy as a whole would be likely to continue its downward path (Schönebeck and Wegener, 1985). With or without the "steel crisis"—the region like many other urban regions in Europe—is suffering the syndrome of urban decline the real causes of which are still not clearly understood and from which recovery seems to be very distant.

REFERENCES

- Berg, L. van den and L. H. Klaassen (1978) *The Process of Urban Decline*. Working Paper 1978/6. Rotterdam: Netherlands Economic Institute.
- Hall, P. and D. Hay (1980) *Growth Centres in the European Urban System*. London: Heinemann.
- Schönebeck, C. and M. Wegener (1985) "Wirtschaftsentwicklung und Raumstruktur—Gesamträumliche und kleinräumige Auswirkungen der Stahlkrise im Raum Dortmund", in Gryczan, W., O. Reutter, E. Brunn, and M. Wegener (eds.), *Zukünfte für alte Industrieregionen*. Dortmund: University of Dortmund (in press).

Metropolitan Processes and Policies in the Melbourne Agglomeration

DAVID F. BATTEN, PETER W. NEWTON and JOHN R. ROY

CSIRO Division of Building Research, P.O. Box 56, Highett, Victoria 3190, Australia

INTRODUCTION

To try to capture the key elements responsible for the complex change processes occurring within a metropolis, and then to condense their description into a few pages, are indeed challenging tasks. As Australia's second largest city, Melbourne's pattern of urban development reflects the operation of several powerful externalities in addition to its own internal dynamics. Relative to other metropolitan regions of the world, it may be classified as a young, sprawling metropolis of very low residential density. But as part of a nation which has relied extensively on foreign labour and foreign capital to support her development, the cyclical nature of Melbourne's growth pattern is characteristic of an urban economy which is responsive to decisions by consumers and investors in many other parts of the world.

For the reader who prefers to gain a concise summary of the development process without perusing the whole paper, we offer the following synopsis of the salient trends:

- sustained population growth before the 1970s; slowdown during the 1970s; mild upsurge during the 1980s
- ageing of the population structure
- declining female fertility
- steadily declining average household size
- persistent dominance of detached, single family housing
- low density patterns of urban sprawl
- persistent suburbanization of households and jobs
- rapid escalation in female workforce participation
- declining role of hitherto dominant manufacturing base
- growing reliance on foreign capital
- rising levels of recorded and hidden unemployment
- emergence of suburban labour markets
- higher proportion of non-radial journeys
- falling demand for public transport
- escalating car ownership
- planning controls largely limited to land use zoning

FACTS ABOUT MELBOURNE'S DEVELOPMENT

Table 1 contains a summary of facts about the development of the Melbourne region since 1954. In terms of population, Melbourne has now stabilized at almost

Table 1. *Basic facts about Melbourne's development*

Year	Population		Households Total (000s)	Jobs Total (000s)	Private cars Total (000s)
	Total (000s)	Aust. Share (%)			
1954	1 589	17.3	389		
1961	1 985	19.0	516	825	595
1971	2 503	19.5	725	1 075	1 013
1981	2 773	18.8	916	1 220	1 376

one fifth of Australia and over two-thirds of the state of Victoria. This is only just short of its traditional rival, Sydney, with which it has been staunchly competitive throughout the nearly 200 years of modern settlement in Australia. It is very likely that the rivalry between these two cities will remain central to the evolution and change of the Australian metropolitan system, since the development of each is also sensitive to other interactive elements linking cities in various parts of the world.

POPULATION TRENDS

The conclusion of World War II heralded the beginning of a 25-year period of sustained urban growth unmatched in Melbourne's modern history, during which the population doubled (to 2.5 million) and spread out to occupy an area twice that of London. Industrial expansion and large scale overseas immigration were the keys to this persistent period of strong growth. By the seventies, however, the city witnessed a sharp decline (see Fig. 1) in the growth rate. During the eighties, there has been a slight upturn, fueled largely by an upsurge in net gains from overseas immigration.

Whereas major peaks of population growth in most Australian cities have been associated with periods of extensive overseas migration, the declining rate of female fertility has contributed to a falling share of population growth attributable to births. The fact that the rate of births has not declined more dramatically, and may even rise during the eighties, is largely due to the current "echo effect" or generation gap in which the large cohorts of children born during the postwar "baby boom" (1950s and 1960s) marry and procreate. These effects, together with an ageing process fostered by improved life expectancies, have generated an age structure or profile which exhibits major bulges within various predictable age groups.

Although total population grew by only 24% between 1966 and 1981, the number of families increased by 48%. This increased rate of household formation is partly related to the factors mentioned in the previous paragraphs, but also reflects an increasing tendency for younger people to leave the family home before contemplating (longer) over marriage. It also stems from higher divorce and separation levels. Single person and single parent households have grown

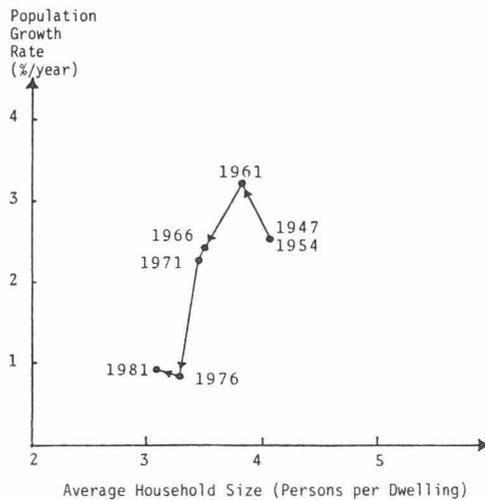


Fig. 1. Population growth and household size trajectories, Melbourne, 1947–1981. Source: Batten, Newton and Roy (1984).

markedly during this period, which partly explains the steady reduction in the average size of households (see Fig. 1).

There has been a persistent trend towards suburbanization of the city's population in the postwar period. Since this net outward movement is closely related to a similar decentralization of firms and job opportunities, we shall return to these processes when we examine economic trends.

HOUSING TRENDS

The key to changes in the demand for dwellings also lies in Fig. 1. One may observe that although there was a slowdown in population growth during the seventies, fewer people were residing in each dwelling. Thus the demand for dwellings has established and maintained a higher growth rate than that of the population.

Detached, single-family housing continues to dominate the urban fabric of the city both numerically (80% of all dwellings in 1981) and spatially (with apartments being concentrated in the core). This has been a key factor in the low-density sprawl which has characterized Melbourne's suburbanization process in the postwar period. More than 90 per cent of the new houses are provided by the private sector: the number of dwellings completed per annum by this sector doubled during the sixties, but the small proportion provided by the public sector remained approximately constant.

Owner-occupancy levels are quite high by world standards, with more than two-thirds of metropolitan households either owning or purchasing their dwelling. This proportion has maintained a surprising constancy throughout the whole period under scrutiny. Nevertheless, the demand for public housing among the less affluent groups has remained high, with queuing and shortages averaging 18 thousand during the 1970s.

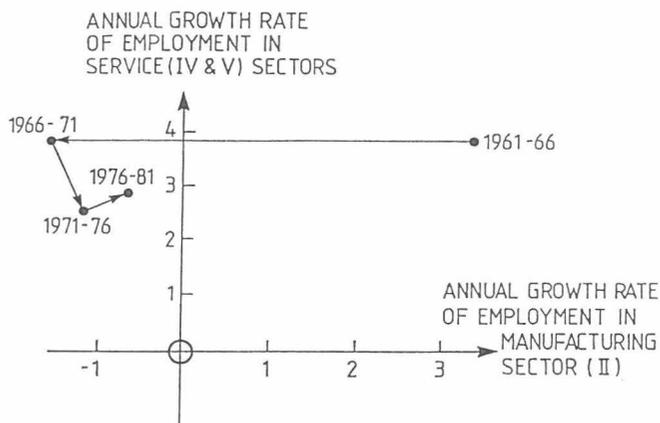


Fig. 2. Growth rates of employment in service versus manufacturing sectors, MSD, 1961-81.

Of particular significance to the house-and-land package are the important changes which have occurred with respect to the spatial configuration of land values. The land price gradients reveal that between 1977 and 1979 inner city prices increased at a faster rate than prices in the suburbs. On average, land prices in the outer suburbs actually fell in absolute terms (possibly due to sharp rises in the energy prices and hence transportation costs). This trend, a definite reversal of earlier patterns, has persisted into the eighties.

ECONOMY AND WORKPLACE TRENDS

The broadly changing industrial structure of Melbourne's economy during the postwar period can be gleaned from Fig. 2. Fewer and fewer jobs are now being generated in the manufacturing sector, whereas the service sectors associated with business, commercial, public and household activities are expanding at about 3% per annum in employment terms.

The evolution of the spatial structure of Australian cities has not been confined to the outward movement of population and gentrification of the inner areas. Processes of job suburbanization have been widespread for many years, and appear to have accelerated through the 1960s and 1970s. In 1961, the central core contained a large surplus of jobs (55% of all jobs) over resident workers (less than 20% of all workers). By 1981, the respective figures had fallen to 27% and 9%, emphasizing the erosion of the core for both industrial and for residential location.

Fig. 3 depicts the changing relationship between job opportunities and the distance from the central district, which confirms that a higher percentage of those who are employed in the centre are now living in the outer areas. When relative rates of inner and outer area job change are calculated, the percentages show that the rate of suburban job growth has slowed appreciably since 1961 (Table 2a).

But perhaps the most significant feature of recent job suburbanization has been the changing structure of Melbourne's economy, both spatially and sectorally.

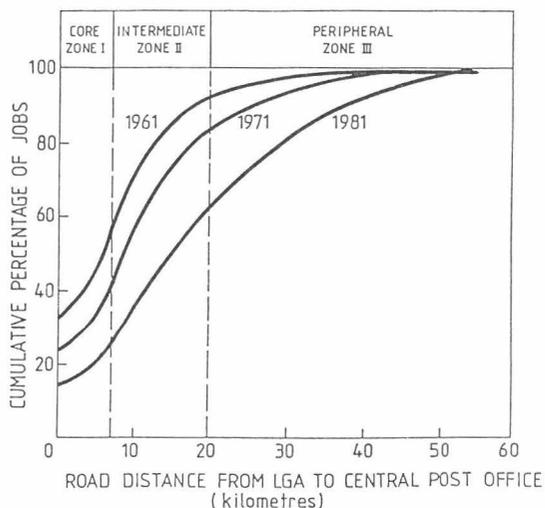


Fig. 3. Changing relationship between job opportunities and distance from the central business district. (Note: The job population at the origin represents employment in the City of Melbourne.)

There is an increasing tendency for secondary (manufacturing), quaternary (business services) and quinary (public and personal services) activities to be found in concentrations away from the heart of the city (Table 2b).

Comparisons of recent changes in Melbourne's sectoral and occupational structure confirm a pattern in which lower skilled jobs are giving way to automated processing and higher levels of skill and qualifications (Fig. 4). Declining workforce participation rates among males and a marked increase in female rates

Table 2a. Relative rates of job change: inner and outer areas, 1961-81 (in relation to the overall Metropolitan growth rate)

Year	Inner area (%)	Outer area (%)
1961-1966	-12.7	+15.5
1966-1971	-11.6	+10.7
1971-1976	-12.9	+ 8.6
1976-1981	- 5.1	+ 3.1

Table 2b. Outer areas by industry classification, 1976-81

Zone	Job classification		
	Secondary (%)	Quaternary (%)	Quinary (%)
II. Intermediate	- 9.0	+ 2.4	+ 1.9
III. Peripheral	+30.9	+31.4	+21.3

Source: Metropolitan Employment Analysis, Melbourne 1961-81, *Unpublished MMBW Report*.

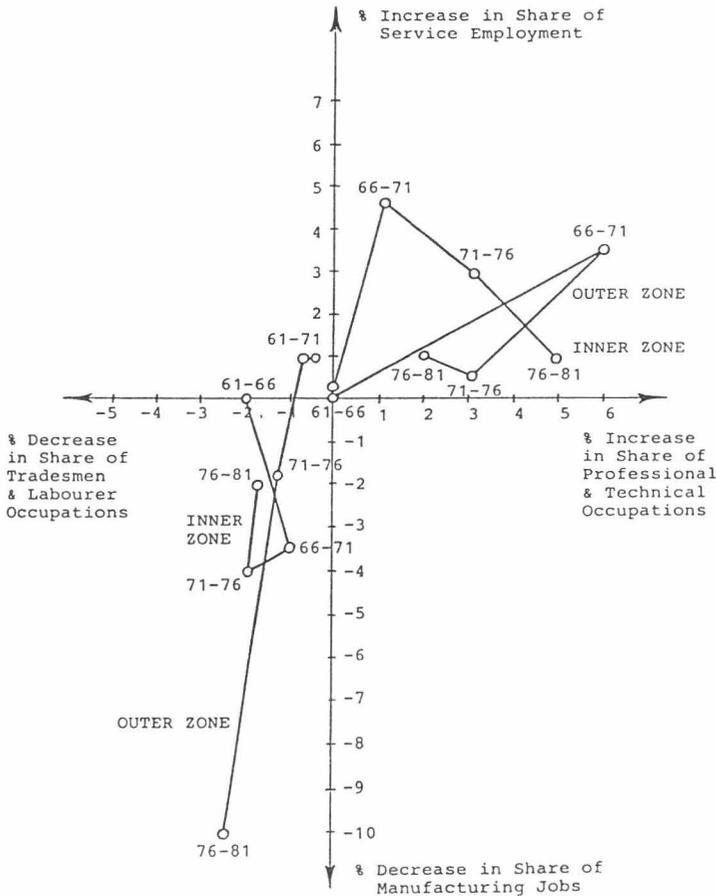


Fig. 4. Per annum changes in economic and occupational structure, Melbourne, 1961-1981.

have emphasized a widening gap between the size of the labour force and the number of jobs occupied. Unemployment reached an official level of 9% by the end of 1983, however an unofficial estimate which takes part-time and “discouraged” workers into account suggests that total unemployment may be almost twice that level.

TRANSPORTATION TRENDS

Escalating ownership and use of the private motor car in Melbourne has probably been encouraged by the processes of suburbanization, since suburban jobs are far more accessible by car than by public transport. Although Melbourne’s train network dominated the transportation situation during the last century (steam trains in 1854, full electrification by 1923), and has strongly influenced the radial development patterns, public transport patronage has eroded substantially as the suburbanization process spreads. The greater need for crossregional journeys has not been met by public transport systems in the metropolitan region.

Melbourne's road network is basically rectilinear in the central area, with major arterial roads forming square grids. Major highways cut diagonally through this rectilinear pattern, and a predominantly radial system of freeways has been added during the last two decades. The older radial routes support the 230 km length of tramway track, which has remained basically unchanged since the middle 1950s. The tramway network extends from the inner suburbs out to some of the middle suburbs. Public and private buses play a minor role in the public transport system, and all transport infrastructure is only changing very slowly (except at the outer fringe).

The transport picture is one of steadily declining use of all modes of public transport, with a strongly escalating pattern of private car ownership and use (particularly for non-radial trips). Off-peak users of both the public and private transport systems tend to subsidize the peak users, particularly in the case of private transport.

Because of the relatively smooth topography of the metropolitan area, together with continued use of public transport modes for journeys to the Central Business District, Melbourne does not suffer the extreme peak-period road congestion problems found in many other cities of comparable size. However, air pollution problems can arise on days when temperature inversions occur.

PLANNING AND POLICY-MAKING TRENDS

The role of planning and policy-making in the metropolis of Melbourne can largely be characterized by reference to the following four evolutionary stages of the city's development:

Stage 1—THE PASTORAL PERIOD (1835–1929) during which control of metropolitan planning and development was exercised using the English zoning approach to land use.

Stage 2—THE RESIDENTIAL PERIOD (1929–1947), during which priority was given to the protection of residential areas and the removal of incompatible land uses, especially industrial activity, resulting in the uncoordinated provision of infrastructure.

Stage 3—THE POST-INDUSTRIAL PERIOD (1971 onwards), during which a slowdown in growth has occurred, tempered by economic recession and substantial changes in the structure of the local and global economies, although Melbourne's planning agencies remain largely the same.

In summary, Melbourne's development since the Second World War has been characterized by a political environment largely antagonistic to the concepts of detailed economic and spatial planning. The general feeling has been that the city's morphology should be largely determined by the unfettered operation of free-market forces. Despite the general antagonism to planning in Federal circles, the State Government has gradually assumed greater responsibility, devoting departmental resources to the strategic areas of housing, transport, energy, commerce, industry, planning and the environment.

The current situation is one in which these State Ministries play an increasing role in formulating and implementing various planning and policymaking strate-

gies, thereby complementing the activities of the city's metropolitan planning authority (the Melbourne and Metropolitan Board of Works), whose role is largely confined nowadays to the exercise of land use zoning controls. In addition to these bodies, a number of other independent authorities and economic agents influence the final development patterns by striving to achieve the best result in their own terms. Consequently, controls on land use changes are not such a powerful weapon in today's arsenal for strategic planning.

It should be remembered that the major infrastructure decisions of the past (such as the provision of extensive rail and road networks) in themselves represent considerable inertia or resistance to future development possibilities. Furthermore, the unbridled speed of change during the Industrial Period was an important factor in limiting various opportunities to control or implement physical planning strategies. During this period, the planning system was really "running to catch up", rather than taking the initiative or providing the direction.

ACKNOWLEDGEMENT

The perceptive comments of Dr Kevin O'Connor (Victorian Ministry for Planning and Environment) have resulted in several major revisions to this manuscript. For his valuable insights, the authors wish to express their gratitude.

REFERENCE

- Batten, D. F., P. W. Newton and J. R. Roy (1984). "Melbourne: A Background Study". Collaborative Paper No. CP-84-00. Laxenburg, Austria: International Institute for Applied Systems Analysis.

Past Processes, Present Trends and Future Prospects of the Budapest Region

N. HÖRCHER and SÁNDOR KÁDAS

Hungarian Institute for Town Planning, Krisztina körút 99, H-1253 Budapest 1, and Institute of Mathematics and Computer Science, Karl Marx University of Economics, Dimitrov t.8, H-1093 Budapest, Hungary

INTRODUCTION. MILESTONES OF PAST DEVELOPMENT, PRESENT STRUCTURE AND TRENDS, FUTURE PROSPECTS

The capital of Hungary, Budapest, was established in 1873 by uniting three towns situated on both sides of the river Danube, Buda, Pest and Óbuda—Buda and Pest became the leading cities of the country already by the end of the 18th century. The population of the new metropolis was about 280 000 at that time. A rapid modern industrialization started attracting masses of people from all parts of Hungary and the population of Budapest grew by 160% until 1900, while the growth in other major cities of the country averaged at 50%.

In the first decades of this century the growth of Budapest slowed down within its old boundaries. New settlements grew around the old core and this tendency was backed up by the economic crisis around 1930—low income groups could not keep pace with growing costs in the city centre. This was the time of a first period in the suburbanization process. The damages of World War II were serious in the housing stock, industrial and infrastructural equipment of the city, though the reconstruction went on rapidly and finished by about 1950.

1950 marked a new milestone in the development of the capital: the settlements around the boundary of the city which had been steadily growing in the last few decades were annexed by Budapest enlarging its administrative area by 2.5 times and the population by 1.5 times, facilitating in this way a more balanced development in old core—old ring relation. A high level of concentration of the country's population, economic and cultural potential in the capital was reached by at time, and has not been changed much since then. This means about 20% of the population—in 1950 somewhat less, in 1970 somewhat more and recently stabilizing at 20%—and roughly 30% of the industrial potential; concentration of the cultural potential is still stronger. In a historic perspective this strong centralization is partly a consequence of the Trianon Treaty after World War I (two-thirds of the former territory of Hungary was annexed by the surrounding countries) and partly of agglomeration advantages offered by the capital for the extensive industrialization process both in the first half of this century and in the period 1950–1970.

In the economic development of the Budapest Metropolitan Area, an extensive industrialization characterized the period 1950–1965 attracting a lot of people from other parts of the country and enhancing employment rates for the former residential population as well. This was also a period of a strong state-financed housing activity.

Extensive growth of the production sectors—particularly extensive industrialization—gradually slowed down in the next period, 1965–1985. This was also the period of implementing important new traffic infrastructure investments: construction of new bridges, the renewal of old ones over the Danube, establishment of three underground lines. New trends were initiated by the new economic mechanism of Hungary introduced in 1968, by the energy price boom in 1973 and later in 1977. The importance of enhancing economic efficiency and competitiveness of Hungarian export goods recently became stronger driving forces than before.

Beside the suburbanization process at the end of the 1960s—which was, however, cut back to a certain extent by economic stagnation and rapidly growing expenses of individual traffic—a reurbanization process in the city centre was also emerging. This was backed up also by a new attitude of city planners concentrating on preservation and qualitative improvement of the existing housing stock and urban infrastructure instead of significant new extension of the built-up area.

The strategy of future development seems to follow this endeavour adding a new impetus by furthering private and small-enterprise initiatives. As to the economic structure, knowledge-based industries and population service activities should gain in proportion versus labour intensive material production in the Budapest area.

DEMOGRAPHIC PROCESSES

The Budapest Metropolitan Area contains almost 30% of the country's total population. This unproportionate concentration started to emerge at the end of the last century and reached its present high degree by about 1970. Table 1 shows how the population in the core (city of Budapest) and the two rings around it has developed in the last two decades. The population growth was markedly stronger for the whole area between 1960–70 (14.5%) than in the next decade (5.6%). But the differences in the dynamics of the development are even stronger in a spatial breakdown: Ring I was growing most rapidly (38.5 and 14.4% in the subsequent periods), while the development pace of the core strikingly declined (from 12.2 to 2.9%). Inside the core, population change was more balanced in the first decade than in the second one. As to the components of population change, in the core net migration is the dominant one—natural increase became even negative in the seventies. In both of the rings, natural increase and net migration contributed nearly equally to the population change.

ECONOMIC STRUCTURE AND EMPLOYMENT CHARACTERISTICS

Budapest was one of the most important industrial centres of the country already at the end of the last century. Since then the rate of industrial growth in the capital has been above the national average. After the reconstruction period following World War II the strong industrialization process concentrated on

Table 1. Residential population (in thousands)

	Pop. 1960	%	Pop. 1970	%	Change % 1960-70	Pop. 1980	%	Change 1970-80 %
Budapest	1 783	75.7	2 001	74.2	12.2	2 059	72.3	2.9
Ring I	246	10.4	340	12.6	38.5	410	14.4	20.9
Ring II	327	13.9	356	13.2	8.9	378	13.3	6.2
Ring total	573	24.3	696	25.8	21.5	788	27.7	13.2
Agglomeration total	2 356	100.0	2 697	100.0	14.5	2 847	100.0	5.6

Budapest as technical and infrastructural preconditions for industrialization were more favourable here than elsewhere. The rapid growth of the required labour-force as a consequence of extensive industrialization resulted in the increase of the activity rate of the residential population in the sixties and at the same time a large number of daily commuters (the proportion of commuters among those who worked in Budapest was 18% in 1970 and decreased only slightly later, to 17% by 1980). By the beginning of the 1970s the limits of extensive industrialization had been reached in the Budapest Metropolitan Area. No additional labour force remained available and changing world market conditions also forced a new, intensive phase of industrial development—technological renewal, sectoral restructuring etc. Industrial employment decreased significantly by 1980, while the share of the tertiary sector increased markedly (see Table 2).

It can be seen here that the decrease of the share of industry and construction and at the same time the increase of the share of the tertiary sector were stronger in ring I than in the core, while the proportion of the tertiary sector is still fairly low in an international context.

The future development strategy plans to make more use of the scientific and high-technology potential available in the Budapest area to increase the share of knowledge-based industries against labour intensive sectors here. A further improvement of infrastructural equipment and population service activities is also foreseen.

Table 2. Proportion (%) of active residential population employed in different sectors

	Agriculture		Industry + construction		Tertiary sector	
	1970	1980	1970	1980	1970	1980
Core	2.8	3.6	55.0	45.2	42.2	51.2
Ring I	10.9	11.9	61.5	49.5	27.6	38.5
In total	3.9	5.0	55.9	45.9	40.2	49.1

HOUSING TRENDS AND STRATEGIES

Housing construction was very intensive in the last two decades both in the capital and in the rings around it. The development was most dynamic in ring I. Housing construction took place in two rather different technological settings in the capital and in the two rings around it:

(a) In the core more than 70% belonged to state housing construction applying mainly prefabricated technologies. In the beginning, most of such new housing units became municipal dwellings with low rents. Gradually, an increasing share of them was sold to the user families trying to shift a part of the financial burden of housing construction from the municipal budget to the inhabitants. About 20% of the new dwellings was constructed by individual families as one-family houses, applying almost completely traditional construction technologies and materials. The remaining part of new houses with on the average 5–8 dwellings was built mainly by cooperatives and small private enterprises. The share of these was continuously increasing in the last few years.

(b) In both ring zones the division between construction technologies was the opposite one: 75% of the new dwellings were built as privately financed one-family houses while the share of municipal housing was only about 10%.

Some of the major indicators of housing quality in Budapest at present and as planned by 2000 are displayed in Table 3.

The most serious problems in the field of housing in Budapest—and in the surrounding ring zones, too—are as follows:

(a) The cost of housing construction increases at a rate which is almost the double that of the average inflation rate;

(b) There is no a unified housing market. The rents for municipal dwellings—although raised repeatedly—cannot cover the expenses of maintenance and are much lower than the costs of privately owned dwellings. Few municipal rented dwellings are constructed and the mobility of old renters cannot be assured under the prevailing regulations.

The strategy to cope with the unfavourable trends or at least to reduce their bad effects includes the following components: (a) To reduce construction costs by assuring unexpensive building sites and developing cost-saving new construction technologies, materials and management.

(b) To make further steps towards a unified housing market—promoting mobility among renters, etc.

Table 3. *Indicators of housing quality in Budapest*

	1980	2000
Person/dwelling	2.82	2.09
Family/dwelling	1.14	0.92
Room/dwelling	1.84	2.05
Person/room	1.46	1.02
Share of 1-room dwellings (%)	35	25–30

TRAFFIC FLOW STRUCTURE AND TRANSPORTATION SYSTEM DEVELOPMENT

The core of the Budapest Metropolitan Area, Budapest itself, has more than 70% of the population and an even higher share of transportation activities. As a consequence, bottleneck problems in the transportation sector and network development projects are associated mainly with this core region. Some of the special features of Budapest concerning location, transportation network and development characteristics are as follows:

(a) The river Danube cuts across the town in the very centre, causing a bottleneck in the capacity of the bridges, especially in the daily peak-hours.

(b) Both the railway and the highway networks of Hungary have a radial pattern with the center in Budapest. Therefore a large part of transit transportation flows has to go through the capital, the resulting burdens being especially serious in the highway transportation sector.

(c) Looking back over the past three decades transport demand and also the rate and quality of its satisfaction have grown dynamically. As for passenger transportation the tramway and in certain areas the bus was dominating in the 1950s and early 1960s. Motorisation became an important factor only at the end of the sixties. Through the construction of new lines and the modernization of existing ones the underground and suburban railway system, gradually becoming an overall network of rapid passenger transportation plays a more and more important role in the mass passenger transportation starting in the beginning of the 1970s. The development of motorisation slowed down in the last decade, mainly as a consequence of the rises in fuel prices and of slow economic development in recent years. Transportation network developments also slowed down somewhat, but the extension of the existing rapid passenger transportation network remains as the first priority.

Some of the findings of the recent traffic surveys and implemented forecasts:

(a) The split between public and individual traffic was 85:15 in 1975 and is expected to change for 72:28 by 1990 and 68:32 by 2010. But this development can be quite different according to different possible development paths of our country's economy and of the energy (fuel) prices.

(b) The trip flows associated with the city centre are significantly stronger at present than the flows between noncentral sectors. But in the forecast this first type of trip flows is expected either to stagnate or to increase only slightly in the future while a dynamic increase in most of the flows between noncentral sectors (over 100% in the next 30 years) is forecasted.

Part IV

Beyond Comparative Analyses of Metropolitan Dynamics

Beyond Comparative Analyses of Metropolitan Dynamics

FOLKE SNICKARS

Ministry of Industry, 103 33 Stockholm, Sweden and CERUM, University of Umeå, 901 87 Umeå, Sweden

International and national organizations engage more or less systematically in comparative analyses of the demographic, economic, and social development of nations. Several of them have separate divisions specializing in comparisons of regional development trends. Such work is primarily of use to planners and policy makers at the national level. The international flow of information concerning urban or metropolitan development is several orders of magnitude more scarce. It is as if planners and policy-makers in the large metropolitan areas of Europe and North America, would not need to cross-compare the development problems they wish to handle, and the policy instruments they attempt to utilize. It is as if planners and policy-makers in the rapidly expanding metropolitan regions of the third world would not need to learn the lessons of failed policy experiences in more industrialized nations. Urban and metropolitan policy needs to be more exposed to international scrutiny. There are many more metropolitan regions than nations. This means both that the variety of development paths to analyze is richer and that the international audience of interested actors is wider than for the national level.

One aim of the comparative analyses of the dynamics of a set of metropolitan regions reported in this special issue is to increase the understanding of the role played by public policy in shaping metropolitan development. From a high altitude, bird's eye view most metropolitan regions look alike. If the position of the spectators is lowered more and more detail is revealed. From a perspective four feet above the ground any metropolitan area seems to be unique and its development path so affected by special events and peculiarities that no generalizations seem meaningful. Superficially there may thus be a similarity in metropolitan development patterns in both market and planned economies in the industrialized world. At a micro level these similarities tend to disappear. The dynamics of different subsystems in the metropolitan regions are to varying degrees afflicted by policy, and the institutional settings surrounding those policies differ. Is it true that basically similar policies incepted in different institutional and economic settings lead to similar results? Maybe institutions are just equivalent ways of implementing policy which contains a core of universal communality? Maybe the fact that so many policies, intendedly and unintendedly, simultaneously affect the urban fabric entail that they cancel each other out? Or are they simply ineffective and not transferable to different settings?

In the 1950s, a classical study on spatial change described residential sprawl as a "tidal wave of urban expansion", implying a long-term role of concentric rings

around the urban core each one having the maximum urban residential density only at a certain point in time. When confronted with a study in this spirit, Stockholm planners refused to accept its results for that particular region. The counter-argument was that Stockholm, indeed, was a region with a carefully planned spatial structure, designed to be optimally served by an efficient subway system. Yet the data showed that the tidal waves existed also in Stockholm. Do such tidal waves exist in metropolitan areas in general? If so, to what extent does their progression depend on long-term acting policies of the public? Do the waves bounce back from the urban boundary and propagate again towards the urban core for a region with a stable building stock? Thus, do the waves exist also when no rapid urban expansion is present? Are there different but coupled waves of residential and work-place density?

Of course this example of urban dynamics is simplistic. Other theoretical concepts, more realistic than the tidal wave one, may be chosen. More detail may be given to the dynamics of the different urban subsystems at hand. The importance of the example is to shift the interest from short-term to medium- and long-term policies. What a planner regards to be short-term policies need not be looked upon in the same way by the analyst, however. Policies designed to affect short-term traffic behaviour, as for example reserved lanes for public transport in the road network, may have considerable longer-term structural effects.

Above we have characterized policies as short-, medium- and long-term. The meaning of these concepts is always relative to the study area. Here the long-term corresponds to the Schumpeterian long waves of the building and fixed capital stock in the urban region. Its dynamics operate in a 20–40 year perspective. The medium-term may be characterized in terms of mobility processes as the residential and work-place change. On the average, a household moves every five years. Relocation is, on the average, more common among industry. The medium-term here is not to be looked upon as shorter than the yearly cycles. To make the separation between the medium- and short-term policies as clear as possible, the short-term concept might be attached to the daily functioning of the urban system. This time-perspective does not only refer to commuting flows but also to flows of goods and services among the urban production systems.

The long-term layer of metropolitan development is reflected in the land-use pattern in the urban region and refers to the development tempo of the fixed urban capital built on the land. An urban study to go beyond mere comparison needs to have information on the location, composition, age structure, and associated characteristics of the building stock in the region. A study oriented towards the long-term needs to have this information for as long a historical period as the one for which scenarios for future development are to be discussed. This is of course one of the main reasons for engaging in such a comparative study in the first place: The expectation to gain insight into the possible future development of the urban region at hand by comparing with development traits concerning the physical structure in other metropolitan areas. Such a comparison needs also to involve the classes of policies (network expansions for transport and energy systems, zoning policies for the work-place distribution) utilized in the various regions. To attain the goal to reach beyond present state comparative

analyses, the study also needs to investigate the methods and models used to plan the physical structure, and evaluate effects of planning actions.

The medium-term layer of the working of the metropolitan system refers to the dynamics of the economic and demographic processes taking place within the built-up stocks. Whereas the long-term analysis centrally addresses the spatial dimension, the medium-term one is more oriented towards sectoral analysis. The analyses then relate to economic and demographic structural change, subregionally and for the whole metropolitan area, over time. The life cycles of residential and work-place districts are examples. Urban renewal in the long-term layer would involve upgrading a work-place zone by modernization. Urban renewal in the medium-term would relate primarily to a change in its sectoral structure. The policies to analyze in this layer to a large extent refer to mobility.

This time perspective is also appropriate for an analysis of how the demand and supply sides of the different markets are organized and function. The development of household structure and income distribution not only influences housing demand but also several supply subsystems at hand in the region. One might conjecture that there is a similarity between the demand patterns of households of a similar socioeconomic status in most metropolitan regions. This is also in agreement with the way consumer demand is modeled in countries with different institutional settings. The differences should be much larger when it comes to the organization of supply. For instance, there is still a lack of comprehensive theory for the dynamics of intrametropolitan work-place distribution. There is also reason to believe that the market channels and market mechanisms are different. Some of these differences are introduced by the public sector by means of laws, rules, and regulations. Others involve variants of free market institutions.

The daily mobility patterns are at the face of the urban complex. The importance of the metropolis as a promotor of intense daily contacts is evidenced in many analyses of urban productivity advantages. The problem of forecasting commuting patterns has been covered at length in regional science research. The need to enhance the methods for forecasting other trips (service, business) and other flows (goods, information) within urban regions is well documented. Public policies aimed at influencing the daily use of the urban systems relate largely to the transport market (parking, network modifications, fare policies). Labour market policies such as the introduction of flexible working hours reduce the pressure on the transport capacity in peak hours but spread it also to other parts of the day. An increased share of part-time work operates in the same direction. The latter is an example of a policy to mitigate the structural effects of a short-term acting process. A rigid view on workhours would cause relocation of households and firms. If the congestion problems were large enough only capacity expansions in the transport network would be capable of alleviating the problem.

Different urban processes operate at different speeds. The speeds may be different from the micro point of view of individual agents (households, firms) and from the macro view of urban process observers, or policy-makers. A prime example of this distinction is provided by the housing market. For the individual household, the decision to move is a seldomly recurrent process, a slow one. The composition of a large number of such slow processes leads to a fast-moving

process at the macro level. The brokers and housing agencies operate in this market, helping both households and landlords bridge the information gaps arising from the fact that mobility is a slow micro process subject to search-induced uncertainties.

If the state of an urban system is defined as the values taken by processes acting in all the three time-segments, different state variables will stay in a certain state longer than others. This means that some urban processes equilibrate in much shorter time intervals than others. A proper understanding of where the interaction of these different equilibrium and non-equilibrium processes will lead the urban system is necessary to arrive at a useful conceptual framework for the study of metropolitan processes and policies.

The occurrence and evaluation of inter- and intraregional disparities in terms of concentration or segregation are central components to be analyzed within the current study. These regional disparities do not only relate to the welfare differentials felt by the household sector. They may also be interpreted in terms of regional differences in production factor endowments, public and private, and their associated factor costs. When analyzing these disparities a framework might be adopted of urban and regional development proceeding in nodal points of the interregional transport and communication networks. Basically all regional development in Sweden has occurred in the network defined by the local urban areas existing several centuries ago. Network expansions have been related to earlier network and node structures. Nodal expansions, as the growth of metropolitan areas, have occurred in points of high accessibility in the existing and currently operated network structures. Processes have been cumulative.

The metropolitan study presented in this issue refers to the internal dynamics of such nodes in the interregional networks which might be termed metropolitan. The internal dynamics of urban regions cannot be understood without analyzing the role of those particular regions in the larger urban and regional system. This is especially true with the ambition of understanding determinant factors behind long-term urban development. Phrased in terms of the three-layer model sketched above, this means that we should be aware that the urban region is an open system, exchanging massive amounts of materials and information with the rest of the world. Let us give some examples from the three speed-levels discussed earlier. In the daily scale the metropolis is a large-scale producer and consumer of goods and services, causing goods and service flows not only within the local hinterland but also to and from national and international markets. The mobility processes of households and firms simply change name from intra- to interregional migration when the regional perspective is broadened. The investment share in fixed capital is often lower for established metropolitan areas than for lagging regions. This is especially true if these shares are compared with the role a metropolitan region, like Stockholm, might play as the capital of a nation.

A modern metropolitan area is a prime example of a complex, hierarchical, and dynamic system. Analyses of the internal dynamics of metropolitan areas, without neglecting their roles in the larger networks of international and national nodes, are prime challenges for researchers with a variety of disciplinary backgrounds. If these tasks are not addressed, system analysts will be turning their

backs on one of the most urgent problems of the future, that of metropolitan regions facing bleak and bright development prospects alike. The prerequisite for passing beyond the stage of comparative analysis of metropolitan development in an international context is that appropriate theory is developed which can form a basis for a deeper understanding of the dynamic mechanisms of the tightly linked metropolitan processes. Some help in this work will be available in the recently developed theories of non-linear dynamic systems. Interdependencies create non-linearities. Non-linearities in even simple dynamic systems tend to deeply affect their stability properties. So do the time-lags so typical of many public decision-making systems. The theories also state that forecasting is inherently difficult in dynamic systems as metropolitan areas. Their development paths can only be understood in a historical context in which periods of structural instability of shorter duration have been intermitted by longer periods of stable change patterns.

These are some of the theoretical issues raised within the metropolitan study presented in this issue. There is plenty to do for a new generation of urban researchers properly schooled in using tools of non-equilibrium dynamic analysis in parallel with tools rooted in classical economic, geographic, or urban planning paradigms.

