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Jabłonna, Poland, May 23-30, 1983

Edited by

JOHN B. GODDARD and ZBIGNIEW TAYLOR

Due to space limitations not all contributions to the Seminar could be included in the present issue. Acknowledgments are made to the British colleagues for their help with the English language verification of Polish papers.

The Editors

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RESOLUTION

The seventh British-Polish Seminar was held at Jablonna, Poland, 23-30 May, 1983. The seminar discussed problems in urban, industrial and social geography and of regional and rural development. The seminar resolved as follows:

1. That thanks be recorded to the Institute of Geography and Spatial Organization of the Polish Academy of Sciences for organizing the seminar, to the British Council and Social Science Research Council for contributing towards travel costs and to the British participants for the gift of books to the Institute Library.

2. That the papers presented at the seminar be published in Poland.

3. That the next seminar be held in the United Kingdom in 1986 on a theme in human geography and continue the tradition of providing an opportunity for young research workers in both countries to discuss research of mutual interest.

4. That in view of the seminar's identification of topics of common interest to geographers in the two countries the possibility of co-operative research be explored with the objective of the presentation of joint or matched papers at the next seminar.

5. That in order to encourage this co-operation information on research activities in the two countries be exchanged, including that carried out by individuals not able to be present at the seminar and by non-geographers who have an interest in spatial problems; furthermore that personal exchanges be encouraged in order to develop this co-operative research.

Professor Jerzy Kostrowicki Professor John B. Goddard

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CONTEMPORARY BRITISH HUMAN GEOGRAPHY: A POLISH VIEW

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In the geographical literature one can find analyses of the development of British geography. Papers on this subject were written by both British and other geographers (for example, Unwin, 1978; Jones, 1979; Doornkamp and Warren, 1980; Claval, 1975, 1980a; Johnston, 1981). These papers, however, usually only make mention of the causes of developments in the subject and do not consider the successes of geography.

The aim of this essay is to indicate the causes of achievement in contemporary British human geography. It is also aimed to present the author's remarks on the socio-economic geography in Poland.[1] It should be pointed out, however, that the paper is not intended to make a full comparison of both countries. The author suspects that it would not be possible to make such a comparison within a necessarily short paper such as this.

For British readers, this paper presents a view of an outside observer who has a friendly attitude to their human geography but at the same time looks at it from a distant perspective. Perhaps in some cases, this makes it possible to have a more objective view. Therefore, the author of this paper believes that it is not 'carrying coals to Newcastle'. For Polish readers, this paper is primarily aimed to provide information. It may also offer some contribution to increasingly animated discussion on the present and future state of Polish socio-economic geography.[2]

'The basic measure of development of a scientific discipline is progress in the field of cognitive level and successful solutions to theoretically and practically significant research issues' (Chojnicki, 1973, 3). In practice, the development of such a discipline in a particular country is reflected in, for example, the number, level and variety of publications, scope of research interests, level of discussion, system of university teaching, number of good research centres. In my opinion, the present

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[1] The scope of subject-matter of Polish socio-economic geography, particularly economic geography, is much narrower than that of Anglo-American human geography because a number of economic-geographical sub-disciplines are not practised in Poland (see later). On the other hand, the Anglo-American economic geography covers, according to its etymology, only production branches (such as industrial, agricultural or transport geography), which means that it is narrower than the Polish (socio-) economic geography. The term 'human geography' is rather out of use in Poland because of its obvious associations with Ratzel's anthropo-geography.

[2] This discussion has intensified recently, also in connection with preparations for a national methodological conference held at Rydzyna in June 1983.

state of human geography in the UK has been determined by a number of factors. This paper is focused on a dozen or so major, in the opinion of its author, causes of this branch's development. [No attempt is made to arrange them in order of importance].

What then makes contemporary British human geography successful?

(1) Cultural and linguistic ties with the rest of the Anglo-Saxon world, and primarily with North America which, undoubtedly, has been the main source of guidance for innovations in the discipline after the Second World War. What may serve as an example of the benefits stemming from these ties is quantitative geography and ways it has developed. In the 1950s many British geography departments either encouraged their students to learn French or expected of them a knowledge of this language, and 'even in the early 1960s at least one prominent department encouraged students to read the French regional monographs as model geography' (Unwin, 1979, 164). Starting from the 1950s the influence of European geographers on British geography has systematically decreased[3], which was connected with the introduction of quantitative and deductive methods.

In the early 1960s the quantitative and theoretical revolution began to spread outside the US, especially in Britain, because (1) innovatory works were published in major American periodicals which are thoroughly studied in the UK, and what is more important (2) many British geographers visited the US. They returned with new ideas which they introduced into undergraduate degree courses in geography, and through the IBG Quantitative Methods Study Group (QMSG), among their fellow research workers (Johnston, 1979).

Unwin has a slightly different approach to this question. He is of the opinion that 'the so-called new geography had been imported into Britain' due 'to the absence of language difficulties, the ease and volume of trans-Atlantic contact, the relative freedom of the UK university/research environment, the widespread availability of powerful computers, the influence of early statistical work by climatologists, and, in retrospect perhaps the most important of all, the UK tradition of logical positivism'[4] (Unwin, 1979, 165).

The common ties, however, do not mean exclusively borrowing foreign ideas, concepts, or research techniques. In quantitative geography only, especially spatial and temporal analyses (for example, autocorrelation in space and time), exploratory data and categorical data analyses, have been developed very largely by British workers (Wrigley and Bennett, eds., 1981).

What is, of course, of primary importance in making use of others' achievements and in an exchange of ideas is a free flow of research workers, information and innovation between the UK and the rest of the Anglophone world.

(2) The number of departments of geography is big when compared with Poland.

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[3] Recent years in the UK have witnessed a growing interest in the achievements of French geographers. The object of interest, however, are not studies by regional geographers but those by radical ones (cf., e.g. Castells, 1977), and also partially by behavioural (e.g. Bailly and Greer-Wootten, 1983; Sarre, 1982) and quantitative geographers (e.g. Bennett, ed., 1981), and methodologists of geography (e.g. Claval, 1980b).

[4] It should be noted that the philosophy of science is generally identified either with logical positivism, or neopositivism, or positivism in the Anglo-American human geography (see, for example, Johnston, 1979, 1983; Johnston, ed., 1981). However, this is an oversimplification and, at the same time, one which makes it easier to criticise. The Polish geographical literature does not employ such terms as (neo) positivist geography or approach. In my opinion this results partially from a correct conviction that there was no direct connection between contemporary geography and positivism.

Area (1980, 335-6) mentions 85 departments of geography (nine in London itself), including 25 in polytechnics plus ten in colleges and institutes of higher education. The faculty of a small department of geography is composed, as a rule, of not more than 10-12 workers, that of a medium-size one — of up to 20, and that of a big geography department — of over 20 workers.[5] Apart from some autonomous institutions which have been or are financed by the government (for example, the Centre for Environmental Studies in London), nearly all research is carried out by institutions of higher education, mostly individually by their research workers who may conduct group research in informal teams. There is no institution as an academy of sciences, though some opinions have been voiced (e.g. Editorial..., 1978) in favour of considering the establishment of a geographical research institution (such as e.g. the Institute of Geography and Spatial Organization, Polish Academy of Sciences). It seems, however, that a great part of the British geographical community is of the opinion that the setting up of a purely research institute would be disadvantageous and unjust because it would introduce divisions into more and less privileged researchers.

It should be remembered, however, that the question of obligatory teaching hours, which is of crucial importance in Poland, is treated quite flexibly at British universities. If a research worker shows stronger research inclinations and has genuine achievements in this field, he is not overburdened with teaching. This is based on a correct assumption that it is necessary to respect research worker's individual predispositions which will also influence the whole department. Opinions about departments or schools of geography are based not only on the 'quality' of graduates but also on the research works written by their faculty members. It is quite common for research workers to have longer leaves (the so-called sabbatical years) for self-improvement, carrying out research, or presenting visiting lectures in other, usually foreign centres.

The research potential is incomparably more concentrated in Poland. The number of geographical centres is much smaller but the number of research workers in an average institute of geography generally is much greater. In general, however, the number of research workers among Polish geographers, including economic geographers, is much smaller than that of their British counterparts.

The biggest geographical institution in Poland is the Institute of Geography and Spatial Organization which is composed of ten units and employs about 90 research workers. University geographical centres are much more numerous in Poland than in the UK. They are situated in Warsaw (Faculty of Geography and Regional Studies), Poznań, Wroclaw, Cracow, Gdańsk, Łódź, and also at Toruń, Lublin and Sosnoviec (eight university institutes of geography). Other institutes at colleges of higher education, including those in economic schools in Warsaw (Central School for Planning and Statistics), and Poznań (Academy of Economics) and in three other centres: schools of pedagogy in Cracow, at Kielce and Słupsk, have a similar number of research workers as British geography departments. A very disadvantageous feature however, is the greatly variety of level of research staff in different centres.

(3) What is of major significance to a proper selection of research staff is the announcing of competitions for various posts.[6] Many outstanding scholars have been won over in this way even to weaker research centres; the School of Geography at Leeds University, for example, has started to be known since 1970 when A. G. Wilson

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[5] Al data cover human as well as physical geographers.

[6] It should be justly said, however, that on the British Isles there are (not numerous luckily) centres in which the research standard of the staff, including heads of the departments, is mediocre, and their views rather not very modern. This testifies to either uncompetitive ways ol filling posts or to a lack of appropriate candidates for vacancies.

moved from the Centre for Environmental Studies in London to Leeds. Until then the local Department of Geography was not conspicuous for its research standards among other centres.

There are considerable migrations of research workers amongst British centres. Migrations of scholars naturally contribute to the diffusion of innovations and information, thus creating favourable conditions for equalizing research standards all over the country.

In this country, as has already been mentioned, there are serious differences in research standards between various centres. This is due to (1) the housing situation in Poland notably the shortage of dwellings; (2) the fact that younger research workers avoid working in weaker centres which do not provide appropriate possibilities for self-improvement; (3) the passive attitude of weak centres in winning over good senior research workers (examples can be provided by university institutes at Lublin, Gdańsk, Toruń, and some departments in economic and pedagogic institutions of higher education). This passive attitude is reflected in a trend 'to force self-development irrespective of possibilities and the standard of education of own research staff' (Chojnicki and Kozarski, 1980, 264).

(4) The work ethics and sense of duty are common among research workers. In spite of medium salaries under British conditions (and much lower than West European ones), geographers are, in general, well-read. They confine themselves, as a rule, to the Anglo-American literature, which after all, is very rich. It is known that a detailed knowledge of the literature on a subject is extremely important because, with the critical approach of a research worker, it is possible to make a proper selection of research issues.

Great competition[7] amongst research workers makes the research standards equal and the number of significant names in literature impressive. Provincial centres have none of the sense of parochialism, which in Poland often serves as a pretext for unjustified lowering of the level of studies.

Many works, not only from the UK, are available through microfilms. Microfilm readers are part of the standard equipment of scientific libraries. British Ph.D. theses completed recently are made available normally within two weeks, and the US ones, within six weeks.

(5) Common computing equipment. As a rule, every geographical centre is equiped with a terminal connected with local computers or with independent micro-computers. If in the 1960s computers were rather uncommon at universities, in the 1970s they were used even by undergraduates (Unwin, 1978). Since computers from every centre are connected with the national computer system, it is possible to make use of all the programmes available on the British Isles by means of these computers. Terminals or micro-computers are operated by geographers with mathematical and statistical interests, and much less frequently by programmers trained in the field of spatial problems. In the late 1970s discussions were held on establishing a library of algorithms, and the distribution of spatial data.

There is no either formal or informal pressure in the UK to publish research results, especially when they fail to confirm preconceived hypotheses, i.e. when research, according to our criteria, ended in failure.

In Poland, there is practically no direct access to computers and calculations are made by means of submitting jobs to the computer centre. It has been pointed out many times (cf., for example, Unwin, 1979), that a direct access to a computer promotes the development of quantitative research.

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[7] Some (for example, Torsten Hagerstrand, personal communication) are even of the opinion that the big number of texts in the UK is a direct consequence of intense competition between research workers.

(6) A substantial number of various level monographs in different fields of applied mathematics and statistics is conducive to quantitative research. New works continue to be published in the field of statistical methods[8] (e.g. Wilson and Kirkby, 1975; Matthews and Hodgart, 1976; Nachmias and Nachmias, 1976; Norcliffe, 1977; Hammond and McCullagh, 1978; Silk, 1979; Thomas and Huggett, 1980; Matthews, 1981; Unwin, 1981), and since the mid-1970s in computing for geographers and planners (Baxter, 1976; Dawson and Unwin, 1976; MacDougall, 1976; Mather, 1976). In the second half of the 1970s, students learned multivariate statistical analysis primarily from two basic texts: Taylor (1977) and Johnston (1978).

Since 1975, the QMSG has successfully published a monograph series entitled *Concepts and Techniques in Modern Geography*. Each booklet discusses a concept or a method and gives examples of its application. More emphasis was put on techniques rather than concepts. The level of the series meets the needs of postgraduates rather than undergraduates, i.e. contrary to what was initially planned. Reviewers agree that the most popular booklets are those presenting techniques which have not been thoroughly discussed in standard texts.[9]

In Poland, a few texts on quantitative methods for geographers have appeared in translation (Gregory, 1963; Bocharov, 1971; Racine and Reymond, 1973). However, the choice of textbooks for geographers, is very controversial. Therefore, students of geography usually use either numerous Polish texts or those translated into Polish but written for non-geographers. The first Polish text on mathematics with elements of statistics for geographers was published as late as 1981 (Jokiel and Kostrubiec, 1981) though a few review publications were published in the 1970s. It should be noted, however, that the writing of texts in Poland does not keep pace with the practical applications of quantitative geography. Practical applications are far ahead of the writting textbooks, syntheses, and/or monographs. This phenomenon, however, cannot be considered desirable in the longer run.

(7) A practically implemented principle is that of pluralistic development of human geography which consists in the coexistence of various research concepts and paradigms within one department, university, or periodical. This is connected with a great tolerance of the scientific community towards others' innovatory views on the shape of geography[10] and towards their political views. Research workers in one department may practise and do practise regional, behavioural, humanistic, liberal, radical (including Marxist) and/or quantitative geography.[11] What deserves emphasis is a friendly attitude of British scholars to those geographers who represent a different line or methodology of research: they are considered equal partners in discussion by their colleagues.

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[8] *Social statistics* by Blalock (1960), a text which is not new but well-written enjoys much popularity among both teachers and students.

[9] A similar series entitled *Quantitative Applications in the Social Sciences* (Sage Publications, Beverley Hills, California) is published in the US but it is meant not only for geographers. A far-reaching comparison of both series has been made by Webber (1980).

[10] Unwin (1979) calls it a relative freedom of the British geographical community as opposed to the rigid hierarchical university structure in France and West Germany.

[11] The latter is represented, on the average, by one or two staff members at a department (Unwin, 1978). A 'quantitative geographer', in the British opinion, freely uses a full set of mathematical and statistical techniques, can discuss their details, and often carries out creative work on alterations of methods, new calculation programmes and spatial applications of mathematics. In my opinion, it would be possible to find only a few such representatives of quantification in Poland where it is relatively easy to be labelled as 'quantitative geographer', even after the application of one or two quantitative techniques in spatial research.

Is it good or bad that there are several research lines or trends in contemporary British geography? It is very good, I suppose, because it makes possible to encompass a greater number of spatial phenomena and processes analysed from various standpoints. Quantification, for example, obviously limits the scope of research to measurable phenomena and processes but what about those on which data are missing? The pluralistic development of a subject helps to treat more comprehensively the surrounding reality and effectively prevents the occurence of research 'blanks'.

Unfortunately, Polish socio-economic geography has many such blanks, e.g. some issues of theory and philosophy of geography, modern historical geography, political and election geography, cultural geography, allocation of resources, spatial disparities of prices, incomes and social inequalities, phenomena of social pathology, accessibility to some services, specific problems of rural transport, mobility of population in connection with incomes, consumer's spatial behaviour, geographical aspects of decision making, environmental perception, mental maps, time geography, medical geography. Personally, I am an advocate of a pluralistic development of Polish socio-economic geography which offers the best prospects under Polish conditions because it creates appropriate possibilities to meet the individual interests of research workers. It is also of significance that the technical equipment of Polish teaching and research centres e.g. computers, is rather poor (Taylor, 1982).

(8) The system of university teaching seems to meet better the current needs compared with the Polish system. It is both flexible, i.e. reacts quickly to novelties and adjusts itself to needs and is spatially differentiated. Every university implements its own syllabus. Without going into details, it seems that the Polish system of education, though much more traditional, is more thorough, while the British one is focused more on the individual training of students in the field of their chosen speciality.

British geographers as opposed to their American colleagues frequently have better humanistic foundations, which is a valuable capital in their studies, especially social ones. It may be supposed that the humanistic orientation is based on the position of historical geography at British universities.[12]

(9) There is genuine co-operation between representatives of different branches of science. Human geography has strong ties with other social sciences, especially with sociology, economics, history, philosophy (e.g. Chorley, ed., 1973; Harvey, 1973, 1982; Chisholm, 1975; Smith, 1977; Bennett and Chorley, 1978; Gregory, 1978; Dicken and Lloyd, 1981; Stoddart, ed., 1981), regional science, operations research and physical planning. Geographers actively participate in planning work.[13]

Joint meetings and co-operation with research bodies outside the direct geographical fraternity are quite frequent. Interdisciplinary environmental groups, set up in some centres, treat geographers as equal, sometimes extremely desirable collaborators and co-authors. They are active and go beyond geographical literature (Chisholm, 1959, 1971; Haggett, 1978; Cliff, Haggett and Ord, 1979); they write, for instance, for statistical periodicals (cf. special issue of the *Statistician* 1974, 3/4; Cliff and Ord, 1975); non-geographers, on the other hand, publish their papers in geographical periodicals (e.g. Floyd and O'Brien, 1976).

There is a true social demand for a considerable part of research. What may serve as a good example is unemployment perceived, by the way, as technological unemployment (which is a serious oversimplification, of course!). Unemployment is an important social, economic and political issue in the country where the number of those unemployed is as big as 3.2 million (Martin, 1982, 257).

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[12] It was Roger Bivand who called my attention to this fact.

[13] The planner's profession became exceptionally popular among geography graduates in the late 1960s and early 1970s. At that time geographers were in great demand as advisers for making planning decisions (Johnston, 1979).

What is extremely surprising for an outsider is the fact that research issues are deeply rooted in solving very real socio-economic problems. It is undoubtedly surprising when confronted with the available literature which is usually of a general character.

(10) An extremely favourable role in stimulating research is played by the method of research financing. Two Committees, the Human Geography Committee and the Environment and Planning Committee inspire and finance definite projects on behalf and from the funds of the Social Science Research Council (SSRC). The way of financing may be termed as an 'addressed' one. The basis for allocating funds, for which even students of geography may apply, is provided by a good justification of the planned work, its significance, and social demand for research results. The amount of subsidies, the time-period for which they are granted (practically from several weeks to three years depending on the issue), the subject of a project and its authorship are made known for the public in *Area*. There are also other sources for financing research such as the Department of Environment, the EEC, etc. (Doornkamp and Warren, 1980).

(11) A lively scientific discussion refers to real issues and is not carried on *ad personam*. A much less hierarchical system than the Polish one means that only arguments count in the discussion and not academic degrees and titles. The scientific circle shows considerable interest for every new concept or idea, without suspecting any misconceived 'novelties' in them. Readers' response to publications is very brisk, which can be well illustrated by the example of Gregory's (1978) book. One could hardly find a valuable work which would not be submitted to polemics, given a note or thoroughly reviewed in several geographical journals, not to mention discussed at working meetings.

(12) The correct principle of equal opportunities is in the force. According to this principle there are no eternal authorities in science. Every article or note for publication is sent to two independent reviewers who act anonymously. Such a procedure means that opinions are formed on the work and not on the author and understatements are thus avoided within the scientific community. Reviews are quickly written and indicate the line to be followed to correct the paper.

(13) One of the causes which is also a symptom of the branch's is a considerable (when compared with Poland) and ever growing number of geographical periodicals.[14] While assessing British geographical periodicals, one should remember about their varied profile. One cannot help feeling that they better meet social needs than Polish journals. British periodicals are assuming an ever more international nature. Publications are specialised, in a way, in various issues and their scientific level.

It seems to me that at least five periodicals: *Area, Transactions IBG, Environment and Planning A, Regional Studies*, and *Progress in Human Geography*, can be numbered among the best in the field of human geography. These journals, although dealing with various issues (some of them are of a general geographic character), most frequently include innovatory articles and ones often quoted in literature.

British periodicals are frequently objects of animated discussions.[15] This is fully understandable because the question of periodicals is of key importance not only for the publication of research results but also for university teaching.

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[14] Periodicals which started to be published in the past dozen or so years include, for example, *Progress in Planning* (1973–), *Cambria* (1974–), *Journal of Historical Geography* (1975–), *Teaching Geography* (1975–), *Journal of Geography in Higher Education* (1977–), *Progress in Human Geography* (1977–), *Applied Geography* (1981–), *Political Geography Quarterly* (1982–), *Government and Policy: Environment and Planning C*, and *Society and Space: Environment and Planning D* (both 1983–).

[15] Cf., for example, a discussion on *Transactions IBG* (Johnston, 1980; Steel, 1980; Lewis, 1980).

(14) Last but not least, it is hard to overestimate the role of the Institute of British Geographers established in 1933.[16] This body has a membership of about 1850 professional (academic) geographers. The Institute does not employ full-time employees (except for an administrative assistant) and its activity is focused on publishing (*Transactions IBG, Area, Special Publications*), on organization and primarily on research. An Annual Conference held at the very beginning of each year is a great scientific event and is attended by a majority of British geographers.

The research activity is carried out in 16 working groups (in 1982). The groups are partially subsidised by the Institute. Both the groups and the Institute often organize seminars, national and international meetings, publish their own Newsletter and initiate discussions on every issue of significance for the academic circle.

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It is possible to number more causes of the present state and development of human geography in the UK (e.g. topical and easily available information, and longer term co-operation between British and Swedish geographers which has recently produced a three-volume work edited by Carlstein et al., 1978). However, already this superficial and certainly incomplete set of causes indicates that they are relevant in part to the whole of Anglo-Saxon geography.

Generally, there are two types of reason. Some of them are characteristic of British geography only, for example, the cultural and linguistic ties with the rest of the Anglo-Saxon world. A majority of them, however, depend on the very academic circle of geographers.

The aim of my paper was to point to the causes of developments in human geography in the UK, and not to analyse the conditions of the discipline in Poland, but future discussions may bring at least partial answers to the relevant questions.

REFERENCES

Bailly A. S., Greer-Wootten N., 1983, Behavioural geography in Francophone countries, *Progress in Human Geography*, 7, 344–356.

Baxter R. S., 1976, *Computer and statistical techniques for planners*, Methuen, London.

Bennett R. J., ed., 1981, *European progress in spatial analysis*, Pion, London.

Bennett R. J., Chorley R. J., 1978, *Environmental systems*, Methuen, London.

Blalock H. M., 1960, *Social statistics*, McGraw-Hill, New York–Toronto–London.

Bocharov M. K., 1971, *Mietody matiematicheskoy statistiki v gieografii*, Mysl, Moskva (Polish edn. *Metody statystyki matematycznej w geografii*, 1976, PWN, Warszawa).

Carlstein T., Parkes D., Thrift N., eds., 1978, *Timing space and spacing time* (Vol. 1 — *Making sense of time*, Vol. 2 — *Human geography and time geography*, Vol. 3 — *Time and regional dynamics*), Arnold, London.

Castells M., 1977, *The urban question: a Marxist approach*, Arnold, London.

Chisholm M., 1959, Economies of scale in road goods transport? Off-farm milk collection in England and Wales, *Oxford Economic Papers*, 11, 282–290.

Chisholm M., 1971, Freight transport costs, industrial location and regional development, in: M. Chisholm, G. Manners, eds., *Spatial policy problems of the British economy*, University Press, Cambridge, 213–244.

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[16] To mark the *Fiftieth Anniversary of the Institute* a special issue of *Transactions* (1983, NS 8, 1) and occasional papers (e.g. Johnston and Doornkamp, eds., 1982; Green, 1982) have been published.

Chisholm M., 1975, *Human geography: evolution or revolution*? Penguin, Harmondsworth.
Chojnicki Z., 1973, Założenia i perspektywy rozwoju geografii ekonomicznej (Assumptions and prospects for the future development of economic geography), *Przegląd Geograficzny*, 45, 3–27.
Chojnicki Z., Kozarski S., 1980, Rozwój nauk geograficznych w latach 1973–1979 z punktu widzenia realizacji postanowień II Kongresu Nauki Polskiej (The development of the geographical sciences during 1973–1979 in the light of the decisions of the second Congress of Polish Science), *Przegląd Geograficzny*, 52, 251–270.
Chorley R. J., ed., 1973, *Directions in geography*, Methuen, London.
Claval P., 1975, Geography in Britain: a French view, *Geographical Journal*, 141, 345–349.
Claval P., 1980a, A Grand Tour through the length and breadth of British geography, *Area*, 12, 245–246.
Claval P., 1980b, Epistemology and the history of geographic thought, *Progress in Human Geography*, 4, 371–384.
Cliff A. D., Haggett P., Ord J. K., 1979, Graph theory and geography, in: R. J. Wilson, ed., *Applications of graph theory*, 2, Academic Press, London, 293–326.
Cliff A. D., Ord J. K., 1975, Model building and the analysis of spatial pattern in human geography, *Journal of the Royal Statistical Society B*, 37, 297–328.
Collins L., Drewett R., Ferguson R., 1974, Markov models in geography, *Statistician*, 23, 179–209.
Dawson J. A., Unwin J. D., 1976, *Computing for geographers*, Newton Abbot, London.
Dicken P., Lloyd P. E., 1981, *Modern western society. A geographical perspective on work, home and well-being*, Harper and Row, London.
Doornkamp J. C., Warren K., 1980, Geography in the United Kingdom, 1976–80, *Geographical Journal*, 146, 94–110.
Editorial comment, 1978, An institute for geographical research? *Area*, 10, 321–322.
Floyd B., O'Brien S., 1976, Whither geography? A cautionary tale from economics, *Area*, 8, 15–23.
Green F. H. W., 1982, Fifty years of the IBG: reflections of a founder member, *Area*, 14, 319–321.
Gregory D., 1978, *Ideology, science and human geography*, Hutchinson, London.
Gregory S., 1963, *Statistical methods and the geographer*, Longmans, London (Polish edn. *Metody statystyki w geografii*, 1970, PWN, Warszawa).
Gudgin G., Thornes J. B., 1974, Probability in geographic research: applications and problems, *Statistician*, 23, 157–177.
Haggett P., 1977, *Mid-term futures for geography*, Monash Publications in Geography, 16, Department of Geography, Monash University.
Haggett P., 1978, The spatial economy, *American Behavioral Scientist*, 22, 151–167.
Hammond R., McCullagh P. S., 1978, *Quantitative techniques in geography: an introduction*, 2nd edn., Clarendon Press, Oxford.
Harvey D., 1973, *Social justice and the city*, Arnold, London.
Harvey D., 1982, *The limits to capital*, Blackwell, Oxford.
Johnston R. J., 1978, *Multivariate statistical analysis in geography*, Longman, London–New York.
Johnston R. J., 1979, *Geography and geographers. Anglo-American human geography since 1945*, Arnold, London.
Johnston R. J., 1980, Death to the generals, *Area*, 12, 19–20.
Johnston R. J., 1981, Ideology and quantitative human geography in the English-speaking world, in: R. J. Bennett, ed., *European progress in spatial analysis*, Pion, London, 35–50.
Johnston R. J., 1983, *Philosophy and human geography. An introduction to contemporary approaches*, Arnold, London.
Johnston R. J., ed., 1981, *The dictionary of human geography*, Blackwell, Oxford.
Johnston R. J., Doornkamp J. C., eds., 1982, *The changing geography of the United Kingdom*, Methuen, London.

Jokiel B., Kostrubiec B., 1981, *Statystyka z elementami matematyki dla geografów* (Statistics and mathematics elements for geographers), PWN, Warszawa.

Jones E., 1979, Contemporary British geography, *Geoforum*, 10, 215–218.

Lewis D. A., 1980, A case for Transactions, *Area*, 12, 207–208.

MacDougall E. B., 1976, *Computer programming for spatial problems*, Arnold, London.

Martin R., 1982, Britain's slump: the regional anatomy of job loss, *Area*, 14, 257–264.

Mather P. M., 1976, *Computers in geography: a practical approach*, Blackwell, Oxford.

Matthews J. A., Hodgart R. L., 1976, *Further quantitative and statistical approaches to geography*, Department of Geography, University of Edinburgh.

Matthews J. A., 1981, *Quantitative and statistical approaches to geography. A practical manual*, Pergamon Press, Oxford.

Nachmias D., Nachmias C., 1976, *Research methods in the spatial sciences*, Arnold, London.

Norcliff G. B., 1977, *Inferential statistics for geographers*, Hutchinson, London.

Racine J. B., Reymond H., 1973, *L'analyse quantitative en geographie*, Presses Universitaires de France, Paris (Polish edn. *Analiza ilościowa w geografii*, 1977, PWN, Warszawa).

Sarre P., 1982, French behavioural geography, *Area*, 14, 191–192.

Silk P., 1979, *Statistical concepts in geography*, George Allen and Unwin, London.

Smith D. M., 1977, *Human geography: a welfare approach*, Arnold, London.

Steel R. W., 1980, A note of caution, *Area*, 12, 20–22.

Stoddart D. R., ed., 1981, *Geography, ideology and social concern*, Blackwell, Oxford.

Taylor P. J., 1977, *Quantitative methods in geography: an introduction to spatial analysis*, Houghton Mifflin, Boston.

Taylor P. J., Goddard J., 1974, Geography and statistics: an introduction, *Statistician*, 23, 149–155.

Taylor Z., 1982, Kryzys czy stagnacja? (Slump or stagnation?), *Biuletyn KPZK PAN*, 118, 261–270.

Thomas R. W., Huggett R. J., 1980, *Modelling in geography. A mathematical approach*, Harper and Row, London.

Unwin D. J., 1978, Quantitative and theoretical geography in the United Kingdom, *Area*, 10, 337–344.

Unwin D. J., 1979, Theoretical and quantitative geography in north-west Europe, *Area*, 11, 164–166.

Unwin D. J., 1981, *Introductory spatial analysis*, Methuen, London.

Unwin D. J., Hepple L. W., 1974, The statistical analysis of spatial series, *Statistician*, 23, 211–227.

Webber M. J., 1980, Literature for teaching quantitative geography: technique by, for, but not of geographers, *Environment and Planning A*, 12, 1083–1090.

Wilson A. G., Kirkby M. J., 1975, *Mathematics for geographers and planners*, Clarendon Press, Oxford.

Wrigley N., Bennett R. J., eds., 1981, *Quantitative geography: a British view*, Routledge and Kegan Paul, London–Boston–Henley.

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CONTEMPORARY DEMOGRAPHIC AND ECONOMIC TRENDS IN THE BRITISH URBAN AND REGIONAL SYSTEM

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INTRODUCTION

The purpose of this paper is to explore some of the features of what is becoming to be described as the 'new geography of Britain'. It is not long ago when researchers were able to make the following types of statement about the nation's spatial demography and economy:

'generally speaking, the only places where an actual decline in population has taken place have been rural areas. Such areas may be extensive (but) none of these constitutes a region of its own, and the decline of such areas is matched by the expansion of urban areas elsewhere in the region' (McCrone, 1969).

'In the congested regions the primary problem is to plan the expansion in such a way as to make the best use of space, minimise the social and economic costs of congestion and preserve the amenity of the environment. This means that some urban concentrations must be prevented from further population growth and expansion must be diverted to other centres' (McCrone, 1969).

Not unnaturally urban and regional policies were formulated to counter such problems as then perceived. Now such statements are no longer admissible and many such policies no longer applicable. The structural changes, social as well as economic, which have affected British society in recent times have had spatial ramifications which have transformed the geography of the country. To be sure there have been some recent spatial policy initiatives intended to counter the emergent problems but it is clear that they are far from being consistent and well reasoned. Policy options will be considered further in the conclusion of the paper where it will be argued that their currently enacted poverty lies just as much in a lack of understanding of structural processes of change as in a lack of political will. The main part of the paper will however be concerned to detail trends in population, employment and unemployment in the British urban and regional system.

URBAN POPULATION AND EMPLOYMENT TRENDS IN THE 1950s AND 1960s

A useful descriptive benchmark upon which to view contemporary trends is the study of British cities using a consistent functional area definition for the 1950s and 1960s (Spence et al., 1982). During this period the economy and society of the country underwent fundamental changes. It is therefore not surprising that the

nation's cities also experienced a massive transformation both in their internal structure and in the distribution of population and economic activity between cities in different parts of the country.

What have been the principal patterns of change? The most well known are those in the internal structure of the largest cities resulting from the substantial shift of people and latterly jobs from inner to outer urban areas, a process widely referred to as metropolitan decentralisation. Although decentralisation is most advanced and has contributed to the most undesirable consequences in the form of inner city problems in the largest urban areas, the evidence suggests that this process has come to characterise most British cities. Generally, decentralisation, especially to the outer metropolitan zones, has been most rapid in the more prosperous parts of the country, a situation which tends to suggest that this spatial process is related to underlying economic forces, notably the ability of people to turn preferences for lower density living conditions into actual residential choices and for industry which is expanding to seek out more extensive sites. On the other hand decentralisation from the decaying very innermost areas of British cities is not a prosperous area phenomenon, with the inner cities in development areas well represented.

Metropolitan decentralisation has not been confined within the bounds of the larger cities or even to their immediate commuting hinterlands. The out movement of jobs as well as people over ever increasing distances has resulted in significant changes in the status of frequently smaller settlements peripheral to the largest cities; many of these having become significant employment centres in their own right. The effect of this combined out movement of population and employment from large cities, most of which are concentrated in the main axial belt of urban England stretching from Manchester to London, has been a net shift of population and employment away from this older heartland into intermediate and smaller sized settlements in previously less industrial parts of the country, notably in East Anglia and the South West. Environmental amenity is clearly becoming a consideration in the inter- as well as intra-urban transfer of population. Many smaller towns both within and outside this axial belt experienced rapid growth in the 1960s. Industry which has become increasingly footloose, has frequently followed population, seeking out locations in the inter-metropolitan periphery.

It is under these relatively recent inter-urban trends that the long established shift of population and economic activity from north to south of the country has continued to operate. Many of the problems of Britain's traditionally declining regions appear now also to be urban problems exacerbated by changes in the intra-regional distribution of population and economic activities, changes which in a number of respects have heightened intra-regional differences relative to those at the inter-regional scale. The decline of large cities in once more prosperous regions, notably London in the South East and Birmingham in the West Midlands contributed to further dampening down these inter-regional contrasts.

Population and employment shifts within and between cities in the 1950s and 1960s have therefore led to a fundamental restructuring of the settlement system of the country, a restructuring which may prove as significant as that occurring during the 19th c. when industrialisation and urbanisation went hand in hand to produce large concentrations of population in particular parts of the country endowed with certain natural resources. At both the urban and regional scales, once peripheral areas have now become the locus of growth, while previously core cities and regions have faced problems of stagnation and decline.

As a context for what follows and in order to provide some substantive support for these generalisations about urban change in Britain some of the findings of the research on British cities can be briefly summarised.

(a) The dominant trend for population is accelerating decentralisation, initially

from urban cores to their inner commuting hinterland, but subsequently spilling over in the 1960s into the outer commuting hinterlands, areas which are only weakly connected to the urban core. While population was decentralising in the 1950s, jobs were growing most rapidly in the urban cores where the bulk of employment was concentrated. In the period 1961–1971, however, job formation occurred more rapidly in the commuting rings than in the urban cores. Just as the national employment growth in the previous decade had chiefly benefited urban cores, so the effect of slower employment growth in the next decade was felt most strongly in these areas of the nation's cities which in aggregate experienced a net loss of 439,000 jobs (−3.1 per cent). In contrast, metropolitan rings experienced a net employment gain of 707,000 jobs (15 per cent) during the same period. However, since employment has decentralised less than population, the cores which still contain the main mass of employment, have become more dependent upon the supply of labour commuting from the outer zones. The immediate inference is that there has been an increase in the separation of homes and workplaces in urban Britain, with a consequent increase in the length of the journey to work (Tables 1 and 2).

TABLE 1. Population change by urban zone 1951–1961; 1961–1971; 1971–1974. Absolute (000's) and percentage

		1951–1961		1961–1971		1971–1974*	
Urban Cores							
Britain	Abs	500		−719		−459	
	%		1.9		−2.7		−5.9
Million cities	Abs	−363		−1199		−473	
	%		−3.7		−9.0		−13.2
Rest of Britain	Abs	863		480		19	
	%		6.9		3.5		0.3
Metropolitan Rings							
Britain	Abs	1708		2503		442	
	%		13.6		17.5		8.6
Million cities	Abs	783		828		53	
	%		10.2		13.1		2.3
Rest of Britain	Abs	925		1675		389	
	%		16.4		21.0		13.2
Outer Metropolitan Rings							
Britain	Abs	245		788		292	
	%		3.1		9.8		10.6
Million cities	Abs	101		220		49	
	%		7.2		14.7		9.2
Rest of Britain	Abs	144		568		243	
	%		2.2		8.6		10.9

* Ten year % rate of change based on Registrar General's Annual Population Estimates
Source: Spence et al., 1982.

(b) Decentralisation of population and latterly of jobs is a process which is coming to characterise most British cities, regardless of their size, region or relative location. What does vary is the rate at which this process is operating and the stage it has reached. Cities in the older industrialised regions are decentralising more rapidly than freestanding towns in less populated regions, suggesting that there is a relationship between economic growth and the rate of change in the internal structure of a region's cities. Size of city is also an important factor in explaining

rates of decentralisation, principally because it is related to the density of jobs and people at the urban core. Density may in turn be related to the stage a city has reached in its life cycle. Large cities, generally with an old stock of buildings, have progressed most towards rapid decentralisation. This has partly been a response to widespread central urban renewal aimed at lowering overall densities. Smaller cities, especially new towns, have had space to grow at the core.

TABLE 2. Employment change by urban zone 1951–1961; 1961–1971. Absolute (000's) and percentage

		1951–1961		1961–1971	
Urban Cores					
Britain	Abs	902		−439	
	%		6.7		−3.1
Million cities	Abs	231		−793	
	%		3.1		−10.4
Rest of Britain	Abs	671		354	
	%		11.2		5.3
Metropolitan Rings					
Britain	Abs	293		707	
	%		6.6		15.0
Million cities	Abs	164		347	
	%		8.9		17.3
Rest of Britain	Abs	129		360	
	%		5.0		13.4
Outer Metropolitan Rings					
Britain	Abs	−14		130	
	%		−0.4		3.9
Million cities	Abs	15		45	
	%		2.6		10.5
Rest of Britain	Abs	−29		85	
	%		−3.3		2.5

Source: Spence et al., 1982.

(c) Differential net migration has been the principal cause of the varying rates of population growth in the constituent zones of British cities. Net migration loss has been the normal experience of urban cores although there is considerable variation. Conversely, high rates of net migration gain have occurred in the commuting hinterlands of most British cities. While rates of natural change vary less dramatically between and within urban zones, natural increase is significantly higher in the metropolitan rings than in the urban cores of the nation's cities. Even if migration into the rings of British cities is curtailed in the future, higher levels of population increase due to natural change are likely to be maintained by a demographically young population.

(d) One of the most important changes in the space economy during the period has been in the contribution of females to the remunerated workforce. During the 1950s female employment growth almost matched that of males in the nation's urban cores, was more than twice as high in the rings and grew by one hundred thousand in the outer rings in contrast to a decline of the same magnitude for males. All this is expressed in absolute terms, the relative change figures being even more impressive. And even more impressive still is the global picture for the 1960s. In the nation's cores, male employment declined by almost three quarters of a million, female

employment grew by over a quarter of a million. In the rings, female job growth was two and a half times that of males. In the OMR, male job losses amounted to 136,000 while female employment grew by twice this amount (Table 3). Basically what employment growth that has taken place has been for females. Even in the urban cores of the nation, suffering markedly from employment decentralisation, increased employment opportunities for women have been seen. However not unnaturally it is in the ring zones, the major receiving areas of employment decentralisation, that female job growth has been at its most dynamic.

TABLE 3. Male and female employment change by urban zone 1951–1961; 1961–1971. Absolute (000's) and percentage

		1951–1961		1961–1971	
		Male	Female	Male	Female
Urban Cores					
Britain	Abs	461	441	−705	266
	%	5.2	9.7	−7.6	5.3
Million cities	Abs	91	141	−661	−132
	%	1.9	5.4	−13.4	−4.8
Rest of Britain	Abs	370	301	−44	398
	%	9.1	15.4	−1.0	17.7
Metropolitan Rings					
Britain	Abs	88	205	195	514
	%	2.8	16.9	5.9	36.3
Million cities	Abs	66	98	129	217
	%	5.3	16.7	9.8	31.9
Rest of Britain	Abs	22	107	66	297
	%	1.1	17.1	3.3	40.4
Outer Metropolitan Rings					
Britain	Abs	−118	104	−136	265
	%	−4.8	12.6	−5.7	28.4
Million cities	Abs	−9	24	−10	54
	%	−2.1	15.4	−2.3	30.2
Rest of Britain	Abs	−109	80	−126	211
	%	−5.3	11.9	−6.4	28.0

Source: Spence et al., 1982.

(e) Growth in job opportunities for women especially in the metropolitan rings must of course be related to a number of other trends ongoing in the urban systen. Population decentralisation is perhaps the major component, with women tending to work near to home and frequently in occupations serving local populations. Trends in the occupational and industrial structure of the economy (in all urban zones are the other major component in the explanation.

Substantial reorganisation of the occupational structure of employment occurred during the period 1961–1971 with marked differences for men and women. The chief effect was of a shift from manual to non-manual occupations, especially a growth in office employment. For Britain as a whole the key features are a high growth in professional and technical jobs for both men and women. There was also a high growth of service, sport and recreation workers, but these were mainly women, and the same can be said, only even more so, for growth in clerical employment. Administrators and managers on the other hand, traditionally a male preserve,

focuses nearly all of its impressive absolute growth into male employment, although in relative terms females have also achieved important gains.

Office employment is highly localised in London and the South East region. Only three cities outside these areas had a greater share of office employment than total employment. The South East region also records the highest rates of growth in office employment (but not London), although of course growth in this activity has taken place in many other areas. Inter-regional inequalities in opportunities to take up office employment continue to be apparent. Not unexpectedly office activities proved to have an urban-size focus, although concentration of office employment in the large cities declined marginally between 1966 and 1971. However it seems that the localisation of office employment is in fact more influenced by regional factors. Major provincial cities in the North, for example Manchester and Liverpool, have less office employment than might be expected on the basis of their size. And over the period 1966–1971 most large cities had less office growth than might be expected on the basis of their office employment structure in 1966.

Much of the growth of office employment in towns in the South East can be attributed to office decentralisation from London. This dispersal has been widely spread over a large number of smaller towns up to 80 or so miles from the capital. Major cities, however, which are relatively close to London, such as Birmingham, seem to have benefitted less from such transfers, and this equally goes for the major provincial cities.

(f) Using an industrial instead of an occupational categorisation of employment, it can be seen that almost ubiquitous manufacturing decline and service industry growth, save for transport, distributive and miscellaneous services, typifies the national change picture 1966–1971. Most of the largest cities which dominate the axial belt of urban England have been losing manufacturing jobs while smaller towns and cities have been growing. The net regional effect has been a dispersal of manufacturing activities from core to peripheral regions. A process of inter-metropolitan decentralisation from larger to smaller cities within each major region also does seem to have reduced intra-regional concentration of manufacturing industry.

Nationally, all industries, except chemicals, financial, professional and administrative services, have declined in urban cores. In total the urban cores lost 600,000 jobs between 1966 and 1971, and it is important to record that around half of these were in decline-following, non-basic services. Conversely, most industries except those nationally in decline (which includes most manufacturing industries) have increased in metropolitan rings. Even those in decline, however, have had lower rates of losses in metropolitan rings. Likewise the service sector growth industries have increased most rapidly in metropolitan rings. In the larger cities the decline in manufacturing employment in urban cores has not been compensated for by increases in office employment. Only higher level managerial office occupations have been achieving significant growth, while clerical jobs in urban cores of the million cities have been declining absolutely. In the smaller cities, office jobs of all types have been increasing more rapidly. Similarly a wide range of office occupations have increased in the nation's metropolitan rings and OMRs.

URBAN POPULATION AND EMPLOYMENT TRENDS IN THE 1970s AND 1980s

Unfortunately it is no longer possible due to boundary changes to use the same functional area base to analyse trends in the 1970s and 1980s. What follows is an attempt to view such trends using whatever information is available. The demographic results (except for detailed migration statistics) are now available for the 1981 Census of Population, and some useful research is becoming available (Robert and Randolph, 1983).

(a) At the regional scale there is evidence of a convergence in the hitherto constrasting fortunes of the declining north and west and the growing south and east of England and Wales (Table 4). Scotland, which was not included in this research, would only rank 9 on the basis of its 1971–1981 rate of change. The improved fortunes of Wales and the declining growth rates achieved in the West Midlands and South East are particularly noteworthy.

TABLE 4. Regional population change in England and Wales, 1961–1981

Rank of % change 1971–1981	Economic planning region	1981 Population 000's	Population change 1961–1971 000's	%	1971–1981 000's	%	Rank of % change 1961–1971
1.	East Anglia	1,865	200	13.6	196	11.7	(1)
2.	South West	4,326	391	10.6	246	6.0	(2)
3.	East Midlands	3,807	312	9.8	174	4.8	(3)
4.	Wales	2,790	87	3.3	59	2.2	(7)
	England and Wales	49,011	2,645	5.7	262	0.5	
5.	West Midlands	5,136	352	7.4	27	0.5	(4)
6.	Yorkshire/Humberside	4,854	175	3.7	−2	−0.1	(6)
7.	South East	16,729	938	5.9	−202	−1.2	(5)
8.	North	3,097	22	0.7	−45	−1.4	(9)
9.	North West	6,406	168	2.6	−191	−2.9	(8)

Source: Robert and Randolph, 1983.

(b) Considering first the patterns of decline at the scale of the local authority two basic features are apparent. First, the declines in the Conurbations, and especially London, are paramount (Table 5). These declines are closely followed by population losses in the Principal Cities of the country (Manchester, Liverpool, Leeds, Newcastle and Sheffield). The fortunes of Glasgow would also fall into this category if it were included in the research. However, important though these declines are, the

TABLE 5. Population change in the urban hierarchy: 1961–1981

Number of Districts	Type of area	1981 population 000's	Population change 1961–1971 000's	%	1971–1981 000's	%	Percentage point shift 1961–1971 to 1971–1981
403	England and Wales	49,011	2,645	5.7	262	0.5	−5.2
33	Greater London	6,696	−540	−6.8	−756	−10.1	−3.3
14	Inner London	2,497	−461	−13.2	−535	−17.7	−4.5
19	Outer London	4,199	−80	−1.8	−221	−5.0	−3.2
36	Metropolitan Districts	11,235	57	0.5	−546	−4.6	−5.1
6	The Principal Cities	3,486	−355	−8.4	−386	−10.0	−1.6
30	Others	7,749	412	5.5	−160	−2.0	−7.5
334	Non Metropolitan Districts	31,080	3,115	11.8	1,564	5.3	−6.5
11	Large Cities	2,763	−41	−1.4	−149	−5.1	−3.7
16	Smaller Cities	1,687	37	2.2	−55	−3.2	−5.4
309	Others	26,630	3111	14.3	1,768	7.1	−7.2

Source: Robert and Randolph, 1983.

shift in the change rate between the 1960s and 1970s is lower than in the nation as a whole. Could this be that the rates of decentralisation from these major urban areas are levelling out?

The second major feature is the fact that major declines are not confined to the principal central cities. For the conurbations the whole area seems to be in decline, as is evidenced by the declines in all of London's outer boroughs. Similarly the Metropolitan Districts surrounding the Principal Cities in total moved into decline in the 1970s. The scale of decentralisation around the major centres of population is then much greater. In addition to this, population decline has moved down to lower levels in the urban size hierarchy. It is notable that the large cities increased their rate of loss. It is even more notable that the smaller cities moved into decline.

(c) Considering next the patterns of growth at the scale of the local authority two features are apparent. First, the spatial pattern of growth in absolute terms closely mirrors the declines in the Conurbations through decentralisation. Important gains are to be found especially around London often including new and expanded towns. The scale of the reception areas for decentralisation processes seems ever wider. Second, the spatial pattern of growth in relative terms greatly favours the rural areas. Rural depopulation is most definitely now a feature of the past. Rejuvenation of the periphery of the urban system is a feature of the results of the 1981 Census. In many cases spectacular growth rates are to be found, usually these are based on small absolute populations but in many cases the absolute gains are too impressive.

(d) The earlier research on decentralisation suggested that it was the migration component that was significant in accounting for such change. Although locally important in some places the natural change component was far more consistent over space and far less pronounced.

Some research on the Registrar General's Estimates of Population up to 1977 lends further support to this general view. The range of variation for migration over the local authorities of England was over four times that of natural change. The pattern of variation for migration closely monitors that for total population. Decentralisation is of course the all pervading process and the range of London boroughs and provincial capital cities is well represented in the list of extreme net migration losses. It may even be observed that the London outer metropolitan new towns of Harlow and Crawley are suffering high net migration losses – a feature unimaginable in the 1960s. Other new and expanded towns however form the main loci of net migration gains. Especially important in the list are Milton Keynes, Redditch and Tamworth. Elsewhere in the urban system it can be seen that it is the peripheral, essential rural areas, which gain most from net migration.

The patterns of gains from natural change cover a wide area of central and especially southern England with far less individual place to place variation. The most dramatic contrasts which do appear are of course due to high rates of natural decrease in retirement centres often in coastal, especially southern, locations. These patterns of high natural decreases are of course related to processes of retirement migration and the two themes should not be considered separately. Similarly the higher rates of natural increase are related to net migration gains primarily of young married couples in new and expanded towns.

In contrast to these comments on demographic trends it is not yet possible to undertake similar analysis of employment for the 1981 Census results are not yet available. The most useful information for employment which is reasonably up to

date is provided by the Department of Employment. Recently completed research by Frost and Spence (1983a) provides a commentary on recent trends.

(a) Wide regional variation in employment change occurred between 1971 and 1977. Modest declines were felt in the core regions of the South East, West Midlands and the North West. Marginal growth was achieved in Yorkshire and Humberside, the North, Wales and Scotland. The three remaining regions of East Anglia, the South West and the East Midlands all performed considerably better. A deconcentrated pattern of growth is clear (Table 6).

TABLE 6. Regional employment change, 1971–1977

	Male		Female		Total
	Full time	Part time	Full time	Part time	
Absolute					
South East	−230,506	34,550	−57,944	235,609	−18,291
East Anglia	23,422	3,568	15,704	29,689	72,383
South West	8,170	8,748	17,703	83,440	118,061
West Midlands	−66,022	2,245	−13,071	72,730	−4,118
East Midlands	8,578	7,678	17,104	70,651	104,011
Yorkshire/Humberside	−24,153	5,130	−1,115	86,834	66,696
North West	−92,403	13,798	−31,606	99,952	−10,259
Northern	−15,609	8,523	4,042	53,206	50,162
Wales	−23,847	2,437	17,971	39,276	35,837
Scotland	−27,610	9,977	−1,945	88,177	68,599
Britain	−445,218	96,703	−34,431	860,030	477,088
Percentage					
South East	−5.50	15.96	−3.09	24.68	−0.25
East Anglia	6.48	16.85	11.21	35.30	11.93
South West	0.96	18.45	5.13	43.54	8.24
West Midlands	−4.94	4.00	−2.45	26.01	−0.19
East Midlands	1.01	18.90	4.92	40.11	7.36
Yorkshire/Humberside	−2.08	10.35	−0.25	33.52	3.48
North West	−5.92	22.48	−4.57	29.24	−0.39
Northern	−2.09	35.90	1.38	37.31	4.16
Wales	−3.92	11.30	7.85	37.94	3.73
Scotland	−2.36	21.56	−0.35	39.45	3.43
Britain	−3.47	16.55	−0.63	31.20	2.20

Source: Frost and Spence, 1983a.

(b) The pattern of regional growth and decline for male full time jobs largely follows the pattern for total employment. This even extends to signs that the previously mentioned deagglomerative pattern of more buoyant or perhaps less depressive performance is present for male full time working. Male part time employment change is distinctive in its contribution to the Development Area regions especially the North, and noticeable in its lack of importance to the West Midlands. However in all regions the absolute magnitude of the change is small.

The pattern of regional growth and decline for female full time jobs largely follows the pattern for total employment. Development Area gains are perhaps unusually high with the rate of growth of female full time jobs in Wales being particularly important. Growth in female part time working was ubiquitous. It did however tend to achieve higher growth rates in the more peripheral regions. The

Development Area regions achieved important gains, only bettered in relative terms by the South West and the East Midlands. However it is perhaps ominous that tne contribution of industrial mix effects in Development Area regions for this type of employment is high.

(c) For the declining core regions of the nation the industrial composition of decline is clear. Rates of loss in manufacturing are often much greater than for the nation, while for services in general the rates of growth are not as high as those reached nationally. In some of the expanding regions the contributions of manufacturing and services are somewhat more variable. In East Anglia services from the prime component of growth backed up by an irregular pattern in which manufacturing gains outweigh losses. The South West is similar although the manufacturing gains are more modest. The East Midlands however records greater manufacturing gains than either of these regions. The industrial change composition of the Development Area regions also tends to follow a pattern. Rapid declines in a few specialised industries are offset by an otherwise favourable change performance to produce modest rates of growth. The manufacturing gains which do exist are usually not sufficient to counter the large manufacturing-based losses.

(d) Wide urban variation in employment change occurred between 1971 and 1977. General declines were felt in most conurbation areas, save for Tyneside where a modest gain was achieved. Outer metropolitan areas gained through decentralisation and this was especially so around London. The fortunes of the major cities may also be included within the general description of this category. Growth was found elsewhere and in general was highest in places lower in the urban size hierarchy and in those having a mainly service base. The ruralisation of employment growth assumes a significance not observed previously (Table 7).

(e) The general pattern of relative performance of male full time employment is similar to the results for total employment. The conurbations fare relatively badly whilst the group of remaining categories fare relatively well, with the outer metropolitan area and major cities categories occupying the middle ground. Within the conurbations, London and Merseyside are notable for their high absolute and relative losses. Growth in absolute terms of male part time employment, although modest, is widespread. Particularly impressive relative gains are to be found on Tyneside and Merseyside, both in the conurbations and the outer metropolitan areas. To these Development Areas can be added important gains in the SE Lancashire–Merseyside and Clydeside outer metropolitan areas.

Female full time employment change in urban areas follows the male full time and thus total employment pattern. The conurbations suffer worst, the small towns and cities and rural zones benefit most. The outer metropolitan areas and major cities occupy the middle ground. Particularly noteworthy are the losses of the Greater London and Merseyside conurbations and the substantial gains of the non service based smaller cities and urban areas. There is pervasive absolute growth in female part time employment in the nation's urban areas. However, in relative terms the conurbations are slow growing, places low in the urban size hierarchy are fast growing and the outer metropolitan areas and major cities achieve intermediate growth rates.

(f) The conurbations of the nation have exaggerated industrial decline and dampened industrial growth where it occurs. As a result manufacturing declines are generally much higher than in the nation and service growth much less. Peculiarities of specialist industrial structures of course figured prominently in individual conurbation declines.

The outer metropolitan areas of the nation and the major cities show mixed industrial fortunes. Certainly the national trends are apparent, but individual peculiarities of industrial growth and decline are to be found. Male and female full time jobs unusually are gained around London especially in servicing. Female full

TABLE 7. Urban employment change, 1971–1977

	Male		Female		Total
	Full time	Part time	Full time	Part time	
Absolute					
1 Greater London Con	−265,176	10,896	−94,897	67,641	−281,536
2 West Midlands Con	−53,334	−438	−13,882	34,591	−33,062
3 SE Lancashire Con	−33,951	3,774	−13,118	32,055	−11,240
4 Clydeside Con	−39,976	733	−9,503	24,673	−24,073
5 West Yorkshire Con	−16,821	1,549	−10,665	25,485	452
6 Merseyside Con	−55,588	2,233	−17,690	17,632	−53,413
7 Tyneside Con	−13,140	2,986	−1,168	15,491	4,169
8 Greater London OM	13,632	12,210	28,146	95,169	149,157
9 West Midlands OM	−9,129	2,056	341	26,263	19,531
10 SE Lancashire–Merseyside OM	−6,515	6,581	−2,483	41,211	38,794
11 Clydeside OM	−3,921	1,376	183	10,375	8,013
12 West Yorkshire OM	797	390	3,318	13,873	18,378
13 Tyneside OM	−1,803	3,217	3,205	14,589	19,208
14 Major Cities	−40,453	9,653	304	122,002	91,506
15 Smaller Cities (Service based)	40,128	14,159	29,918	114,183	198,388
16 Smaller Cities	13,960	8,970	29,794	90,626	143,350
17 Urban Areas (Service based)	15,719	4,913	9,496	29,957	60,085
18 Urban Areas	2,926	4,406	12,217	37,661	57,210
19 Rural	5,454	4,311	6,983	24,841	41,589
20 Semi-rural	7,211	2,679	6,344	21,246	37,480
Mean	−21,999	4,833	−1,658	42,978	20,189
Percentage					
1 Greater London Con	−10.71	9.27	−8.21	13.20	−6.61
2 West Midlands Con	−6.87	−1.39	−4.59	20.65	−2.59
3 SE Lancashire Con	−5.95	14.99	−5.01	24.85	−1.14
4 Clydeside Con	−8.73	5.01	−4.22	30.26	−3.09
5 West Yorkshire Con	−3.93	7.59	−5.72	24.84	−0.06
6 Merseyside Con	−15.11	19.27	−11.62	21.18	−8.68
7 Tyneside Con	−5.29	38.53	−1.11	31.70	1.02
8 Greater London OM	1.37	22.14	6.96	37.07	8.73
9 West Midlands OM	−2.23	11.86	0.22	32.82	2.95
10 SE Lancashire–Merseyside OM	−1.23	32.86	−1.06	37.92	4.34
11 Clydeside OM	−2.15	25.31	0.23	37.35	2.71
12 West Yorkshire OM	0.53	6.50	6.09	40.63	7.47
13 Tyneside OM	−1.03	71.97	4.69	43.15	6.84
14 Major Cities	−2.43	13.01	0.04	33.57	3.29
15 Smaller Cities (Service based)	3.77	21.80	6.22	42.97	10.58
16 Smaller Cities	1.27	22.56	7.21	44.78	8.17
17 Urban Areas (Service based)	6.17	29.46	8.33	48.83	13.44
18 Urban Areas	0.06	22.37	6.58	42.05	7.29
19 Rural	1.95	22.92	6.20	40.11	8.78
20 Semi-rural	3.31	20.32	6.86	46.22	10.14
Mean	−2.33	20.82	0.90	34.70	3.68

Source: Frost and Spence, 1983a.

time jobs, again unusually, are gained around Leeds and Newcastle especially based on manufacturing. Part time gains in female employment were of course important in all outer metropolitan areas.

The remaining urban areas of the country, low in the rank size hierarchy or rural, formed the major growth centres. Employment gains in full time working as well as part time and some manufacturing as well as service are to be seen in the service based and non service based towns and cities and even the rural areas of the country. Certainly the highest gains are in part time working, especially for females, and in the service sector, but it is widely based overall buoyancy of small local economies that is particularly apparent.

To conclude this brief review of recent demographic and economic trends some mention must be made of unemployment and research by Frost and Spence (1983b) is useful in this respect. Figure 1 shows the changing national rates of unemployment for both males and females. Generally the rates are on the increase save for the troughs apparent for both series reaching their bases in mid 1966, early 1974 and

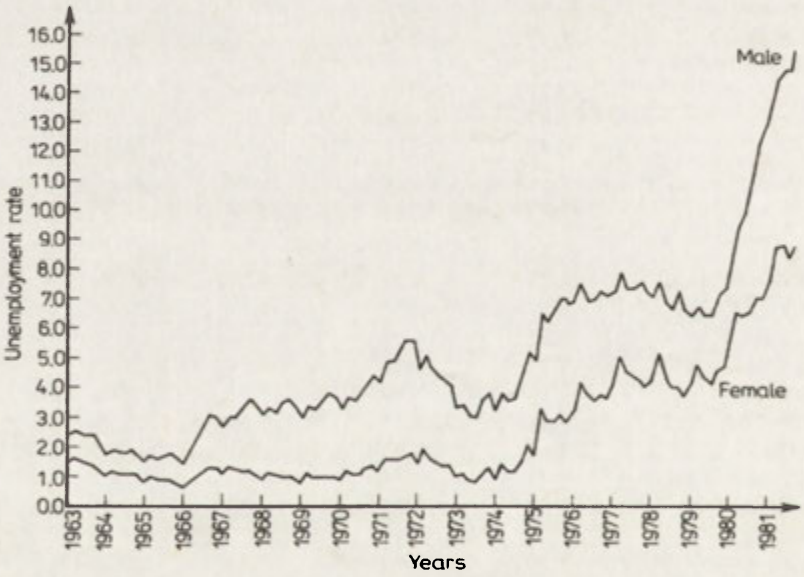

Fig. 1. Unemployment rates in Britain, 1963–1981. *Source:* Frost and Spence, 1983b

early 1979. A consistent upward sloping trajectory is apparent, steeper for males, for the period early 1967 to early 1972. There is a sharp rise in rates from the bottom of the second trough reaching a plateau and culminating in the last rather shallow trough. This is then followed by the imprecedented acceleration of unemployment rates to heights that surely could not have been conceived of at the start of the series. The overall shape of the series then consists of a rather weak cyclical form projected onto a more consistent upward trend.

In actual figures for males the series begins at around two and a half per cent and terminates at slightly over fifteen per cent. This reflects some 345,000 and 2,123,000 people out of work respectively. For females the equivalent figures are around

one and a half per cent and eight and a half per cent, again in absolute terms 115,000 and 833,000 respectively.

The national economic business cycle is of course the primary factor influencing these graphs but the slightly differing responses of male unemployment compared to female unemployment are interesting to consider. Several aspects are apparent. The first is the much greater response of male unemployment to the economic downturn from June 1966 to February 1967, where a rise of one and a half per cent unemployment was twice as high as that for females. This proved to be an important and long lasting differential. The winter of 1971–1972 also saw a similar lack of male unemployment responsiveness to recession. Exactly as to why these differences are apparent has been a matter for some considerable debate. It has been suggested that the greater responsiveness of male unemployment for given levels of economic activity in the main reflects productivity increases which is not so apparent in the continued trends for increased levels of female employment. Related to this could be the widespread substitution of female for male labour throughout the economy. The penultimate downturn to be considered also poses some interesting male-female differences. This, by far the deepest recession of the 1970s, hit female unemployment rates probably harder than those for males.

As yet it is not possible to evaluate all of the potential explanations of fluctuations in female rates but the complexity of the issue is further illustrated by the most recent recession figures. Female rates reacted markedly to the onset of the latest recession in the last few months of 1979 and this persisted until mid 1980. Since then, if anything, male unemployment rates seem to have been more responsive to the economic crisis no doubt related to the disastrous fortunes of the vehicles, mechanical engineering and metal manufacturing and goods working sectors.

So much for the national trends, what of the subnational breakdown of the statistics? A simple indication of the levels and rates of unemployment for the nation's regions can be seen in Figs. 2 and 3. Two cross sections of the time series have been selected to illustrate change – January 1972 and January 1982 – both corresponding to peaks in the cycle (optimistically assuming future improvements). With just under a million persons unemployed in January 1972 the South East being the most populous region accounted for the highest absolute regional total – some 30,000 more than in the whole of Scotland. Scotland, however, was the region of greatest relative intensity of unemployment recording over seven per cent. The North, Wales, North-West and West Midlands, in that order respectively, followed Scotland in relative levels of unemployment. In contrast the region of lowest relative levels of unemployment was the South East followed by East Anglia and the East Midlands. This then is the by now traditional pattern of British regional unemployment.

Not so traditional is the more recent regional picture. With just under three million persons unemployed in January 1982 the South East again accounted for the highest absolute regional total. But by this time the figure was around 350,000 higher than in Scotland, well over double Scotland's number of unemployed. The North assumes the role of worst hit region in relative terms followed respectively by Wales, Scotland, the West Midlands and the North West. The unemployment rate in West Midlands, and almost that reached in the North West, now matches the rate for Scotland at 15.3 per cent. The region of lowest relative levels of unemployment is still the South East followed again by East Anglia and the East Midlands but relative difference in both rates and levels between these regions and the rest of country has altered markedly over the ten year period. On these cross sectional figures alone the regional unemployment convergence hypothesis seems to be particularly strong. There are now more persons unemployed in the West Midlands than in all the then Development Areas of Great Britain in 1972, and more than twice as many in the South East.

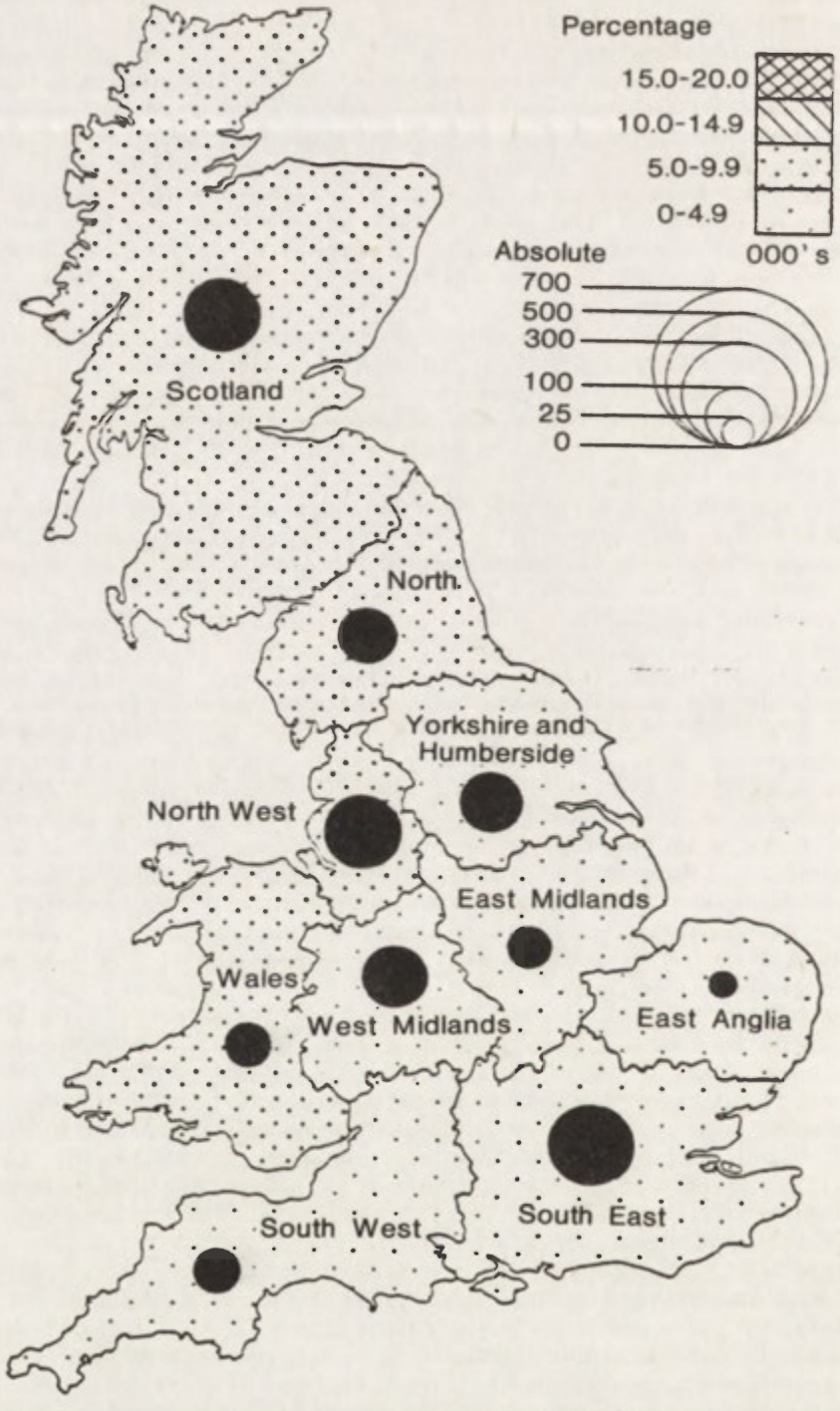

Fig. 2. Absolute and relative levels of unemployment in Britain, January 1972. *Source:* Frost and Spence, 1983b

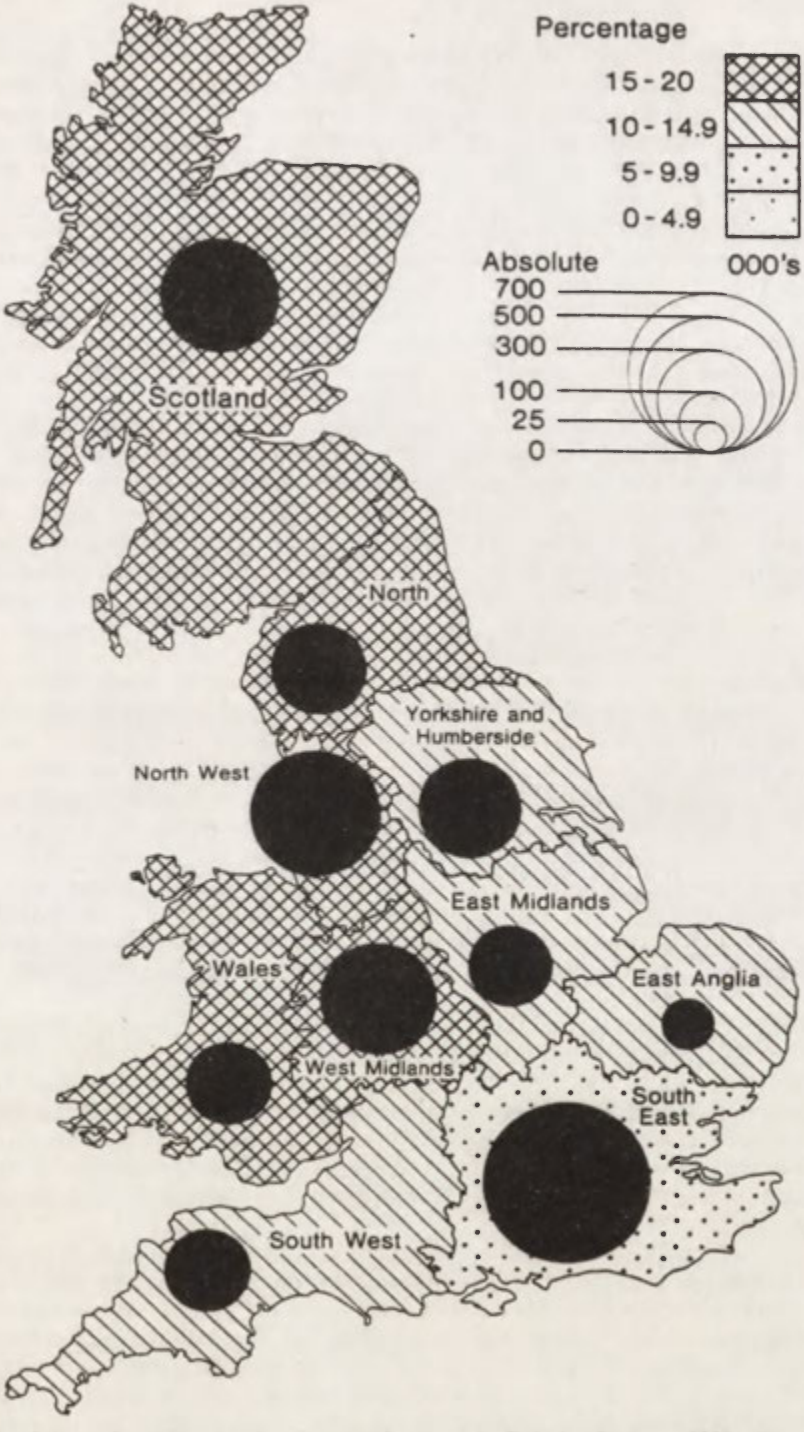

Fig. 3. Absolute and relative levels of unemployment in Britain, January 1981. *Source:* Frost and Spence, 1983b

CONCLUSION

So much for the description of trends, as usual it is far easier to describe them than it is to account for their occurence. That they constitute a 'new geography of Britain' cannot be doubted, but how has this new geography come about? The fundamental point is that the fortunes of the urban and regional system respond to societal structure and change. It is no accident of geography that the provincial conurbations developed and prospered in earlier times, and that rural depopulation was once a typical feature of the British periphery. The urban and regional system of the nation has simply, in a way in part, outlived its currently evaluated usefulness. Now all of this is not to say that space does not affect and interact with societal structure and change. Its inbuilt inertia and differential comparative advantage necessitates that it does. There is a complex, and as yet poorly understood, interaction between the urban and regional system and societal processes. But some of these links are being developed.

Deindustrialisation of the economy representing progressive reduced dependence on primary and secondary activities is clearly one of the important processes having spatial ramifications. Deindustrialisation tendencies, measured in terms of job losses, are clear in the descriptions. An urban and regional system founded on industrialisation processes must expect some reorientation. The service economy both basic and non basic aspects requires perhaps a different mode of spatial organisation. Job growth in the service sector is a prime feature of the descriptions. More needs to be understood about the requirements of the service sector especially the variety of forms that it takes – population serving, business serving, etc. Just how dependent is servicing on manufacturing or on the public sector? Just how volatile is the service sector?

Restructuring of the economy representing progressive demands for increases in the productivity of labour is another important process with clear but as yet hardly understood spatial implications. Some would argue that this is not one process, but many, including intensification, rationalisation and technical change (Massey and Megan, 1982). Many of the descriptive results pointed to earlier lend some support to the hypotheses suggested by a restructuring approach, as does other research (Frost and Spence, 1981a). However important though these processes undoubtedly are they should not be viewed in isolation of other societal trends. Additionally there has been a research preoccupation with the restructuring of manufacturing activity in the economy. Similar processes with equal, if not more important, implications are going on in the service sector and are as yet poorly understood.

Changing labour force participation is another important feature of the second half of the 20th c. Increasing female activity rates and declining male activity rates are prime components of the contemporary employment picture. It is important to realise that these are changing just as much in response to labour force demands as the requirements of capital. Part time working trends, destined to be perhaps an equally important feature of the industrial scene, are also related to the evolution of the urban and regional system. Furthermore increased part time working seems to be being actively planned for by government.

To these three mainly economic processes must be added the range of purely social processes which are changing such that they affect nature of regions and cities. It is a simple point to make that the relationships between spatial and societal change are exceedingly complex. Yet the trends are having implications that undoubtedly need to be planned for. Indeed research has argued that the planning process in recent times has aided the transformation of the urban and regional system (Moore et al., 1977; Diamond and Spence, 1983). It must be the case for example that the continued application of regional policies since 1963 has had an important redistributional effect. In terms of job creation in the Development Areas various estimates are

available. Moore et al. (1977) suggest that some 282,000 manufacturing jobs were due to the direct effects of regional policy over the period 1960–1976 in the nation's Development Areas. Other research has, it is true, questioned these numbers, but perhaps more important it has questioned the quality of the jobs created (Frost and Spence, 1981b; Massey, 1979). That urban policies have had important effects in planned decentralisation of people and jobs to new and expanded towns is also clear.

Now the planning process is being expected to reverse some of these trends. In terms of regional policy fewer areas are being used to induce development. Indeed areas traditionally more buoyant in employment terms but not now so, such as the West Midlands, are being given special status in terms of government ministerial responsibility. In terms of urban policy a whole battery of initiatives have recently been enacted to rejuvenate the central cities. Partnership Area schemes between central and local government are intended to improve the urban environment in which future development could take place. More controversial are the Enterprise Zone Schemes in which certain designated areas have been scheduled to receive tax and rate concessions so as to attract economic activity.

Clearly there is no lack of enthusiasm for the implementation of spatial planning policies. What is lacking is both understanding and coordination. The processes of societal change and the way in which they affect the urban and regional system are not well understood. Planning as a result usually then is seen as a response to crisis rather than the design of efficient policies to meet well defined objectives. Often crisis planning fails to account for conflicting policies. The time has come for a cerefully thought through prescription for each part of the national urban and regional system – a sub-national plan.

REFERENCES

Diamond D., Spence N. A., 1983, *Regional policy evaluation: a methodological review and the Scottish example*, Gower, Aldershot.

Frost M. E., Spence N. A., 1981a, Policy responses to urban and regional economic change in Britain, *Geographical Journal*, 147, 321–349.

Frost M. E., Spence N. A., 1981b, *Unemployment, structural economic change and public policy in British Regions*, Progress in Planning, Pergamon, Oxford.

Frost M. E., Spence N. A., 1983a, *The changing structure and distribution of the British workforce*, Progress in Planning, Pergamon, Oxford.

Frost M. E., Spence N. A., 1983b, Unemployment change in Britain, in: J. B. Goddard, ed., *The urban and regional transformation of Britain*, Methuen, London.

Massey D., 1979, In what sense a regional problem? *Regional Studies*, 13, 233–244.

Massey D., Megan R., 1982, *The anatomy of job loss*, Methuen, London.

McCrone G., 1969, *Regional policy in Britain*, Allen and Unwin, London.

Moore B. et al., 1977, The impact of regional policy in the 1970s, *Centre for Environmental Studies Review*, 1, 67–77.

Robert S., Randolph W. G., 1983, Beyond decentralisation: the evolution of the population distribution in England and Wales 1961–1981, *Geoforum*, 14, 75–102.

Spence N. A. et al., 1982, *British cities: an analysis of urban change*, Pergamon, Oxford.

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CHANGING VIEWS OF THE CITY IN BRITISH GEOGRAPHICAL RESEARCH

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To think back twenty-five years – just one generation – in urban geography is to enter a quite other world. When I was in university in 1958, twenty-five years ago, we had no formal course in urban geography. In studying what now we would call urban topics, the texts that we could call on were few and far between and were predominantly descriptive, historical and evolutionary. I recall reading Griffith Taylor and the apocalyptic views of Lewis Mumford. Some of the ideas of central place theory were just beginning to seep into the British curriculum from America. Twenty five years on, what intellectual gymnastics the new urban geographers have been through. We have had a wealth of research and a welter of textbooks. Yet now it would be a brave man who could confidently define the scope of urban geography or resolve its numerous apparent aims and concerns. Many would even question whether it exists as a subject. It was as long ago as 1968 that Castells asked *'Y-a-t-il une sociologie urbaine*?'; he could as well have asked it of a *geographie urbaine*. More than the subject as a whole, urban geography has bent and twisted its way through a panoply of different emphases, of different philosophical starting points and of different goals. Has it, like the city itself, flourished briefly if dramatically as a kind of intellectual comet with a brief if brightly shining head and a tail that is long in its dying?

THE CHANGES

The changes themselves can be described very briefly. The 'new' urban geography of the 1960s was a compound from the ideas of central place theory, on the one hand, and the human ecologists, on the other. Both of these were positivist in their approach – intrinsically so in the case of central place theory, but not intrinsically in the case of ecology since the work of Park and his Chicago followers was an interesting blend of behaviouralism and functionalism. What the geographers took from the ecologists, however, was their interest in place and space and their positivistic stress on the system-like qualities of urban society. The city, in both of these approaches could be viewed in a relatively unambigous way: it could be defined physically as a compact densely settled area in which social differences and behavioural differences could be related to the facts of density and social heterogeneity; or, using the same physical definition, it could be seen as a functional entity, as a service

centre or a place of production and distribution. What has replaced both of these approaches during the 1970s has been a *melange* of behaviouralism, of 'managerialism' and of structuralism.

There are two grounds on which these changed perspectives have developed. First is the move away from a belief that society is based on concensus and towards the idea that it is based on conflict: this has politicised many of the writings in the subject. It has focussed attention both on the processes by which one side 'wins' and another 'loses' in the jostling for position within the power relations of the city and on who the losers and the winners in such struggles might be (Cox and Johnston, 1982). It has gone hand in hand with a disillusionment about the concept of a neutral solution to most of the urban issues out of which change derives and a disbelief in the nostrums offered by 'experts' of whatever persuasion.

Second has been the dissatisfaction with approaches which assumed that process could be inferred from pattern, that how an outcome was derived could be 'read off' the map of who gained and who lost. This was part of the broader and critical debate on the appropriate scale or level at which explanations could be derived. If one is interested in the location of services within the city, can the distribution, for example, of schools in a city be seen as the product of forces that are essentially local – of ward politicians and local authority officials and of local public opinion and pressure groups – could it better be seen as a broader question of power within the city as a whole or within the region; could the provision of educational facilities only be understood, in a more fundamental sense, by looking at the goals and structure and purposes of the *state* as a whole? Such shifts in the scale and types of explanation have been just as stringly evident in work on production; the older explanations of changes in manufacturing firms had been couched in terms of individual plants at a local level, but more recent explanations have increasingly looked to regional. national and international scales partly as a reponse to the growth of large multi-product and often multi-national corporate structures and partly as changes have been 'read off' not the happenings in individual firms but the logic of the broader processes of production and the goals of the economic systems of which they are a part. The earlier 'local' views have increasingly been seen – and hence been criticised – as merely a form of dotting the 'i' s on a manuscript written by a larger and unseen hand. So, underlying what we can crudely call scale or level, there has therefore been a much broader philosophical debate about the epistemology of explanation.

It has been from these two grounds of dissatisfaction that the whole edifice of the 1960s' urban geography has shattered – and shattered is not too strong a word since the shape of the topic is now extremely difficult to discern.

At a superficial level the sequence of these changes can most readily be illustrated by the sequential unfolding of the vast literature on urban residential patterns where the changes have perhaps been most rapid and dramatic (Robson, 1975). Initially, the studies of factorial ecology were concerned to describe the patterns – who lives where, what descriptive dimensions can best and most economically (in statistical or mathematical terms) account for the kaleidoscope of residential differentiation in the city (Herbert, 1972). Some of these studies may have used the descriptions as a springboard to derive sample areas for studies of other social phenomena, but the underlying goal of such work was static, descriptive and positive. This early phase of research led the focus of work to shift to the question of residential mobility – of who moved house, why and to where – thereby introducing an element of dynamism to the concern for understanding patterns of residential areas. Initially, the focus here was on consumer preference – what was it that prompted moves, what was it that consumers looked for to satisfy their residential aspirations. The conclusions emphasised the importance of demand-side elements – how important were

income and social class, how central was the concept of the life cycle in determining the timing and the choice of a new house. However, it was increasingly recognised that such demand-stimulated approaches ignored the constraints on the supply of housing – certain groups of households are clearly less well placed than others to 'choose' particular houses, not because of the neutral fact of income differentials, but because of institutional constraints. Black households face institutionalised discrimination which may be expressed in market terms through their paying more or through a generalised hostility from white residents which discourages their search in certain areas (Fenton, 1977); tenants have to meet various residential requirements or family circumstances or behavioural standards before they can gain eligibility for local authority housing or are allowed by the local authority to move within the stock of public housing; those who do not already possess an 'owner occupied' house to trade in on the market, regardless of their income, are at a disadvantage by comparison with those who do have a house to sell and such disadvantage is the product of financial and taxation legislation. For all of such reasons, the focus of work moved again, very rapidly, to look at institutions in the housing market, stressing the supply-side arguments by moving the research concern into an exploration of the practices, the goals and the belief systems of those agencies such as building societies or the housing departments of local governments which can be thought of as determining the life chances of households in their access to such goods as houses (Bassett and Short, 1980; Boddy, 1980). From here, clearly, it was a short step for the focus to move into yet further new areas and new directions: on the one hand into the production side by studying the creation of housing and the national legislative and financial context in which the output of private and public housebuilding occurs and the role and logic of the development industry itself (Merrett, 1978; Ball, 1981; Smyth, 1982); on the other hand into a variety of other types of goods and services such as the delivery of health systems, of education, of libraries, of services for the elderly, of child clinics (Warners, 1982; Kirby, 1979). Each such substantive topic necessarily took the concern, at a higher level of generality, to a consideration of the state and the local state and of the wider societal structures whereby a division between public, quasi-public and private agencies determine the production and the allocation of such goods and services (Duncan and Goodwin, 1980; Johnston, 1982).

To use the philosophical jargon, we could clearly say that such a progression has been a move from positivistic, through behavioural, to managerial and to structural approaches. Yet this would be too simplistic. Philosophical debate has not, I would contend, *led* such changes; rather it has had a dialectical relationship to them. As the progression of work which stemmed from studies of residential differentiation suggests, the new foci of enquiry can be argued to have followed a linear track, partly prompted by the evolving theoretical views and partly by an independently evolving interest in the substantive topics that have led to a deeper understanding of the same general concern: from residential patterns, to the household mobility which factually creates those patterns, to the institutions such as building societies or local authority housing departments which control access to that mobility, to the developers who build the houses and the finance capital which provides the resources for that development. At this first level, the changing focus has merely been a form of "House that Jack built" in which the levels of research concern have simply pushed back the substantive empirical topics into deeper and different fields. At a second level, however, the shifts have reflected the desire to pursue questions of motivation, of goals and of incentives and constraints at each successive higher level of abstraction until the concern is with the broad logic of the capitalist system as a whole. In empirical British geography, it has been the first of these which seems to have been the more compelling strand. The substantive concern to follow a line of reasoning has

arisen out of a healthy preoccupation with empirical work and this has never been far from the surface in determining the changes of direction and the changes of focus in the work of urban geography. It has been one of the subject's great strengths. The more abstract writings of the continental and British sociologists – of Castells (1978), Harvey (1973), Giddens (1973), Lojkine (1977), Mingione (1981), Harloe and Lebas (1981) – have consistently been tried in the furnace of empirical study in British urban geography. The changes that the subject has seen have largely derived from the interplay between an interest in such theory and a concern to explore the 'facts on the ground'. If correct, this suggests that the principal product of the changes of the last decade has been the change in *what* is studied as much as in *how* it is studied. It is this which explains the continuing attraction and the preoccupation with the so-called managerialist approach (Williams, 1978; Leonard, 1979). The legacy of neo-positivism in geography has largely reconciled itself to structuralist writing by reference to Weberian views of the growth of a state bureaucracy and a shift of research concern to look at the tangible facts of the operation of the agencies of that bureaucracy.

It has meant, however, that it is now much more difficult to write a text on urban geography or to describe what now its concerns might be. There is an awkward schism between the conflicting philosophical bases on the one hand, and the empirical work on the other. This largely explains the fact that, while many texts on 'urban' topics have been written, there have been very few textbooks which claim to write of 'urban geography'. Those that have appeared have either been historically oriented (Dennis and Clout, 1980) or have attempted to cover only a very partial span of topics such as social questions (Knox, 1982) or conflict and politics (Kirby, 1982; Johnston, 1982). The broad view of the city that could be seen in the textbooks of the 1960s and 1970s (Carter, 1972) has largely evaporated. Those texts that do try to offer a broad coverage reflect the schims and the irresolvable disputes that stem from the philosophical debate. They either offer a parody of the structuralist views (Johnston, 1980) or they merely review the conflicting approaches and leave them largely unresolved (Clark, 1982). One which does try to resolve the conflicting views is Herbert and Thomas (1982). In practice most of their text is a standard review of the empirical literature from the structuralists, the managerialists, the phenomenologists and the positivists. However they do attempt to resolve the contradictions in terms of what Herbert calls 'levels' of approach: the three levels of production, distribution and consumption are equated with the concepts of social formation, allocative systems and spatial outcomes; the three research perspectives of macroscale institutional analysis, managerialism and neo-positivist studies of process pattern and response can then in turn be related to each of these three substantive foci. This is an attractive sentiment, but it is little more than a categorisation which sits in an uneasy theoretical vacuum.

THE PROMPTS TO NEW APPROACHES

What has so far been said suggests that the changes in the subject are the result of an internal academic debate within the subject. And indeed it is true that much of the philosophical framework in which urban geography has been couched reflects the wider debate in the social sciences as a whole. The subject can be seen to have become process oriented, to have taken on the debate about production and consumption, to have been politicised, to have become more concerned with policy questions and with arguments about conflict and power to do with society as a whole – all of which is very much in line with the philosophical changes in the social sciences as a whole. Yet this is by no means the whole story explaining the

transformations within the subject. The debates within the social sciences – and within geography – did not take place in a vacuum. Rather, there have been such substantial changes both in the nature of the city and its encompassing society in western nations that it seems inherently implausible that the older positivist views could long have held sway if they were any longer to be able to claim that they offered a realistic exploration of urban society. It is as much the influence of events and changes external to the academic debate that can help us to understand why it is and how it is that there have been such profound changes in geographical work on the city. I want to explore three exogenous stimuli which go a long way towards explaining the changes that we have seen in the subject. If the academic philosophical arguments are internal, these three can be considered to lie outside the academic debate itself.

SOCIETAL CHANGE

First, and most obvious are the changes within society itself in Britain. Four such changes can be highlighted. All of them can be argued, independently, to have underpinned one or more of the changed perspectives and topics which now figure on the agenda of urban geography.

i) *The growing importance of the state.* Throughout the twentieth century the state has grown in importance at something of an exponential rate. Nineteenth-century arguments about the establishment of national and local legislation and of regulatory agencies, pale into insignificance beside the expansion of welfare services since the First World War, and more particularly since 1945 when both economic and physical planning were given teeth for the first time (with nationalised industries and service agencies and with effective town and country planning embodying the nationalisation of the development rights in land). Allied to this has been the growing scale of both the public and the private sectors, not merely the growth of the state itself but the growth of corporate enterprise in the private sector. The motivation of the private sector may appear to be different in the short term from that of the state sector – the creation of wealth rather than the meeting of need and the establishment of a framework of social welfare to achieve conditions in which equity might flourish – but the long-term interests of both are not dissimilar – the creation of a social and economic climate conducive to the maintenance of profitable enterprise. Clearly one can argue about the reasons for such development – depending on whether one takes a Weberian view of the inherent tendency for the growth of rationality and of bureaucratic structures or a Marxist view of the immanent evolution of centralisation and aggrandisement which flow from the contradictions embedded in the capitalist state. What cannot be doubted is that the state at both a national and a local level is more apparent, more obtrusive and more all-pervasive than ever before. And with this has come the army of state managers – both the paid appointed officials and the elected – who, because their presence is more visible and their decisions less evidently motivated by the 'neutral' metric of the market, must necessarily be more open to question, to dispute and to scrutiny than ever was the case in a context of more market-oriented criteria. That their decisions are scrutinised is itself a function of one of the very activities that state influence and control have introduced – the universal and more effective forms of education which have been the product of both a 'free' educational system and of the growth of the media of television and the press. The growth of the state and of corporatism has itself created its own more informed and more critical audience.

Much research has charted and explored such aspects of the growth of state activity. The increasing control exerted by the central state has been seen both

through its financial control of payments made to local authorities (Bennett, 1982), and through its legislative influence on the supply of housing (Gray, 1976; Duncan, 1977) and the sale of public housing to private consumers (Forest and Murie, 1976). The centralisation implicit in the growing corporatism in the sphere of production has been an explicit or implicit theme of much of the recent work on manufacturing industry (Dicken and Lloyd, 1979; Massey and Meegan, 1982). These have been empirically demonstrable changes which have brought with them a greater salience and visibility to the importance of policy-making and it seems inconceivable that research could have continued to rest on assumptions of the neutral logic and the invisibility of policy-making in the face of such changes.

ii) *Ideology*. Second, and clearly associated with this, has been the growth of a more strident ideology amongst state bodies. This clearly has been associated with the post 1974 economic crises that have affected all of the capitalist economies. It is certainly not peculiar to the Britain of the present government, otherwise one could not explain why it is that the same trends are apparent in the United States and in many of the countries of Western Europe. In Britain the more proximate causes can be seen as a function of two developments. First is the statism of welfare socialism which has failed to deliver (even in affluent times) the equality and the style of welfare that it had promised. As the welfare state has grown so all of its activities can be seen to have been concerned with content and little with style. The preoccupation of the statist bureaucracy has been with *what* is delivered rather than with *how* it is distributed and allocated. It is not so much that welfare benefits might be paid to people or houses allocated, but that the manner in which such goods are allocated in a large impersonal centralised bureaucracy has alienated those to whom rights and benefits are accorded. Second, it is a function of the particular severity of the impact of economic recession. The rules of welfarism might have survived longer in the context of growth and expansion; they have manifestly failed in the face of the contraction and the reversal of growth which have occurred during the last decade. At every scale – from the individual, and the household, up to the region – the principle of equity has proved a fragile one in the face of the prospects of distributing decline rather than distributing growth.

So, in Britain, the growing disillusionment with large-scale state welfare bureaucracy has helped lead to a rhetoric about rolling back the state and encouraging private enterprise. That this is rhetoric rather than reality is suggested by the fact that the state has continued to be involved in supporting state and private industries; that in its social policies, despite the avowal that help will be given to the voluntary sector, what help has been given has taken the form of programmes managed through the state-run agencies such as the Manpower Services Commission which has thereby effectively increased rather than decreased the dependence of the non-statutory sector in the welfare field. In the course of achieving numerous cutbacks in welfare, the Government has effectively increased the direct and indirect role that the state has played.

Such changes have led both to a broader concern about ideology *per se* and about the forms of legitimacy through which urban government and central government maintain themselves and hence about the more tangible aspects of the concept of the 'ungovernability' of a population, particularly in urban areas, as it is expressed in protest and the clamour for new styles of public participation in the making of decisions.

iii) *Urban decline*. If these first two aspects of external change have both brought the state and its decision-making apparatus into greater prominence, the third and fourth changes have altered the 'facts' of what it is that urban geography has had to study. The third change is the obvious one that the very nature of the city has changed massively over the period of the last two decades. The physical and demographic

changes are clear and striking. Population loss in Britain has been of an order of magnitude never before experienced. Let me illustrate this from the census data of the last decade, 1971–1981. The relationship between density and population decline is a clear and consistent one. The more dense (and thus in general terms, the larger) the city the more rapid has its population loss been; the lower the density the greater has been the relative or absolute gain in population. Were one to list those places which have experienced the greatest loss or the greatest gain in population over that decade, the catalogue would make interesting reading: with the special exception of the London boroughs which are not really comparable since they are all internal subdivisions within a metropolitan area, it is the large old industrial centres (especially in the old industrial heartlands such as Liverpool and Manchester) which have lost population most massively; those which have gained most include a number of 'new towns' for which there are clearly special circumstances, but they also include a number of medium-sized free-standing towns in the semi-rural periphery – a roll call of names very different from those which characterised the period of urban growth in the 19th century and not the places which any instinctive urban-orientated expectations might suggest as the growth engines of the economy. In Manchester, the city which I know best and perhaps *the* archetypal city of the industrial era of Britain's history, the population loss has been typical of the large metropolitan areas. In the last thirty years it has lost more than 1 in 3 of its population, having reduced in size from over three-quarters to less than one-half million. And, as various studies have shown (Hall, 1981; Drewett et al., 1976; Spence et al., 1982; Fielding, 1982), the loss of population has been followed by a loss of jobs in the cities themselves such that a continuing, and possibly an accelerating, sequence of decentralisation – or of 'counterurbanisation' – has taken place. Whether or not this process represents what Vining and Strauss (1977), in the American context, call a 'clean break' is still debated; but, whether or not the process is a continuation or a new direction of change, it nevertheless represents a massive change in the fortunes of cities *vis-a-vis* the non-urban areas. It has been accompanied by all of the evidence of equally massive disinvestment of capital – in terms of abandonned land and buildings and withdrawal of investment in shopping, commercial, service and manufacturing activities. Again, to quote the Manchester experience, its manufacturing jobs have fallen from 108,000 in 1971 to a mere 69,000 in 1981; office employment has fallen by one-fifth in the period from 1966 to 1977 despite a massive investment in office floorspace during the same period; and the centre as a whole has progressively lost its drawing power both for shopping trips and for journeys to work – the latter, for example, having fallen from 139,000 in 1966 to 104,000 in 1976.

Some of these changes have been the conscious product of state activity. The large-scale clearance and renewal programmes which were undertaken between the mid-1950s and the mid-1970s contributed in no small measure to the dereliction and the decay of inner urban areas. Again, the Manchester case is typical of other large metropolitan areas. During the period 1955 and 1977 a total of 77,624 houses were demolished (some 36 per cent of the total housing stock in 1955) and only 10,303 new houses were built within the city (78 per cent of them being built by the local authority). The net loss of over 30,000 dwellings that this great housing programme entailed reduced the total housing stock from 213 thousand to 182 thousand during that 12-year period. A further example of the direct and indirect effects of public policy on the facts of urban decline is provided by the policy of establishing new towns in the non-urban areas which has also contributed either tangibly or psychologically to the further decay of established large metropolitan areas.

Such examples of the interplay of 'counterurbanisation' and public policy suggest the overlap between urban decline and the growth of the state and takes us back to my earlier point about the growth of state involvement. The intervention of the local state

has nowhere been more in evidence than in the metropolitan areas and particularly in the inner parts of those areas. The inner areas of large towns like Manchester or Birmingham or Liverpool or Glasgow have been converted into vast publicly owned housing ghettoes as the private landlord has been encouraged to sell or has had his property demolished, and as owner-occupiers have progressively moved out to the periphery, often leaving their houses to be subdivided, later to be demolished or bought-up by the local authority. Those new dwellings which have been added to the inner areas are almost uniformly local-authority flats and houses, many built to appallingly low standards in the high-rise industrialised building surge of the late 1960s and early 1970s (Dunleavy, 1981). What we are left with, then, is a very different inner city: one that has been residualised in terms of the composition of its population since it is the least fortunate, often the black minority groups, who form the bulk of this population with levels of unemployment currently standing in many areas at over 30 per cent and at levels much higher than this for the black and for the young; a population that is 'institutionalised' in that it is massively dependent on state welfare for its housing, its services, its very sustenance. We have in the inner areas a 'client society' of a scale and of a degree that is historically unique in Britain. Poverty has long been a characteristic of inner area populations; what now is different is that this deprived population is deprived *and* dependent on the state *and* in a period of general economic recession. Research has inevitably moved to focus attention on state policies for dealing with this unique circumstance, given the visibility both of the problem and of the policy intervention that it has generated. Inner-city policy at its outset in 1977 was focussed on the amelioration of such social problems by the injection of funds to tackle social deprivation. Increasingly, however, this goal has given way to broader economic priorities as the impacts of general recession and the apparent economic irrelevance of the city have forced themselves on the political retina. Local government, partly at the prompting of the centre, has become no longer a mediatory body, dealing with social problems and dispensing social benefits; it has instead become initiatory in both the social and more particularly in its economic sphere. Not only has the focus of innercity policy changed to stress the encouragement of and the investment in economic initiatives rather than social welfare, but also even in its social policy local government has become initiatory. In the housing sphere, for example, this is reflected in the change from housing allocation policies that clearly derived from welfarism (allocating houses to the 'deserving poor') to ones which smack of market-oriented goals (allocating 'problem flats' to non-family groups such as relatively affluent students and to whoever is able and willing to occupy them; and selling-off properties to 'homesteaders' who are prepared to undertake their renovation in return for a nominal payment for ownership). Such changes provide compelling examples for the Marxist view of the need for government agencies to seek legitimation, since, in the face of economic recession and a 'residualised' population, local governments can be argued to need to be seen to take an initiatory role in both the economic and social spheres.

iv) *Population change*. The fourth, and final change that I want to discuss briefly is the change in the nature of households and the demographic composition of population. First is the impact of the falling levels of the birth rate which has introduced yet further traumatic effects on a variety of policy areas such as in the provision of schools where, first at primary level (for children of 5 to 11), then for secondary levels (11 to the minimum school-leaving age of 16) and then for sixth-form levels (from 16 to 19 years), the overprovision has led to a new range of policy measures to achieve cuts in the provision of schools, more particularly in the inner areas of cities where such losses have been most striking (Thomas and Robson, 1983; Brown and Ferguson, 1982). Such objective changes in the demographic composition of cities have reinforced the politically perceived need for financial economies and have thus reinforced

the impact of intensely unpopular exercises in the distribution of decline rather than the redistribution of growth which is what the promise of state welfare had held out. Second have been the effects of household changes with rising levels of divorce; and with the widespread appearance of 'non-traditional' households formed by other than the 'standard' family of two parents with children. This standard family now forms a minority of all households; and in the inner city in particular this minority has become a very small one. In its place has come a variety of single-person, joint households and childless couples; all of whom have placed new and difficult demands upon a housing market that is geared for the standard traditional household (Rapoport et al., 1982). Such demographic changes have also been accompanied by equally significant changes in the occupational composition of the population with a continuing fall in the proportion of manual households and the growth of a new unionised and non-traditional form of non-manual household, with clerical and minor supervisory workers.

Such changes have been ones that have had two exogenous effects on the nature of work in urban geography. Not only have the old stereotypes of the city – of its form, its role, its internal composition – had to change massively and to change in directions that the earlier positivist theories have not been able to accommodate. The changes, with the ever-increasing visibility and prominence of the state have meant that a new set of 'actors' has inevitably come to the fore in any analysis of the meaning and the functioning of the city. Whatever our philosophical starting point, it has simply not been realistic to ignore the role and the goals of state activity. Hence the inevitable politicising of analysis; hence the greater attention paid to conflict; hence the need to come to terms with what it is that the state claims to be doing and how it is that one can evaluate the hidden motives that may throw clearer light on what it is *actually* doing.

THE AVAILABILITY OF DATA

The second external influence is the impact of data and its availability. Is it too fanciful to argue that the quantity and the nature of the data that we have at our disposal in itself plays an independent role in altering the nature of the work that we can do? The purist view is that data emerge to fill the needs of a research imperative. And indeed to a large extent this is how research has progressed. All of the data on patterns of ownership in the manufacturing field or of joint directorships in the worlds of finance and banking existed long before geographers became interested in using them to argue, in recent work, about the nature of ownership or about the flows of capital between cities or regions (Short, 1981). Yet, at the same time it is undoubtedly the case that data are now available in amounts and of kinds that were unthinkable a decade ago. While there have been losses (such as the quinquennial census or industrial employment statistics), there has been a massive net gain in information available to researchers: the family expenditure survey; the general household survey; increasing amounts of information collected, and now made more generally available, by local governments; the labour force survey; information from the Central Office of Information; as well as the small area statistics from the census. The census is especially interesting to speculate on since again one can argue that there is an interplay at work between, on the one hand, the evolving and changing styles and approaches in academic work, and on the other, the appearance of a regular set of comprehensive statistics on economic and social conditions which acts as a bench mark both for the population which it measures as well as for the styles of work researchers who use it. Is it without significance that, just as in historical urban work where the appearance of each successive newly-released set of

enumerators' books from the 19th-century censuses has prompted a new flurry of work which has both incorporated new emphases from the academic experiences of the prior decade and prompted new emphases in the succeeding period, so with the censuses of 1961, 1971 and 1981 the data have established new directions of emphasis in the work of urban geography. For 1961, it was the start of factorial ecology. For 1971 it was the development operational concepts of daily urban systems and functional definitions of the urban area together with work on the spatial concentration of deprivation (Holtermann, 1975) which formed something of a benchmark for many subsequent studies of social conditions in towns (Knox, 1975; Smith, 1977). For 1981 I would hazard the guess that we will see the data being used for two main purposes: on the one hand explorations of the connection between labour and housing markets which will cement the ties which have been established between social and economic geography in urban areas; and on the other, work on the structure of the household and the family which will carry forward into a new dimension some of the demographic work which has begun to appear in the last few years (Rees and Wilson, 1977; Jones, 1981; Woods, 1979).

THE ROLE OF FUNDING BODIES

A third, only partly external, influence might also be recognised in the role that the funding bodies have played, at the margin, in bending the direction and the nature of the research endeavour. For urban geography, as for human geography as a whole, the most relevant such body is the Social Science Research Council which is the largest single independent research funding body in the social sciences and whose policies have increasingly emphasised a concern with applied or 'useful' research. It has funded some of the major empirical studies on urban geography over the last decade and continues to fund such 'designated research centres' as the Newcastle Centre for Urban and Regional Studies whose programmes of work have been essentially empirically based and directed to concerns with clear policy implications. To this extent, the patterns of support from SSRC have given a push at the margin towards such styles of work. A related aspect of external funding which *has* made a significant difference to the shape and pattern of urban research is the greater involvement by Government departments in comissioning policy-oriented research – this, for the period of the early 1970s, was true of the Department of the Environment and now is true of the Department of Industry and the Manpower Services Commission. Geographers have been successful in attracting a large number of such commissions and the effect has clearly been to give another external push in the direction of steering the subject towards an essentially policy-orientated view of the city.

An example of such involvement can be seen in the work on the innercity issue, in which DoE-funded and SSRC-funded research has played a considerable part. At the outset, in the middle 1970s, most of the academic views of the 'problem' of the inner city began with enquiries about the nature and degree of concentration of deprived populations within the inner areas. The assumption underlying much of the work was that amelioration, if not 'solutions', could be sought and could be applied within those areas within which deprivation was concentrated. Increasingly, the perspective altered to stress the broader context, arguing that only by analysing the forces and processes which lie beyond the inner city itself might one be in a position to understand what happens in inner areas (Hall, 1981). The latest evolution of the research programme has now moved much more consciously into the policy arena with research teams looking at four cities (working in Glasgow, Birmingham, and Bristol which are taken as representative of cities which are respectively heavily declining, recently declining and relatively successful, together with the special case of

London) and addressing common policy questions by assessing the intended and unintended impacts of existing policy instruments, and evaluating the *capacity* of government agencies to implement what they claim to be their goals. Such a progression, leading to an increasing focus on policy evaluation and the creation of a framework within which policy might be set, undoubtedly bears some hallmarks of the closer connection between academics and government departments which such intermediate funding bodies like SSRC have encouraged. Too much should not be made of this however since the Research Council has continued to fund theoretical and purely academic styles of work. Indeed one could well argue that major theoretical changes of direction come less often from large funded projects than from the influence of a very small number of seminal thinkers within a discipline, much of whose initial exploratory theoretical work is rarely externally funded in any case.

A SYNTHETIC VIEW OF THE CITY

Such influences, coming from outside the academic concerns of the discipline, have played no small part in determining the changes in research trends in urban geography. They have altered both what is feasible and what is realistic if we are to address the very pressing concerns of a declining urban advanced economy and, at the same time, if we are to understand the trends themselves. The synthesis that is called for by the rifts and schisms of philosophical viewpoint is still elusive and seemingly distant. Perhaps the closest resolution has come, not uncharacteristically, from outside geography itself, in the work of Saunders (1981). Despite the fact that he argues for an aspatial approach to urban studies, he provides a schema that offers both a way of resolving the polar views of managerialists and Marxists and a framework within which the spatial concerns of geography might usefully be set (Table 1). His definition of what is 'urban' offers an emphasis on three elements: what O'Connor (1973) and Dunleavy (1980) call 'social consumption'; the participatory

TABLE 1. An urban schema

Conceptual criterion	Urban aspect	Relational aspect	Principal tension
Primary function	Social consumption	Social investment	Economic management *vs* social provision
Mode of interest mediation	Competitive politics	Corporatist politics	Planning *vs* democratic accountability
Level of administration	Local government	Regional/national government	Centralization *vs* peripheral autonomy

Source: Saunders, 1981.

democratic style of competitive politics; and *local* government. These urban elements are seen in the broader non-urban context of the mirror opposites of these three elements; the 'non-urban' questions surrounding social investment, corporate policy and centralised control. Given the dualism implicit in this set of relations and tensions, managerialism can be seen to straddle the corporate-competitive divide within politics such that managers may not be the *focus* of urban study, but managerial outcomes become the *context* within which urban analysis takes place. Such a perspective helps to resolve the schism between aspects of production and consumption and the dual view helps equally to resolve the difficulties surrounding the ambiguities of the concept of the relative autonomy of the state which so

bedevil the ideas of the structuralist writings. In this view, then, it is the competitive, local-consumption aspects which form the arena that the city provides: certainly in practice it has been in these fields that the great majority of urban work on the distribution of goods and services and the study of conflicts around their provision has been tackled. Within this, the scope for the characteristic emphasis on spatial outcomes and externalities which have figured so large within the geographical literature begins to assume a logical position.

In such a view, the city is clearly no longer seen as a physical object. Rather it becomes an arena in which the battles over consumption issues are fought out as a mere element of the wider society in which production and the questions of social investment assume a more dominant position. The observable, measurable elements within urban society – the conflicts, the derivation of policy, population change and loss – which have formed so large a part of recent writings on the geography of the city thus sit within the still-changing views of the meaning of the city which provide the frameworks within which we can 'explain' the role of the state and the meanings of urban phenomena.

REFERENCES

Ball M., 1981, The development of capitalism in housing provision, *International Journal of Urban and Regional Research*, 5, 145–77.

Bassett K., Short J. R., 1980, *Housing and residential structure*, Routledge and Kegan Paul, London.

Bennett R. J., 1982, *Central grants to local governments*, Cambridge Univ. Press, London.

Boddy M., 1980, *The building societies*, Macmillan, London.

Brown P. J. B., Ferguson S. S., 1982, Schools and population change in Liverpool, in: Gould W., Hodgkiss A., eds., *The resources of Merseyside*, Liverpool Univ. Press, 177–190.

Carter H., 1972, *The study of urban geography*, Arnold, London.

Castells E., 1978, *City, class and power*, Macmillan, London.

Clark D., 1982, *Urban geography*, Croom Helm, London.

Cox K., Johnston R. J., eds., 1982, *Conflict, politics and the urban scene*, Longman, London.

Dennis R., Clout H., 1980, *A social geography of England and Wales*, Pergamon, Oxford.

Dicken P., 1977, The multiplant enterprise and geographical space, *Regional Studies*, 10, 401–12.

Dicken P., Lloyd P. E., 1979, The contribution of foreign-owned firms to regional employment change, *Working Paper*, 8, NWIRU, Manchester.

Drewett R., Goddard J. B., Spence N. A., 1976, British cities: urban population and employment trends, *Research Report*, 10, Dept. of Environment, London.

Duncan S. S., 1977, The housing question and the structure of the housing market, Journal *of Social Policy*, 6, 385–412.

Duncan S. S., Goodwin M., 1980, The local state and restructuring social relations, *Working Paper*, 24, Urban and Regional Studies, Sussex.

Dunleavy P., 1980, *Urban political analysis: the politics of collective consumption*, Macmillan, London.

Dunleavy P., 1981, *The politics of mass housing in Britain 1945–75*, Oxford University Press, London.

Fenton M., 1977, Asian households in owner occupation, *Working Paper*, 2, SSRC Research Unit on Ethnic Relations.

Fielding A. J., 1982, Counterurbanisation in Western Europe, *Progress in Planning*, 17, 1–52.

Forest R., Murie A., 1976, Social segregation, housing need and the sale of council houses, *Research Memorandum*, 53, CURS, Birmingham.

Giddens A., 1973, *The class structure of the advanced societies*, Hutchinson, London.

Gray F., 1976, Selection and allocation in council housing, *Transactions of the Institute of British Geographers*, NS 1, 36–46.
Hall P. et al., 1973, *The containment of urban England*, Allen and Unwin, London.
Hall P., 1981, *The inner city in context*, Heinemann, London.
Harloe M., Lebas E., eds., 1981, *City, class and capital*, Arnold, London.
Harvey D., 1973, *Social justice and the city*, Arnold, London.
Herbert D. T., 1972, *Urban geography: a social perspective*, David and Charles, Newton Abbot.
Herbert D. T., Thomas C. J., 1982, *Urban geography: a first approach*, Wiley, London.
Holtermann S., 1975, Areas of urban deprivation in Great Britain, *Social Trends*, 6.
Johnston R. J., 1980, *City and society: an outline for urban geography*, Penguin, Harmondsworth.
Johnston R. J., 1982, *Geography and the state*, Macmillan, London.
Jones H., 1981, *A population geography*, Harper and Row, London.
Kirby A., 1979, *Education health and housing*, Saxon House, Farnborough.
Kirby A., 1982, *The politics of location*, Methuen, London.
Knox P., 1975, *Social well-being: a spatial perspective*, Oxford Univ. Press, Oxford.
Knox P., 1982, *Urban social geography*, Longman, London.
Leonard S., 1979, Managerialism, managers and self-management, *Area*, 11, 87–88.
Lojkine J., 1977, 'Big firms' strategies, urban policy and urban social movements, in: Harloe M., ed., *Captive cities*, Wiley, London, 141–156.
Massey D., Meegan R., 1982, *The anatomy of job loss*, Methuen, London.
Merrett S., 1978, *State housing in Britain*, Routledge and Kegan Paul, London.
Mingione E., 1981, *Social conflict and the city*, Blackwell, Oxford.
O'Connor J., 1973, *The fiscal crisis of the state*, St. James' Press, London.
Rapoport R. N., Fogarty M. P., Rapoport R., eds., *Families in Britain*, Routledge and Kegan Paul, London.
Rees P., Wilson A. G., 1977, *Spatial population analysis*, Arnold, London.
Robson B. T., 1975, *Urban social areas*, Oxford Univ. Press, Oxford.
Saunders P., 1981, *Social theory and the urban question*, Hutchinson, London.
Short J., 1981, Defence spending in the UK regions, *Regional Studies*, 15, 101–110.
Smith D. M., 1977, *Human geography: a welfare approach*, Arnold, London.
Smyth H., 1982. The historical growth of property companies and the construction industry in Britain, Unpublished Ph.D. thesis, Bristol Univ.
Spence N. et al., 1982, *British cities: an analysis of urban change*, Pergamon, Oxford.
Thomas R. W., Robson B. T., 1983, The impact of falling school rolls on the assignment of primary schoolchildren to secondary schools in Manchester, *Environment and Planning*, forthcoming.
Vining D., Strauss A., 1977, A demonstration that the current deconcentration of population in the US is a clean break with the past, *Environment and Planning A*, 9, 751–758.
Warnes A., ed., 1982, *Geographical perspectives on the elderly*, Wiley, London.
Williams P., 1978, Urban managerialism: a concept of relevance? *Area*, 10, 236–240.
Woods R. I., 1979, *Population analysis in geography*, Longman, London.

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CHANGING VIEWS OF THE CITY IN POLISH GEOGRAPHICAL RESEARCH

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The post-war period in the development of Polish geography has been characterised by the dominating role played by organized, planned and partly successful research. One says 'only partly successful' because, in spite of all efforts, the results of work carried out on the basis of preconceived programmes only rarely fully realized their proposed and intended goals. Nevertheless, the progress achieved, particularly in the field of settlement and urban geography, remains significant. This progress was marked by many shifts in aims and views and showed a constant increase in the breadth and depth of theoretical concepts and analytical methods. With these shifts the view of Polish cities was naturally also changing. The aims of current studies were the main reason for such changes. Of necessity the whole research was until recently mainly concentrated on Poland and Polish urban transformations. Monographs and comparative studies of cities in foreign countries became more frequent only in recent years.

Very early in the first post-war years a specific polarization of studies in settlement geography and in particular in urban geography has taken place. One, well pronounced approach was to study – on the basis of population and economic phenomena – the functional problems of settlement and urban development; and the other, much better rooted in traditional research, but much weaker in its intensity, was concerned with the morphology of settlement as expressed among others by types of land and building utilization and their distributions. This polarization may also be defined as the study of human contents and material forms of settlement.

The inspiration for both approaches came originally from the physical planning authorities and offices. The functional approach evolved out of the needs of planning at the national and regional levels for more definite and precise projections of future growth, short- and long-term tendencies in population changes in individual cities. The morphological one has been derived out of efforts to identify various zones of land utilization and to define building regulations in city planning. With most economic planning aiming at the rapid and forced industrialization of the whole country, the functional approach seemed and in fact was of the greater importance and in the period of the last thirty years of evolution reached an undoubted state of maturity with a large number of defined and developed basic concepts, some fully fledged theories, and subtle and complex analytical methods based and derived from detailed topical studies. On the other hand morphological research although never completely discarded has been unable to develop wider generalizations or truly theoretical ideas and

views. In this paper therefore the whole presentation follows systematically the achievements and changes of the functional research with only incidental references to the more important of the morphological studies as they have occurred through time.

FUNCTIONAL STUDIES

The view or even better the concept of the city was changing as the new problems and new planning tasks emerged for and in geographical research. In the beginning the city was conceived both in functional and morphological studies as a separate social, economic and material whole. However, the search for the structure of the economic urban base led early to the consideration of a city in its relation to the outer world, its environment and then in relation to other cities. Interpretations of their interactions were at that time based more or less on central place theory.

In such studies the activities taking place in the city, its functions, were divided (following W. Sombart and his followers and successors) into city-building and city-serving ones or, using American terminology, into basic and non-basic. Later in Polish studies the terms exo- and endogenous activities or sectors were introduced as devoid of any *a priori* implied priority or hierarchy. In the 1960s the exogenous activities and functions were further subdivided into regional, i.e. central, and specialized ones. This additional division allowed the extension of central place theory into a much wider application, covering the totality of urban places. While classical central place theory was based on the existence of the competition between central places of the same rank, the extended theory also took into account the co-operation between cities based on the social division of labour on regional, national or even supranational scales. Obviously, this implied that the movement costs of overcoming distance are not always significant economic and technical factors in production, services and consumption. In reality very often they are negligible and the technical progress in transport produces an increase in importance of specialized functions and of the social division of labour in the development of cities.

Efforts to study and to measure the processes of urbanization and later on of the emergence, growth and changing structures of urban agglomerations have started with the identification of urbanization itself with the growth of cities and this led to study of migrations from rural to urban areas. But such study, when considering urbanization as it takes place in reality, has brought the need for extension of the concept itself by including in it not only the growth of cities, but also the transmission and spread of urban customs or modes and ways of life into the countryside. Such an approach implied the understanding of urbanization as a phenomenon of inclusion into a specific social community rather than of inhabiting a special place or a separate and specific territory.

This change in understanding of urbanization and its processes together with the partial abandonment of the identification of urbanization with the growth of cities has meant an important correction to the concept of urban agglomeration and the recognition of the phenomenon that the modern city does not possess clearly cut and defined boundaries. At one time there was an ardent discussion about the meaning and the interdependence of such terms as conurbation, metropolitan area and urban agglomeration. By a general agreement, although not a consensus, the term 'urban agglomeration' was assumed to denote the most general phenomenon in settlement while the remaining terms were to be limited to specific cases: 'metropolitan area' to monocentric urban agglomerations (developing usually around the regional or national capitals), and 'conurbation' to polycentric industrial and urban agglomerations, usually connected with mining and/or industrial regions. This convention is still widely used although from time to time it is being questioned in later work.

In later development of this terminology several geographers tried to classify and order terms used for denoting the usually concentric zones developing inside and around urban agglomerations: 'the city'; 'CBD'; 'central district'; 'inner and outher suburbs'; 'suburban zone'; 'urban core' or 'central city'; 'metropolitan region'; 'city-region'; 'urban field'; 'daily urban system'; 'functional urban region'; 'regional settlement system'; as well as 'city hinterland' or 'the tributary area'; and finally 'the nodal region'. From these last terms there was only step to the concept of settlement systems in general and of urban systems in particular.

SYSTEMIC METHODS

Already the identification of the close dependence based on the social division of labour between major urban centres on national or supranational scales and between all such centres on regional and local scales formed during the late 1960s the beginning of efforts to formulate some theory of urban networks. However, the concept of a 'network' turned out to be inadequate and insufficient. As a result it was quickly superseded in the 1970s by the concept of settlement and in particular of urban settlement system. At the same time systemic methods of analysis were introduced and used in research.

Originally the systemic concept and analytical methods in their application in research on settlement, in particular on urban settlement, were used only for interpretative and explanatory purposes. But in a later phase, in the late 1970s, they were followed also in empirical studies, mostly for the verification of the intuitively and *a priori* formulated hypotheses. Consequently, certain kinds of deductive theory of settlement systems seem to emerge.

The empirical research has shown that a variety of systems may be easily identified and defined within the settlement of region, state or nation. Two main types were found, the territorial and the functional systems. The territorial systems reflect the organization of the society and of settlement in a specific area. They are either local, regional, national, federal or supranational. This implies formation at the different levels of hierarchical relations between such settlement systems. The functional systems reflect social, usually economic, relations and are based on the social division of labour which has already been stressed. Here the hierarchical relations, although possible, are not typical.

However, in reality settlement systems are mixtures or, better, resultants of several such systems of territorial and functional types superimposed one over the other and fused together. Among the territorial systems the concept of a subsystem connecting the main urban centres in Poland was conceived and tested. It was found to be still in an early stage of development. The functional systems in Poland are mainly connected with industrial processing and production. Their existence is indicated by the strength and size of the specialized sector in the economic base of Polish cities.

The systemic approach was also found to be of value in the interpretation of internal urban structures. These, together with the movements of population to and in the cities, form at present an increasingly large part of research undertaken by Polish urban geographers.

INTERNAL CITY STRUCTURE

Already in the 1960s in the research pertaining to the Upper-Silesian Industrial District the importance of industrial location for the distribution of housing estates and indeed the whole pattern of the settlement network was found to be decisive. In the

1970s the study of relations between places of work in general and dwellings was started on a wider scale. In particular this problem emerged in the research on permanent migratory flows, on journey-to-work and to schools and on the initiatives and policies of industrial enterprises in relation to the location of various services, such as schools, nurseries, health centres, shopping areas, open spaces as well as the whole housing estates providing for their employees. These studies has shown the significant impact that the location of places of work has upon the internal structures of a city or an agglomeration.

With the introduction of the systemic approach the internal patterns and structures of a settlement, especially of the largest cities or urban agglomerations, are now interpreted in terms of dynamic daily processes and historic change. Some specific regularities were observed and are now studied more closely, especially in terms of their theoretical implications and the possibilities of using such insights in controlling and steering city development. These are: the polarization of traffic and movement directions with increasing distance from the city centre; the specific patterns in the distribution of people and their dwellings in relation to the larger concentrations of work-places; and finally changes in distribution of work-places and dwellings within the city due to the differences in strength and patterns in their decentralization and the evolution of the processes of urbanization, involving the changes from the growth of cities themselves to the spread of urban ways of life and urban culture.

MICRO-SCALE STUDIES

All of this progress and advancement in the geographical knowledge of settlement in general and urban problems in particular were obtained either in macro-scale economic and social research or by analysis of aggregate statistical data dealing with mass information. Detailed geographical studies at a more microscopic scale or of individual behaviour have been very few in the last thirty years. The reasons may be found in the strongly and centrally directed economy and politics prevailing during this period, in which individual reactions were both difficult to obtain and did not have strong influence on current changes and transformations. Now, however, after two years of social, economic and political turmoil and upheavals and with economic and political reforms slowly being introduced, this kind of research is growing in value and in importance.

In particular with the growing autonomy of industrial enterprises and of agricultural production units in state and cooperative farms as well as peasants' homesteads; with the reintroduction of territorial local self-government; and with the change in functions of central authorities at the national level, away from the directing and towards the steering of regional and local activities towards a coherent, integrated and purposeful economy, the need for better knowledge of problems and processes emerging at the lower levels and their closer definition is being recognized. As a result microscale research has been given new incentives, new functions and active support by the social and political leaders.

Such studies, however, should be based on different techniques of observation, of gathering basic materials, and of subsequent transformation and analysis. They must, by their nature, involve much closer collaboration with sociologists and representatives of other social sciences. In fact they should lead us to multidisciplinary approaches and some interdisciplinary integration of views on the nature, structure and transformations of cities and urban life.

Looking back on all these changes and the evolution of previously studied problems, of methodological approaches and of the new themes now emerging, it seems obvious that the attention of Polish geographers — at least as far cities are concerned —

has already begun to move from analyses of their spatial position, role and functions in the national economy and in cultural and political life to the study of urban society as a spatial community composed of smaller units. It is interesting, for example, to observe a new interest concentrated on the role and transformations taking place in families and family life.

However, at the same time there is a definite change of generation taking place among Polish geographers and the new tasks can already be seen as being the responsibility of the younger men. The older generation was fairly successful in tackling the functional and later systemic analyses of settlement and urban problems. Time will show how successful younger Polish geographers will be in the new directions of research.

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RECENT DEVELOPMENTS IN SOCIAL GEOGRAPHY

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It may seem strange advocating the assessment of developments in social geography, when there is a general movement within the social sciences towards a more integrated, interdisciplinary approach. Indeed, in a recent historical view of the sub-discipline, the author suggested that such movement might possibly result in the demise of social geography (Eyles and Smith, 1978). It is, however, important to interpret such a comment correctly. The move towards greater social science integration is likely to lead to the demise of social geography as a separate entity. This does not mean that it will cease to exist. It will contribute to, become part of, and be constituted by the broader social science endeavours. Paradoxically, this may require a greater awareness of the role of social geography. Thus, even in multidisciplinary studies, social geography remains important for two reasons. In the field of human geography, it constantly and consistently focuses attention on people and their problems. It is possible to argue that human geography itself is artifactoriented, analysing the city, the factory or the clinic rather than the people whose actions and activities constitute such artifacts. In social science, social geography keeps the geographical dimension to the fore. All social actions have a geographical dimension which is more than a mere reflex of the social. Historically, most social theory has been almost totally aspatial. It is only recently that such theory has recognised the importance of the spatial (see Giddens, 1981). That dimension must not disappear from view again.

THE PROBLEM OF DEFINITION

While it may be argued that the importance of social geography has been identified, before it is possible to assess developments in the sub-discipline, it is necessary to determine what constitutes social geography. It must of course be recognized that no one definition is likely to be acceptable to the whole community of scholars working in 'social geography' and its related fields. It may be suggested that social geography orders and structures geographical events and entities in a specific way, namely one in which 'people' are placed at the centre of attention. 'People' requires some elaboration. Do we take it to mean individuals, groups or population aggregates? Does it treat these categories simply as they are, as bundles of attributes or as social relationships? We may answer these questions by suggesting that the primary focus of social geography is the social group in space (see Jones and Eyles, 1977), where social group is taken to mean a collectivity of individuals meaningfully related by shared social attributes, such as occupational status, ethnicity, family status,

political affiliation, educational qualifications, and health status. But this identification of social groups in space is only a first step in social geographical analysis. Its tasks may also be said to include the exploration of the activities of these groups as in shopping and leisure behaviour, and the search for housing space, and the assessment of the impact of the relationships between different groups in space, as for example, occurs in migration and segregation.

From elaborating the idea of 'people in space', three empirical sets of problems have been identified within social geography: the isolation of meaningful social groups in space (a task shared with sociology); the examination of group activities (shared with planning studies); and the assessment of the impacts of group interactions (shared with several social sciences). The core of social geography is, therefore, empirical and this empirical core firmly locates the sub-discipline within an interdisciplinary framework. But social geography is not merely an empirical science, it is also a theoretical and practical one as well. It is possible to discern these other interests if we continue our assessment of the problem of definition, by examining earlier definitions of the field.

The definition of social geography has varied quite significantly over time and it is interesting to note that its definition has usually reflected the dominant academic interests in human geography at particular times. Thus, in the mid-1950s, Watson (1957) defined social geography as the identification of different regions according to associations of social phenomena related to the total environment, firmly locating the sub-field in the traditions of regional geography. About a decade later, Pahl (1965) suggested that social geography was the study of the patterns and processes necessary for understanding socially defined populations in a spatial setting. Such a definition may be said to mirror the concerns of scientific social science and to emphasise the links with other social disciplines. In the mid-1970s, Eyles (1974) defined the subject as being concerned with the analysis of the social patterns and processes arising from the distribution of, and access to, scarce resources, reflecting the relevance movement and the welfare-social problems perspectives. In such a definition, social geography was viewed as a normative perspective. This was taken further by Asheim (1979) who stressed the role of structural relations in analysing social problems, analysis being on material reality and the social contradictions this produces.

This last definition highlights the incorporation of Marxian theory into social geography. Two further definitions, more general and less time-specific, emphasise the input of humanist ideas. Thus, Buttimer (1968) saw social geography as the study of the areal patterns and functional relations of social groups in their environments as well as their activities and channels of communication, while Jones (1975) argued that it consisted of understanding the patterns which arise from the use social groups make of space as they see it, and of the processes involved in making and changing such patterns. While these definitions may be regarded as detailed variations on the 'people in space' formulation, they also emphasise the importance of shared communication and perceived space, i.e. they implicitly stress humanist ideas.

It is pertinent to ask: what is the relevance of these definitions if they are time-specific? Their relevance to an assessment of recent social geography is fourfold. First, they point to the close relations between social geography and other social sciences as well as conventional scientific practice (Pahl, Buttimer). Secondly, although their derivation is timespecific, their influence shapes and continues to shape social geographical research. Thus, it is possible to suggest that Watson's areal differentiation approach may be still found in the welfare approach of Smith (1977, 1979) which identifies variations in quality of life within and between territories. The emphasis on 'scarce resources' (Eyles) may still be seen in the development and assessment of output and evaluation measures in the fields of educational and health

care provision. In passing, it may be noted that the continued utility and relevance of earlier ideas argues for the rejection of the notion of paradigm shift in preference to evolutionary approaches. While the paradigm approach emphasises change within scientific practice, evolutionary theory (see Bellah, 1964; Fletcher, 1974), with its references to relicts, the problematic path of development and the co-existence of competing systems, links the history of ideas firmly with societal change. Such a view does not suggest that earlier ideas are relicts in any pejorative sense but that they maintain a significant role even when others come to the fore.

Linked to the possibility of policy evaluation, is the third relevance of the definitions. They point to a possible practical involvement for social geography in that its empirical investigations may help in formulating, monitoring, instigating or changing policy. Fourthly, the definitions point to the close relationship between social geography and social theory. On a general level, due attention is paid to the significance of normative theory, i.e. that human endeavour should be directed at improving the human condition. In this regard, social geography may be regarded as a truly humanist enterprise. The general definitions of Buttimer and Jones support such a contention in that improvement may better emerge from understanding what people are, how they see themselves and from what they want. This empathetic approach would, however, be challenged by the Marxian perspective (Asheim) which advocates not only a particular way of looking at the world but also a political action programme aimed at the radical transformation of society as it is presently constituted. At the level of social geographical work, such perspective has emphasised critique, i.e. the importance of exposing the assumptions of theoretical systems, and there is a rich debate between the theoretical parameters of humanism and Marxism (Eliot Hurst, 198); Eyles, 1981; Duncan and Ley, 1982).

This discussion of definitions enables an isolation of three main strands in recent social geographical development, namely the empirical, the theoretical and the practical. It must be said, though, that this trinity is more apparent than real in much social geography where there is a conjoining of theory and empirical research and in which solutions to particular social problems may be advocated. We shall, however, isolate the three for the purposes of discussion.

THE EMPIRICAL

While developments in theory have often attempted to illustrate their conceptions with observational statements, the empirical have, to a large extent, been explicitly atheoretical. This is not to say that they have not been informed by a particular mode of explanation and perspective on phenomenal relationships. But by and large, such features have remained at the implicit level. That this may occur is due to the fact that the implications are accepted and indeed taken-for-granted by the majority of social geographical practitioners, whether they are isolating groups in space, examining group activities or exploring the impact of group interactions. In other words, the bulk of social geographical developments, especially in the empirical, works within the canons of empiricist science. In such a science, the relationship between theory and observation is viewed unproblematically with observational statements being accorded a special privilege as being the ones which make direct reference to phenomena in the real worlds. Further, they can be declared true or false without reference to the truth or falsity of the underpinning theoretical statements. 'Facts' speak themselves and theoretical concepts tend to be 'suppressed'.

The bulk of social geography is not only empirical, therefore, but also empiricist. Within the context of such a set of ideas, it is possible to point to studies of segregation and changes in ethnic areas, of variations in specific activities between

territories and groups, e.g. leisure, shopping and travel behaviour, voting affiliations and housing search activity, and of groups in residential space, often identified by multivariate analyses. Such analyses no longer treat census variables alone, although in Britain the availability of small area statistics from the 1981 Census may increase the number of such studies. Such techniques have, in fact, been used to address normative concerns like the quality of life and its constituent parts, such as educational and health care provision, recreational activities and the location of criminal offences and offenders. But overall, it is possible to argue that quality of life studies have emphasised positive questions and methodological sophistification rather than normative issues. Indeed, the 'relevance revolution' in human geography did little more than change the variables used in multivariate analyses. The 'facts' still speak for themselves. There is a tendency for research to concentrate now on specific aspects of quality of life, e.g. accessibility, facility location, health status and educational provision. Such tendencies may still be regarded as being within the spatial science tradition in which the technical appraisal of an identified 'social problem' takes the structures of state and economy as given, consensual elements. This technicialism and methodological sophistication are also to be seen in behavioural geography which has borrowed many different methods from psychology to study the relationship between individual and environment (see Bunting and Guelke, 1979). Such borrowings often result in the individual being shorn from his social context. It may be that if the individual in his social geographical context is to be explored, then an existential geography based on the principles of *Gestalt* psychology requires development.

The empirical core of social geography is largely empiricist. It is nevertheless important as it provides detailed studies of many facets of social life. Some ideas of the variety of topics covered by the sub-discipline can be gained by looking at texts and collections of papers (see, for example, Herbert and Johnston, 1976; Jones and Eyles, 1977; Lewis, 1979; Gold, 1980; Knox, 1982; Cox and Johnston, 1982; Flowerdew, 1982; Ley, 1983). But this core is also limited. Its limitations stem from its treatment of the theory-observation relationship and can be seen in the problems of explanation, the key endeavour of the social scientist. The associations, correlations and relationships discovered require explanation. Thus, for example, why does a pattern of segregation take the form and have the impact it does? Why does the quality of life or nature of health care provision vary between territories? To explain such phenomena fully requires their location within the social, economic and political relationships of the containing society, i.e. a model of society is required. Segregation cannot be explained only in terms of the internal choices of, and external constraints acting against, ethnic minorities. Nor can health care provision be understood only in terms of accessibility and facility provision. Explanation requires an elaboration of the nature of social, economic and political relationships. Thus, the explanation of social phenomena demands a model of society which posits the logical and necessary relations between phenomena, suggesting that explanation in the social sciences is different from that in the natural sciences (see MacIntyre, 1971; Bernstein, 1976). Explanation demands a theoretical system, which is also likely to be committed to a particular set of normative statements.

THE THEORETICAL

While there is no one theoretical system to which all social geographers subscribe, the sub-discipline is primarily a humanistic enterprise. In fact, many of its insights for establishing models of man and of society have been taken from humanistic philosophies, specifically phenomenology and existentialism (see Harvey and Holly, 1981). Such borrowings have focussed attention of the empathetic understanding of

individual groups and their environments. Overwhelmingly, therefore, such social geography has been speculative and contemplative, emphasising landscape tastes, senses of place and the interpretation of landscape through prose, poetry and art (see Relph, 1976; Tuan, 1977; Ley and Samuels, 1978). Some research has, however, been less contemplative. It has emphasised the meanings individuals and groups bring to their perception and use of facilities and the environment. Thus health research at Queen Mary College has focussed on how different groups view and treat their health conditions, environment and health care facilities (see, for example, Cornwell, 1982). Other research, also based on interpretative sociology, has constructed ideal-types of senses of place to discover how space is ordered and used (Eyles, 1983). Further, the time-geographic work of the Lund school, based on the existential view of a whole person with a whole life, has not only examined how individuals perceive and utilise time-space but has also been used as an input into policies to improve the locations of, and accessibility to, facilities like schools and clinics (see Carlstein et al., 1978).

Competing' with humanist ideas are those of the Marxian perspective, predicated on a view of an exploitative society and alienated man. It must be remembered that Marxism is conceived in these terms as a set of explanatory ideas and not as a political system. Most of the work in this and related traditions has been critique, especially of 'bourgeois social science' and positivism (see Slater, 1975; Gregory, 1978). The Marxism in social geography has tended to be a mechanistic, deterministic Marxism, based largely on the ideas of Althusser, Balibar, Godelier and Castells. In such a context, the economic base is seen as the motor of society, determining the political and ideological layers of the social world. The primary relation is that between capital and labour (Peet, 1979) and despite protestations to the contrary, policy and ideology are largely seen as reflexes of this relation (see Harvey, 1982). Less deterministically and in interesting attempts to link the concerns of social and industrial geography, Massey (1979, 1981) has addressed the problems of regional development and industrial restructuring in terms of a spatial division of labour and capitalist centralisation and concentration.

Two further theoretical developments may be briefly mentioned. First, there is the theory of structuration which is important because it shows geographical ideas to have their own theoretical relevance and because it demonstrates the dynamic interplay between the conscious activities of individuals and the structures which affect their lives. Structures of communication, domination and tradition are created by individuals and groups but once created take on a life of their own, significantly shaping individuals possibilities. Thus far, structuration theory has only been applied in historical social geography in a study of the transformations wrought in the West Riding of Yorkshire by the industrial revolution (Gregory, 1983). It is possible, however, to suggest that the interplay of individual creativity and structure through the mediation of available interpretations, resources and traditions is useful in policy assessment in that the structures created by policy are altered by the responses which they induce in individuals. The theory may, therefore, demonstrate how unintended consequences flow from policy.

Secondly, there is critical theory, especially as it has been recently developed by Habermas (1976). Its central concern has been the problems of legitimation in post-industrial society. It has attempted to theorise the relations between the economic and political systems, as the latter tries to manage crises developed primarily in the former. Thus far, in social geography, suggestive use has been made of critical theoretical concepts. Ley (1980) has examined their utility in a discussion of the post-industrial city while Eyles et al (1982) have utilised some of the ideas in an examination of how economic crises can become manifest at the political level, specifically in their example at the level of resource allocations for health care facilities.

THE PRACTICAL

During the discussion of the theoretical, attempts were made to relate theoretical developments to both the empirical and the practical. We now turn explicitly to the practical or policy level, although it may be said that the overall relationship between social geography and policy-making is a slight one. There are two major reasons for this, namely the nature of policy-making in the United Kingdom and the dominant form of planning in this society.

The relationship between academic geography and policy-making is virtually non-existent. There is little interchange of personnel or even ideas between the sectors as can be found in the USA, Canada and Australia. This state of affairs stems from the history and centralisation of British policy-making, meaning that the major influence is an indirect one in that individuals trained in geography departments become policy-makers in central and local government. Once recruited to these services, the individuals are soon socialised into an ethos of bureaucratic administration, an ethos which emphasises the rigid demarcation of sectors and which, for the most part, denies the relevance of academic involvement. This is not to say that individual academics are not involved with government but their contributions are few.

Social geography's lowly contribution can also partly be explained by the dominant form of planning in the UK. While national, strategic planning is primarily economic, most spatial planning, whether it is urban or regional, is reactive planning. (Further, we should note that most Western governments are, at least at the ideological level, attempting to reduce the role of planning and allow market principles to determine the shape of society). Reactive planning is taken to mean planning aimed at the short-term, at the exigencies of the moment, as reactions to the movements of capital or past political decisions. In essence, reactive planning chooses the policy option which will ameliorate the offending conditions – deprived region or inner city – in the shortest possible time for the minimum outlay of resources. None of this means that social geographers need not have a role in such planning. But it is a role of outsider. They can, through their research, point to the deficiencies in the quality of life in particular areas and this may help to instigate reactive, remedial planning. At this level, the role of the social geographer is primarily critical, pointing to areal problems or the deficiencies in resource allocation criteria. It is interesting to note that such criticism suggests a model of society – theoretical constructs – against which present conditions are evaluated. Such critical awareness need not, of course, be heeded. It is more likely that policy-makers will accede to political or economic pressure rather than academic argument. It is also likely that some pressures will be regarded as more important than others, especially those emanating from business interests and key social groups (see Saunders, 1979).

There is, however, another form of planning – creative (or innovative) planning – to which social geographers may better contribute. Such planning may also be called social development planning (Jones and Eyles, 1977). It is, in fact, more a feature of certain East European societies rather than those of Western Europe. In such societies as Hungary and Czechoslovakia, academics and planners work closely together developing norms for educational, housing, recreational, and health care provision. In the UK, such planning is mainly found in 'new communities' in the new and expanded town programme. In this context social development planning has meant the establishment of neighbourhoods with specific population mixes and with relatively easy access to urban facilities. It has also encouraged the participation of the residents in local affairs. Similar aims can be discerned in the urban aid programme which was focussed primarily on the inner city and which attempted to improve the provision of facilities. It may be that this programme is better regarded as part of reactive planning as it attempted to remedy the defects of an existing environment

and infrastructure. Both the 'new communities' and the 'urban aid' programmes are now of less significance as public expenditure reductions lead to cut backs in the provisions. In any event, the involvement of social geographers in such planning has again been slight and mainly through their individual recruitment on the specific programmes.

Does this lack of impact and response mean that there can be no practical developments in social geography? The answer must be qualified no. While all disciplines must be realistic in what they feel that they can achieve, empirical investigations will continue to highlight problems while critical appraisals will point to the technical deficiencies in policy options. The theory-informed developments may also contribute to the practical, by pointing to the overarching significance of the normative. But in the UK, it must be said that the practical level is likely to remain the least developed (and most difficult to develop) part of social geography.

While this matters as all social disciplines should have a practical orientation, it may be concluded that social geography is *par excellence* a critical academic discipline with strong relationships with other social sciences and social theory. It has a vital role to play in interdisciplinary research and for its own developments it requires theory-informed empirical studies which may, then, through their critiques and evaluations, feed into some stage of the policy-making process.

REFERENCES

Ashcim B. T., 1979, Social geography-welfare state ideology or critical social science? *Geoforum*, 10, 5–18.

Bellah R., 1964, Religious evolution, *American Sociological Review*, 29, 358–74.

Berrstein R., 1976, *The restructuring of social and political theory*, Blackwell, Oxford.

Bunting T., Guelke L. W., 1979, Behavioural and perception geography: a critical appraisal, *Annals of the Association of American Geographers*, 69, 448–62.

Buttmer A., 1968, Social geography, in: D. L. Sills, ed., *Encyclopedia of the social sciences*, Vol. 6, MacMillan, New York.

Carlstein T., Parkes D. N., Thrift N. J., eds., 1978, *Timing space and spacing time*, Vol. 2, Arnold, London.

Cornwell J., 1982, Approaches in medical sociology to 'felt need' for health care, in: Health Research Group, eds., *Contemporary perspectives on health and health care*, Queen Mary College, Department of Geography, Occasional Paper 20.

Cox K. R., Johnston R. J., 1982, *Conflict, politics and the urban scene*, Longman, London.

Duncan J., Ley D., 1982, Structural Marxism and human geography: a critical assessment, *Annals of the Association of American Geographers*, 72, 30–59.

Eliot Hurst M. E., 1980, Geography, social science and society, *Australian Geographical Studies*, 18, 3–21.

Eyles J., 1974, Social theory and social geography, *Progress in Geography*, 6, 22–87.

Eyles J., 1981, Why geography cannot be Marxist, *Environment and Planning A*, 13, 1371–88.

Eyles J., 1983, *Senses of place*, University of London.

Eyles J., Smith D. M., 1978, Social geography, *American Behavioural Scientist*, 22, 41–58.

Eyles J., Smith D. M., Woods K. J., 1982, Spatial resource allocation and state practice, *Regional Studies*, 16, 239–53.

Fletcher R., 1974, Evolutionary and developmental sociology, in: J. Rex, ed., *Approaches to sociology*, Routledge and Kegan Paul, London.

Floverdew R., ed., 1982, *Institutions and geographical patterns*, Croom Helm, London.

Giddens A., 1981, *A contemporary critique of historical materialism*, Macmillan, London.

Goll J., 1980, *An introduction to behavioural geography*, Oxford University Press, Oxford.

Gregory D., 1978, *Ideology, science and human geography*, Hutchinson, London.

Gregory D., 1983, *Regional transformation and industrial revolution*, Macmillan, London.
Habermas J., 1976, *Legitimation crisis*, Heinemann, London.
Harvey D., 1982, *Limits to capital*, Blackwell, Oxford.
Harvey M. E., Holly B. P., eds., 1981, *Themes in geographic thought*, Croom Helm, London.
Herbert D. T., Johnston R. J., eds., 1976, *Social areas in cities*, 2 vols, Wiley, Chichester.
Jones E., 1975, Introduction, in: E. Jones (ed.), *Readings in social geography*, Oxford University Press, Oxford.
Jones E., Eyles J., 1977, *An introduction to social geography*, Oxford University Press, Oxford.
Knox P. L., 1982, *Urban social geography*, Longman, London.
Lewis G., 1979, *Rural communities: a social geography*, David and Charles, Newton Abbot.
Ley D., 1980, Liberal ideology and the post-industrial city, *Annals of the Association of American Geographers*, 70, 238–52.
Ley D., 1983, *A social geography of the city*, Harper and Row, New York.
Ley D., Samuels M., eds., 1978, *Humanistic geography*, Maaroufa Press, Chicago.
MacIntyre A., 1971, *Against the self-images of the age*, Duckworth, London.
Massey D., 1979, In what sense a regional problem? *Regional Studies*, 13, 106–25.
Massey D., 1981, The UK electrical engineering and electronics industries, in: M. Dear, A. Scott, eds., *Urbanisation and urban planning in capitalist society*, Macmillan, London.
Pahl R. E., 1965, Trends in social geography, in: R. J. Chorley, P. Haggett, eds., *Frontiers in geographical teaching*, Methuen, London.
Peet R., 1979, Societal contradiction and Marxist geography, *Annals of the Association of American Geographers*, 69, 164–69.
Relph E., 1976, *Place and placelessness*, Pion, London.
Saunders P., 1979, *Urban politics*, Hutchinson, London.
Slater D., 1975, The poverty of modern geographical enquiry, *Pacific Viewpoint*, 16, 159–76.
Smith D. M., 1977, *Human geography: a welfare approach*, Arnold, London.
Smith D. M., 1979, *Where the grass is greener*, Penguin, Harmondsworth.
Tuan Y. F., 1977, *Space and place*, Arnold, London.
Watson J. W., 1957, The sociological aspects of geography, in: G. Taylor, ed., *Geography in the twentieth century*, Methuen, London.

SOCIAL ASPECTS OF URBAN PROBLEMS · INEQUALITY IN THE AMERICAN CITY. THE CASE OF ATLANTA, GEORGIA, 1960–1980

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INTRODUCTION

Inequality in living standards has emerged as a major focus of interest in urban geography over the past decade. The early 1970s saw attempts to identify patterns of inequality in various conditions by means of territorial social indicators, while more recently attention has shifted to the distributive processes involved. The relative deprivation of particular population groups is a matter of special concern in both Britain and the United States, the most obvious example being that of racial inequality. This paper provides a case study of racial inequality in the spatial context of a major American city. It is part of a broader study which seeks to elucidate the process of social change as the balance of formal political power shifts from whites to blacks. Only the empirical findings concerning 'race-space inequality' are presented here; a more complete analysis will be published in due course (Smith, 1983).

Racial inequality and its spatial expression is one of the most distinctive characteristics of the cities of the United States. The past two decades have seen many blacks leaving the original inner-city ghettos, as upward economic mobility is accompanied by residential change, yet the American city is still highly segregated racially and their black population markedly worse off than the whites when taken in aggregate. An important empirical question, to which little explicit attention appears to have been directed, is whether the modern era of change in the location and status of blacks has made the cities of the United States more equal, from a racial and spatial point of view. If so, then some social progress might be recognised on equity grounds, despite the persistence of racial segregation. If, however, the degree of inequality in living standards remains much as before, or has even been exacerbated, then the years of black emancipation, economic advance and growing political power may be judged less favourably from a welfare point of view. Indeed, in these circumstances the paramount importance of race itself as the origin of inequality in the American city is called into question, and with it much of the conventional interpretation of socio-economic differentiation in urban America.

This paper seeks to answer the question of whether race-space inequality in living standards has decreased or increased over the two decades 1960–1980, for a single city. The city chosen is Atlanta, Georgia. While typical of metropolitan America in many respects, Atlanta has some special features which give it a particular interest and significance as a case study of trends in inequality by race and residential space.

Atlanta is popularly viewed as a prosperous symbol of the economic vitality and civic enlightenment of the so-called 'new South', it has a black middle class going back three or more generations, and since 1973 it has had a black mayor. Conditions in Atlanta might therefore be considered especially conducive to black advancement, and to the reduction of inequality insofar as this is a product of racial discrimination. The fact that the period under review covers the change from white to black power in a formal political sense adds further interest.

THE CITY OF ATLANTA

The City of Atlanta as a political jurisdiction comprises the central part of a wider metropolitan region with a total population of about 1.75 million. Atlanta itself had 425,000 inhabitants at the time of the 1980 Census, a reduction of 70,000 compared with the 1970 figure (in 1960 it was 488,000). The 14 per cent population loss can be attributed largely to the outmigration of white families with children: the number of households in Atlanta remained virtually the same but average household size decreased from 2.95 persons in 1970 to 2.51 in 1980. The associated demographic changes may be summarised as a decrease from 31.2 to 26.8 per cent in Atlanta's population under the age of 18 and an increase from 9.1 to 11.5 per cent in those over 64.

Particularly significant from the perspective of the present study is the change in racial composition of Atlanta's population. The two decades under review have seen the proportion of blacks in the city's population rise from 38 per cent in 1960 to 57 in 1970 and 67 in 1980. Between 1970 and 1980 the black population increased by 10.9 per cent while that of the whites decreased by 42.7 per cent.

The period from 1960 to 1980 saw considerable changes in Atlanta in the spatial arrangement of the two races. This process has been described in detail elsewhere (e.g. Hartshorn et al., 1976, 46–50; Smith, 1981, 10–14) and only the most general observations are required here. Up to 1950 the black population has been virtually confined to an inner-city ghetto. During the 1950s and 1960s considerable expansion of black residential space in a westerly direction took place, to form a wedge from the CBD to the city limits. A decade of inner-city urban renewal beginning in the late 1950s eliminated substantial sections of the ghetto, with the inhabitants filtering into adjoining areas or removed to nearby public housing projects. In a few areas gentrification also bit into black inner-city residential space. The 1970s saw further black advances into the south-west and eventually into most of the southern half of the city. Thus by 1980 the affluent so-called Northside of Atlanta remained virtually the only predominantly white part of the city, white suburbia having been largely displaced by a process of neighbourhood racial transition to new tracts beyond the city limits.

The impact of two decades of change is summarised cartographically in Figure 1. This shows the sequential extention of predominantly black residential space, into the eastern and southern parts of the city. The changes are highlighted by the identification of 'racial transition' census tracts, which experienced an increase of at least 75 in the percentage of population black. That such extensive areas of the city should have been, in effect, transferred from one race group to the other in two decades or less is indicative of the pace with which occupancy of residential space in the American city can change, under the impetus of a process of population relocation in which racial homogeneity is for most people the preferred and expected neighbourhood characteristic.

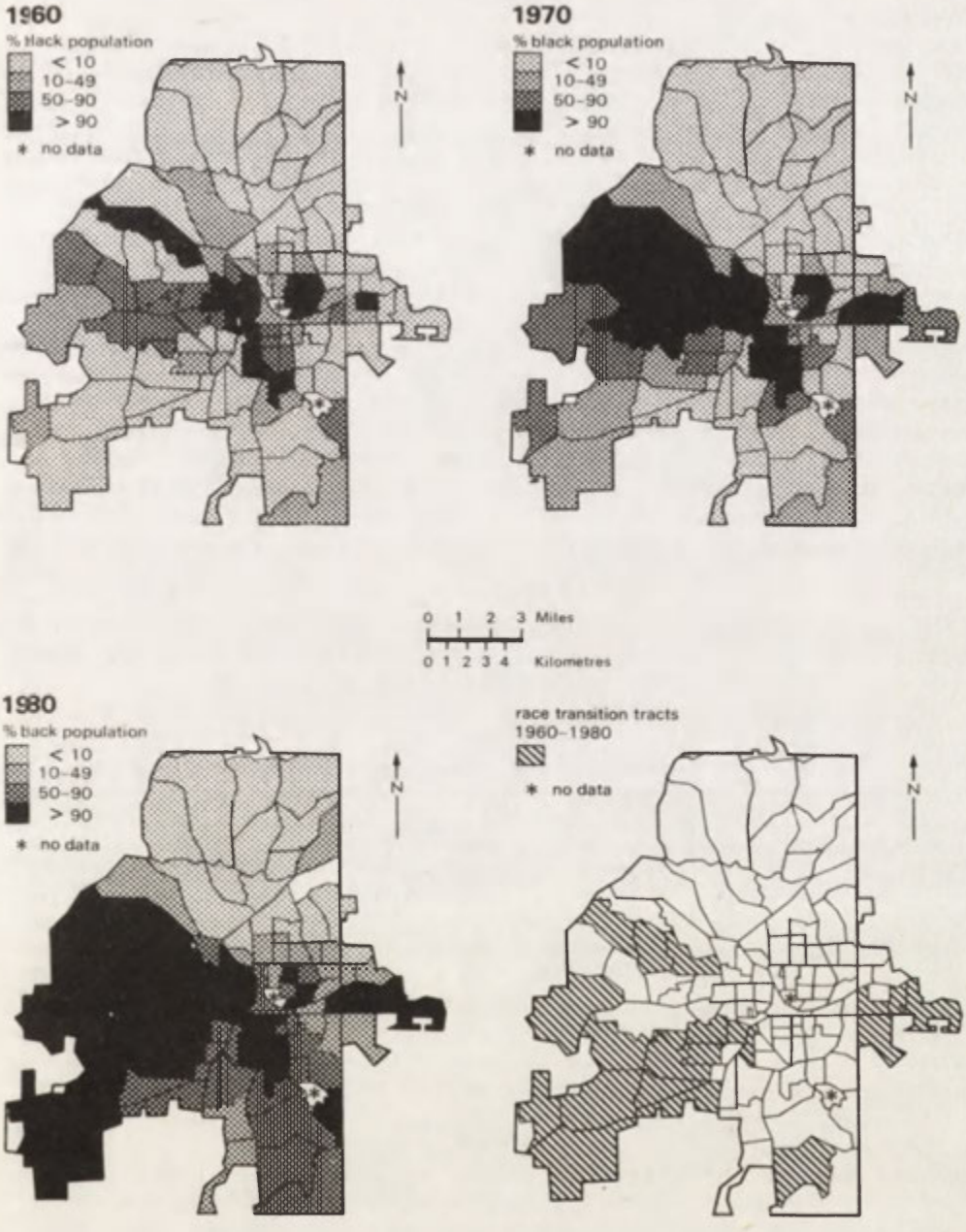


Fig 1. Changes in racial composition of tract populations, 1960–70–80 (*Source: US Census of Population and Housing*). 'Racial Transition' tracts are defined in the text

RACE-SPACE INEQUALITY: EARLIER RESEARCH

The existence of marked spatial inequality in living standards in Atlanta follows from racial residential segregation and the relative socio-economic deprivation of the black population in aggregate. The association between race and living standards in this city was first examined by Clarke (1971) and then more fully by Bederman (1974). Bederman generated a 'quality of life' index for 1970 by census tracts, based on eleven variables measuring health, public order (i.e. crime), housing quality, socio-economic status and population density. He revealed a strong association between low "quality of life" and high proportion of blacks in the tract population, and vice versa, but complicated by the considerable range of 'quality of life' scores among the predominantly black, and more especially, the predominantly white tracts. By 1970 a process of upward socio-economic mobility accompanied by residential change had generated sufficient growth of a black suburban middle class to blur the spatial association between race and living standards.

It was against this background of growing complexity in the relationship between race, space and living standards that the present study was initiated. The first stage involved an examination of trends in inequality between 1960 and 1970, the findings of which are reported fully in Smith (1981). Five indicators were chosen: median family income, median value of owner-occupied housing units, housing units lacking complete plumbing (i.e. hot piped water, exclusive use of a flush lavatory, and a bath or shower), housing with more than one person per room, and median school years completed (cf. Table 1). Data were compiled from the 1960 and 1970 *Census of Population and Housing*, for 102 territorial units comprising tracts or combination of tracts necessitated by changes in tract boundaries between 1960 and 1970. The city was divided into 'black', 'white' and 'mixed' census tracts by five alternative definitions involving different qualifying percentages of the race groups: over 90 per cent, 80, 70, 60 and 50 per cent respectively (Table 2).

TABLE 1. Social indicators and summary measures by census tracts[1]

Indicator	Date	Min	Max
1. Median family income ($)	1960	1,336	16,250
	1970	1,951	30,063
	1980	2,499	48,260
2. Median value of owner-occupied housing units ($)	1960	5,000	25,000
	1970	6,200	50,000
	1980	10,000	145,900
3. Housing with more than 1 0 persons per room (%)	1960	0.5	47.7
	1970	0.2	32.4
	1980	0.1	16.7
4. Median school years completed (by persons 25 and over)	1960	6.2	14.7
	1970	7.0	16.0
	1980	7.1	16.1[3]
5. Infant deaths per 1,000 live births[2]	1960	0.0	166.7
	1970	0.0	85.7
	1980	0.0	52.6

Source: 1-4: *Us Census of Population and Housing*, 1960, 1970, 1980; 5: Fulton County Health Department.

Notes: [1] The units of observation are Census tracts or combinations of tracts; $n = 98$; data are incomplete for some indicators for a few tracts.

[2] Calculated from aggregated data for three years, as follows: "1960" = 1963–65, "1970" = 1968–70, "1980" = 1979–81.

[3] Nine tracts where the reported value is "16+" have been assigned 16.1 for the purpose of this study.

The first question posed was that of the comparative position of the two race groups, as indicated by mean values in 1960 and 1970. Irrespective of the tract definition adopted, the predominantly black tracts showed a greater relative improvement than the predominantly white tracts on four of the five indicators, the non-conforming condition being value of housing. However, only in the case of housing lacking complete plumbing was the rate of improvement in the black tracts markedly greater than in the white tracts.

The second and more fundamental question concerned the degree of inequality among census tracts. To establish trends between 1960 and 1970, the coefficient of variation (i.e. tract standard deviation divided by mean) was calculated, for each of the five indicators. Taking all tracts irrespective of racial composition showed a substantial reduction in the coefficient (i.e., in 'spatial inequality') for housing with more than one person per room, small reductions for the income and education variables, and marked increases in inequality for housing value and incomplete plumbing. For the predominantly black tracts, four of the five indicators showed marked increases in inequality, the exception being median school years completed. For white tracts, little change was found, except for a substantial increase in inequality in housing values.

The conclusion was that, while the gap between living standards in black and white residential space had narrowed somewhat, this had been accompanied by an increase in inequality among the predominantly black parts of Atlanta. Such a trend is consistent with a selective process of upward (and outward) mobility on the part of blacks, which brought modest suburban affluence for some but left others anchored in inner-city poverty.

RACE-SPACE INEQUALITY: 1960–1970–1980

Having undertaken the work summarised briefly above, the next stage in the project was to replicate the 1960–1970 study for the period 1970–1980. This was dependent on access to 1980 census data, which the US Bureau of the Census began to release in 1982. The form of the 1980 census data along with a reconsideration of the indicators to be adopted required the reconstitution of the data base for 1960 and 1970. The earlier analysis has therefore been re-run, in a manner required to make 1960–1970 changes directly comparable with those for 1970–1980 and to generate a 1960–1980 change where this seems helpful.

AREAL UNITS

Comparisons between data for the three census years are facilitated by the relative stability of census tract delimitations. For the 1960–1970 study the 119 tracts as defined in 1970 were reduced to 102 to produce a set of territorial units comprising tracts or combination thereof for which data could be compiled for both 1960 and 1970. Further splitting or amalgamation of tracts reduced the total in 1980 to 117, and the units required to generate comparatable data for all three years to 98. Census tracts are designed to be relatively homogenous with respect to the social and economic characteristics of their population. In 1980 they ranged in population size from a few hundred to about 20,000 but most were between 2,000 and 6,000. The possibility of extending to study beyond the city limits and into the wider metropolitan area where most of the recent suburban development has taken place was considered, but rejected because of the difficulties arising from changes in tract boundaries and because the interpretation of trends would be affected by the fact that some suburban tracts in 1980 had been sparsely populated rural areas in 1960.

TABLE 2. Mean values for social indicators, 1960, 1970 and 1980, by census tracts classified accor

Classification of tracts by proportion of population black		I Black > 90%	I White < 10%	I Mixed 90–10%	II Black > 80%	II White < 20%	II Mixed 80–20%
Number of tracts	1960	19	52	27	24	58	16
	1970	33	40	25	37	44	17
	1980	42	18	38	51	27	20
Indicator							
1. Median family income	1960	2,396	6,380	3,776	2,690	6,162	3,410
	1970	5,710	12,146	7,482	6,106	11,890	6,603
	1980	9,473	31,612	12,138	9,525	26,048	11,955
2. Median value of owner-occupied housing units	1960	8,942	14,762	9,515	9,352	14,505	8,235
	1970	12,124	22,705	14,366	12,786	22,111	13,026
	1980	19,939	85,272	31,392	20,627	71,696	28,872
3. Housing with more than 1.0 persons per room	1960	33.06	6.48	23.89	30.71	7.21	30.74
	1970	19.74	4.55	13.50	18.93	4.73	15.43
	1980	8.80	0.83	6.14	8.50	1.97	6.56
4. Median school years completed	1960	7.94	11.66	9.23	8.32	11.57	8.18
	1970	9.54	12.25	10.02	9.76	12.16	9.42
	1980	10.69	15.41	16.97	10.79	14.92	11.41
5. Infant deaths per 1000 live births	1960	37.73	22.72	34.92	36.96	23.37	37.79
	1970	32.71	19.90	23.49	31.17	20.79	23.23
	1980	21.36	13.31	18.50	21.69	11.86	20.68

INDICATORS

Two changes were made in the choice of indicators for the 1960–1970–1980 comparison. Proportion of housing units lacking complete plumbing was dropped from the study, on the grounds that by 1980 so few dwellings fell into this category that it has lost its power of spatial discrimination. The mean tract value of 18.3 in 1960 had already been reduced to 3.1 in 1970 and in 1980 it was only 2.1. This move to virtual ubiquity in the availability of the three basic amenities reflects the replacement of most of the slums by public housing projects. It is nevertheless worth noting that even in 1980 there was one census tract in the inner city ghetto with more than 10 per cent of its housing units lacking complete plumbing.

Dependence on the *Census of Population and Housing* produces a rather narrow conception of living standards, despite the fact that in the USA (unlike Great Britain) information on income and education is included. Some non-census data can be obtained, but the need to aggregate to census tracts creates almost unsurmountable difficulties. Bederman (1974) was able to compile data by tracts for infant mortality and for two crime variables in his 1970 study, while the present author had access to a wide range of non-census data for a social indicators study in Tampa, Florida (Smith and Gray, 1972; Smith, 1973, 120–134) and found a more limited exercise possible in the smaller Florida city of Gainesville (Dickinson, Gray and Smith, 1972). However, to compile comparable sets of data for more than one (census) year for a non-census variable requires access to records of a kind very seldom kept by such agencies as the city police department or local health authority.

Despite the difficulties it has been possible to compile data for this study on one non-census variable, infant mortality — albeit with some reservation as to its accuracy.

ding to racial composition

	III			IV			V	
Black > 70%	White < 30%	Mixed 70–30%	Black > 60%	White < 40%	Mixed 60–40%	Black > 50%	White < 50%	Mixed nil
27	63	8	30	63	5	31	67	
41	46	11	42	48	8	44	54	
54	31	13	59	35	4	62	36	
2807	5,963	3,430	2,843	5,963	3,776	2,924	5,800	
6111	11,612	6,603	6,175	11,388	7,483	6,205	10,895	
9420	24,556	12,173	9,673	23,159	11,719	9,761	22,859	
9462	14,058	8,269	9,283	14,058	8,590	9,420	13,635	
12756	21,754	13,068	12,833	21,248	13,569	12,795	20,453	
20829	69,229	22,642	20,724	64,417	21,988	20,754	63,292	
3096	8.45	30.23	31.60	8.45	25.98	31.05	9.67	
1866	5.21	15.09	18.53	5.87	13.85	18.41	6.69	
852	2.17	6.97	8.49	2.64	6.15	8.39	2.72	
836	11.35	8.18	8.31	11.35	8.36	8.40	11.13	
972	12.04	9.47	9.76	11.87	9.59	9.75	11.62	
1077	14.69	11.11	10.79	14.26	11.38	10.81	14.20	
3698	25.12	32.55	36.66	25.12	31.76	36.80	25.38	
3069	20.67	23.08	30.49	21.15	20.87	30.39	20.85	
2141	13.52	20.34	21.66	13.80	19.64	21.80	13.56	

Source: U.S. Census of Population and Housing 1960, 1970, 1980 and Fulton County Health Department.

Smal-area infant mortality rates are liable to fluctuate from year to year because of the very low number of incidents involved, so it is generally necessary to aggregate data for more than one year. Bederman (1974) took 1968, 1969 and 1970 to calculate infant deaths per 1,000 live births by census tracts, and figures made available by the Fulton County Health Department for 1979, 1980 and 1981 enable a comparable data set to be compiled for '1980'. Although some figures for 1960–1962 were available for some parts of the city in Fulton County, to cover the whole city for a date near 1960 required the aggregation of 1963, 1964 and 1965 for Fulton County as a whole along with 1965 data for DeKalb County, what is presented for '1960' therefore relates to a somewhat later data. Even the '1970' and '1980' figures must be regarded as merely approximation of true tract rates: for example, the '1980' figures are based on a total of only 493 infant deaths over three years, spread across 98 territorial units twelve of which recorded no deaths. While the inclusion of infant mortality data does enable the present study to go beyond the census and to include what is widely regarded as a sensitive indicator of community health, the results must be treated with caution.

Table 1 lists the five chosen indicators, along with their extreme values for the three census years. The extremes provide a simple measure of the degree to which census tracts in Atlanta differ. For example, median family income in the highest tract in 1980 was about 20 times that in the lowest, a higher ratio than in 1970 (15:1) which was itself higher than in 1960 (12:1). Similarly, median value of owner-occupied housing units in the highest tract was more than 14 times that in the lowest in 1980, compared with 8 in 1970 and 5 times in 1960. Such figures are suggestive of an increase in inequality among census tracts during both of the inter-censal periods, but more sensitive measurement is required to confirm this trend.

INEQUALITY BETWEEN THE RACES

We may now proceed to an examination of trends in inequality between the races. For this purpose the city is divided into 'black' and 'white' census tracts. As any such classification is arbitrary in the absence of complete racial homogeneity by tracts, the five alternative definitions in the original 1960–1970 study (Smith, 1981), using different qualifying percentages of blacks and whites in the total tract populations, are adopted again. The most stringent definition classifies tracts with over 90 per cent blacks in the total population as 'black', less than 10 per cent blacks as 'white' and the remainder as 'mixed', the next takes 80 per cent and 20 per cent, and so on until 50 per cent identifies black and white but no 'mixed' tracts (see Table 2).

The most obvious basis for comparing the black and white parts of Atlanta in the three census years is the tract mean. These are listed in Table 2. For each of the five variables in each of the three years the black areas are worse off than the white areas, irrespective of the tract definition employed. This observation comes as no surprise, though the extent of the disparities may (for example, the ratio of more than 4:1 in median value of owner-occupied housing units between black and white tracts in 1980 by definition I). There is a general tendency for the gap between black and white tracts to narrow as the definitions become less stringent (i.e. from I to V). The reason should be obvious: as the qualifying percentage of the race group in question are successively reduced the tracts become more racially mixed. Thus, for example, median family income in tracts classified as black increase as the qualifying percentage of blacks is reduced and the population includes more whites who generally have higher incomes than blacks. The consistency of this tendency for tract means to improve as the population balance shifts from black towards white is a further reflection of the fundamental differentiation between blacks and whites in aggregate.

The examination of trends in racial inequality over time is facilitated by comparing rates of improvement in conditions in black and white tracts, which can be achieved simply by dividing the base-year tract mean into the mean for the subsequent year. Trends from 1960 to 1970 are shown in Table 3a. The black tracts reveal a greater improvement in median family income than the white tracts, irrespective of the definitions adopted. The same is true of the measure of density of housing

TABLE 3a. Percentage improvement in social conditions, 1960–1970, by "Black" and "White" tracts

Indicator		Definition of 'Black' (B) and 'White' (W) tracts*				
		I	II	III	IV	V
1. Median family income[1]	B	2.38	2.27	2.18	2.17	2.12
	W	1.90	1.93	1.95	1.91	1.88
2. Median value of owner-occupied housing units[1]	B	1.36	1.37	1.35	1.38	1.36
	W	1.54	1.52	1.55	1.51	1.50
3. Housing with more than 1.0 persons per room[2]	B	1.67	1.62	1.66	1.71	1.69
	W	1.42	1.52	1.62	1.44	1.45
4. Median school years completed[1]	B	1.20	1.17	1.16	1.17	1.16
	W	1.05	1.05	1.06	1.05	1.04
5. Infant deaths per 1000 live births[2]	B	1.15	1.19	1.20	1.20	1.21
	W	1.14	1.12	1.22	1.19	1.22

Source: US Census of Population and Housing, and Fulton County Health Department.

* see Table 2.

Note: [1] 1970 tract mean: 1960 tract mean.

[2] 1960 tract mean: 1970 tract mean.

occupation and of median school years completed. Median value of owner-occupied housing shows a greater improvement in white tracts than in black tracts, while for infant mortality there is virtually no difference. On balance, then, the trend is towards greater equality between the races, though the rate at which the gap was narrowing can hardly be described as rapid. For example, if the rate of reduction in the ratio of white-tract to black-tract median family income (by definition I) between 1960 (ratio of 2.66:1) and 1970 (2.13:1) continued it would take a further 40 years to achieve equality.

What actually happened during the following decade (1970–80) is indicated in Table 3b. Three of the five indicators now show a greater relative improvement in the white tracts than the black tracts (again, the alternative tract definitions make no difference except that the contrast is usually sharper the more stringent the tract definitions). In the case of housing value the 1970–1980 trend is a sharp exacerbation of the 1960–1970 trend, but in the case of median family income and housing with more than one person per room a widening of the gap between the race has replaced the narrowing evident between 1960 and 1970. The two remaining

TABLE 3b. Percentage improvement in social conditions, 1970–1980, by "Black" and "White" tracts

Indicator		Definition of 'Black' (B) and 'White' (W) tracts*				
		I	II	III	IV	V
1. Median family income[1]	B	1.66	1.56	1.54	1.57	1.57
	W	2.60	2.19	2.11	2.03	2.10
2. Median value of owner-occupied housing units[1]	B	1.64	1.61	1.63	1.61	1.62
	W	3.76	3.24	3.18	3.03	3.09
3. Housing with more than 1.0 persons per room[2]	B	2.24	2.23	2.21	2.18	2.19
	W	5.48	2.40	2.40	2.22	2.46
4. Median school years completed[1]	B	1.12	1.11	1.11	1.11	1.11
	W	1.26	1.23	1.22	1.20	1.22
5. Infant deaths per 1000 live births[2]	B	1.53	1.44	1.43	1.41	1.39
	W	1.50	1.75	1.53	1.53	1.54

Source: US Census of Population and Housing, and Fulton County Health Department.

* see Table 2.

Note: [1] 1980 tract mean: 1970 tract mean.

[2] 1970 tract mean: 1980 tract mean.

indicators (infant mortality and median school years completed) show little difference between the races, though in the latter a greater relative improvement in black tracts in1960–1970 has been reversed in 1970–1980. Overall, then, Atlanta became a markedly more unequal city during the 1970s, in so far as black and white residential space is concerned. In fact, the reversal during the 1970s of the trend towards greater racial/spatial equality during the 1960s was so marked that changes over the two decades together (1960–1980) show greater percentage improvements in white tracts than black tracts for the income, housing value and overcrowding indicators and negligible differences for infant mortality and school years completed. Thus none of the five measures record a reduction of the ratio between black and white space.

The conclusion that racial inequality has increased in the city of Atlanta over the past two decades – the more so during the 1970s for most of which the mayor was black – runs counter to certain expectations outlined at the beginning of this paper.

However, acceptance of such a conclusion must be tempered by some circumspection, with respect to what the data involved actually mean. The figures related to the population of only part of a wider metropolitan area in which major transfer of whites from Atlanta to suburbs beyond the city limits have taken place while black population growth has been much more confined to the city itself. This could effect the interpretation of changes in tract means if the migration of whites from the city had been selective in significant respects. For example, the fact that income and housing indicator mean values have experienced greater increases in predominantly white tracts than in predominantly black tracts might be explained by the fact that the whites who left the city between 1960 and 1980 were largely from income or housing groups generally subject to lower rates of increase than in the case of the whites who remained in the city. More obviously, if those who left were largely middle income or housing value whites and those who remained mainly the rich, this alone would generate a disproportionate increase in mean values for white tracts. Available data do not permit a direct consideration of such possibilities. However, some inferences can be made from an examination of the characteristics of the population and housing of areas vacated by whites during the two decades under review, as many of the people involved probably left the city for the still-white suburbs beyond. Taking the 'racial transition' tracts as identified in Figure 1, those in which the proportion of population black increased by 75 or more between 1960 and 1980 (most of which had less than 5 per cent blacks in 1960), their average for median family income was $ 5,750 in 1960 and for median value of housing $ 11,962. Both these figures are less than the averages for all tracts with under 10 per cent blacks in 1960. Similarly, the average values for the income and housing indicators for the predominantly white (over 90 per cent) tracts in 1960 which remained white in 1980 were greater than for all such tracts.

These observations suggest that differential population movement among white social groups is responsible for some of the apparent widening of the gap between white and black space within the city of Atlanta between 1960 and 1980. Whether it could account for the whole of the increase in race-space inequality is impossible to judge from the data available. However, this reservation does not alter the fact that, within the boundary of the city of Atlanta, an increasing polarisation has occurred, with the remaining largely high-income white areas more sharply differentiated from the black area than in 1970 or 1960.

TABLE 3c. Percentage improvement in social conditions, 1960-1980, by "Black" and "White" tracts

Indicator		Definition of 'Black' (B) and 'White' (W) tracts*				
		I	II	III	IV	V
1. Median family income[1]	B	3.95	3.54	3.36	3.40	3.34
	W	4.95	4.23	4.12	3.88	3.94
2. Median value of owner-occupied housing units[1]	B	2.23	2.21	2.20	2.23	2.20
	W	5.78	4.94	4.92	4.58	4.64
3. Housing with more than 1.0 persons per room[2]	B	3.76	3.61	3.63	3.72	3.70
	W	7.81	3.66	3.89	3.20	3.56
4. Median school years completed[1]	B	1.35	1.30	1.29	1.30	1.29
	W	1.32	1.29	1.29	1.26	1.28
5. Infant deaths per 1000 births[2]	B	1.77	1.70	1.73	1.69	1.69
	W	1.71	1.97	1.86	1.82	1.87

Source: US Census of Population and Housing, and Fulton County Health Department.

* see Table 2.

Note: [1] 1980 tract mean: 1960 tract mean.
[2] 1960 tract mean: 1980 tract mean.

SPATIAL INEQUALITY

Before turning to trends in inequality among the census tracts occupied predominantly by blacks and whites respectively, some indications of the overall situation may be presented. As in the earlier study of the decade 1960–1970, inequality among census tracts is measured by a rather simple device – the coefficient of variation – in the absence of data in a form suitable for the calculation of a Gini coefficient or other more sophisticated indices. Reservations must be made even about the use of the coefficient of variation, when applied to distributions so skewed as to reduce the validity of the mean and standard deviation (on which the coefficient depends) as measures of central tendency and dispersion. Table 4 lists the coefficients of variation for all census tracts irrespective of racial composition of population. Two indicators – housing with more than one person per room and median school

TABLE 4. Coefficients of variation for social indicators by census tract, 1960, 1970 and 1980

Indicator		Mean (m)	Standard deviation (s)	Coefficient of variation ($s \times 100/m$)
1. Median family income	1960	4,890	2,853	58.34
	1970	8,789	5,013	57.04
	1980	14,573	10,435	71.61
2. Median value of owner-occupied housing units	1960	12,275	5,288	43.08
	1970	17,014	9,674	56.86
	1980	36,380	30,310	83.32
3. Housing with more than 1.0 persons per room	1960	16.43	13.52	82.30
	1970	11.95	8.57	71.73
	1980	6.31	4.31	68.28
4. Median school years completed	1960	10.27	2.32	22.58
	1970	10.78	2.12	19.69
	1980	12.05	2.34	19.38
5. Infant deaths per 1000 live births	1960	28.99	21.47	74.07
	1970	25.13	15.27	60.75
	1980	18.77	12.30	65.49

Source: US Census of Population and Housing, and Fulton County Health Department.

years completed – show trends toward greater equality (i.e. reduced coefficients). The fact that the changes are smaller in 1970–1980 than 1960–1970 reflects the general reduction in overcrowding (note the reduced means) and the trend towards more time in school with a virtually fixed upper limit of about 16 years; both conditions reduce inequality to the point where little further narrowing of the spread among census tracts can be expected. The infant mortality figures show conflicting trends – reduced inequality in the 1960s and a (smaller) increase during the 1970s. Median family income shows a marked increase in inequality in the second decade after little change from 1960 to 1970. Median value of housing shows an increase in inequality in the 1960s and an even more marked increase from 1970 to 1980.

The coefficients of variation by tracts classified according the racial compositions are listed in Table 5. Trends over the two decades as a whole are summarised in Tabe 6, by simply calculating the ratio of the coefficients of variation in 1960 and 1980. In interpreting these figures it is helpful to bear in mind that the most stringent definition of black and white tracts (I, i.e. greater than 90 per cent in one race group) includes most of the census tracts in Atlanta and that as the qualifying percentages are reduced (i.e. from definition I to V) the black and white tracts

TABLE 5. Coefficients of variation for social indicators, 1960, 1970 and 1980, by census tracts

Classification of tracts by proportion of population black		Black > 90%	White < 10%	Mixed 90–10%	Black > 80%	White < 20%	Mixed 80–20%
Number of tracts	1960	19	52	27	24	58	16
	1970	33	40	25	37	44	17
	1980	42	18	38	51	27	20
Indicator							
1. Median family income	1960	23.83	47.93	32.82	34.10	48.80	32.18
	1970	29.24	48.21	39.11	36.13	47.83	38.12
	1980	49.08	38.49	33.60	47.41	49.43	29.78
2. Median value of owner-occupied housing units	1960	16.95	39.68	24.06	18.30	39.44	24.93
	1970	24.31	54.41	34.48	32.17	54.27	27.35
	1980	38.24	41.58	52.46	36.26	49.85	59.72
3. Housing with more than 1.0 persons per room	1960	22.45	86.51	46.72	28.16	82.56	31.82
	1970	33.31	91.54	43.06	36.97	86.10	29.99
	1980	41.75	148.01	54.69	41.03	167.96	42.86
4. Median school years completed	1960	15.16	16.23	18.94	17.62	15.94	16.43
	1970	15.00	16.19	16.73	15.71	16.41	15.38
	1980	13.30	8.09	16.14	12.65	9.98	16.43
5. Infant deaths per 1000 live births	1960	26.96	105.87	69.08	29.11	100.11	65.47
	1970	38.74	82.37	54.49	43.16	79.41	49.71
	1980	48.62	103.87	53.03	48.02	104.07	56.45

Source: *U.S. Census of Population and Housing* 1960, 1970 and 1980 and Fulton County Health Department.

include successively more of the other race group. Thus the figures for definition I are those which highlight the differential experience of areas approaching racial homogeneity of population; the other figures merely serve the purpose of showing that the differences between the black and white parts of the city are consistent irrespective of the definition adopted though generally less marked the less stringent the definition.

Taking the summary in Table 6 first, the greatest increase in inequality (for all tracts) is shown by median housing values. However, it is the black areas which are largely responsible for this; the most stringent definition (I) shows a marked increase in inequality among black tracts but very little among white tracts. Median family income reveals a similar distinction, with inequality among black tracts increasing (markedly under definition I) while for the white area there is little change and a decrease in inequality among the tracts with over 90 per cent whites. Infant mortality also shows increased inequality among black tracts but little change among white tracts. Housing overcrowded by the criterion of more than one person per room has become more unequally distributed in both black and white space but with little difference between the two, while median school years completed shows a trend towards greater equality among both black and white tracts. (In passing it should be noted that the apparent inconsistency between on the one hand the increases in inequality for both black and white areas, e.g. in housing with more than one person per room and on the other the reduced inequality among all tracts is explained by the convergence of two distributions which are themselves becoming subject to more internal dispersal). The conclusion from these figures is that the predominant trend is towards greater inequality among Atlanta's black residential areas, while in white Atlanta trends are more contradictory and less pronounced.

An important question raised at the outset of this study was whether the 1970s

classified according to racial composition

Black > 70%	White < 30%	Mixed 70–30%	Black > 60%	White < 40%	Mixed 60–40%	Black > 50%	White < 50%	Mixed nil
27	63	8	30	63	5	31	67	
41	46	11	42	48	8	44	54	
54	31	13	59	35	4	62	36	
35.07	49.99	29.72	33.28	49.99	35.10	35.44	51.21	
36.95	49.38	34.47	36.74	50.24	38.47	35.77	51.88	
47.77	51.41	24.98	46.57	54.17	9.93	45.25	54.66	
18.97	41.14	25.53	19.17	41.14	31.71	20.21	42.76	
31.38	54.50	30.89	31.06	55.91	28.56	30.49	56.20	
36.71	50.06	40.90	35.82	55.27	8.28	34.91	56.46	
31.07	88.65	31.12	30.05	88.65	32.11	31.60	91.45	
36.32	89.91	33.57	36.42	96.01	32.75	36.16	86.64	
39.96	145.65	38.07	38.99	130.85	22.41	39.02	126.41	
18.48	17.27	17.11	17.74	17.27	21.56	18.25	18.91	
15.69	16.71	16.36	15.68	18.03	14.47	15.38	18.85	
12.38	11.65	14.15	12.06	15.26	8.32	11.89	15.33	
29.69	97.64	64.45	29.00	97.64	57.29	28.48	95.38	
43.38	78.78	50.58	43.34	76.14	61.33	43.02	75.28	
48.20	101.89	45.57	51.14	94.65	59.17	49.98	95.54	

would reveal different trends from the 1960s, bearing in mind the election of the first black mayor early in the second decade. Table 5 provides indications of changes which run counter to what might have been expected intuitively, especially when the experience of black residential space is compared with that of the white areas. Median family income shows a reduction in the coefficient of variation during the 1970s in white areas according to the most stringent definition, after little change in the 1960s; as the proportion of whites is reduced (through definitions II to V) the distinction is largely lost. However, the black tracts show a marked increase in inequality during the 1970s after a moderate increase (definition I) in the 1960s or very little change. Median value of owner-occupied housing units shows a continuation of a trend towards greater inequality if the 1960s and 1970s are compared for black tracts according to the most stringent definition, but a smaller increase in the coefficient in the 1970s than in the 1960s on the other tract definition. By contrast, the white areas show reduced inequality during the 1970s on definitions I, II and III and stability on IV and V, after marked increases during the 1960s. Housing with more than one person per room shows a continuing trend towards greater inequality among black tracts when the 1960s and 1970s are compared, for all tract definitions; the same is true for the white tracts, where the very high coefficients are a reflection of the degree of spatial concentration of the small amount of overcrowded property now occupied by whites. Infant mortality shows continuing increases in inequality for black tracts, whereas for white tracts a reduction in the 1960s was followed by an increase in the 1970s. Median school years completed is the only indicator to show a continuing reduction in inequality through both decades and for both races irrespective of census tracts definition – a reflection of the general increases in length of time in school, subject to an upper limit already reached in some areas.

The overriding impression is, therefore, of a continuing increase in inequality

TABLE 6. Trends in inequality among census tracts, 1960–1980, measured by changes in coefficients of variation[1]

Indicator		Definition of 'Black' (B) and 'White' (W) tracts*					All tracts (n = 98)
		I	II	III	IV	V	
1. Median family income	B	2.06	1.39	1.36	1.40	1.28	1.23
	W	0.80	1.01	1.03	1.08	1.07	
2. Median value of owner-occupied housing units	B	2.26	1.98	1.94	1.87	1.73	1.93
	W	1.05	1.26	1.22	1.34	1.32	
3. Housing with more than 1.0 persons per room	B	1.86	1.46	1.29	1.30	1.23	0.83
	W	1.71	2.03	1.64	1.48	1.38	
4. Median school years completed	B	0.89	0.72	0.67	0.68	0.65	0.86
	W	0.50	0.63	0.67	0.88	0.81	
5. Infant deaths per 1000 live births	B	1.80	1.65	1.62	1.76	1.75	0.88
	W	0.98	1.04	1.04	0.97	1.00	

Source: *US Census of Population and Housing*, and Fulton County Health Department.

* See Table 2.

Note: [1] cv. 1980: cv. 1980; figures of greater than 1.00 indicate an increase in inequality, less than 1.00 a decrease.

among black residential areas, despite the ascendance of blacks to formal political power during the 1970s. In the case of income, the trend appears to have been exacerbated. In white parts of the city the tendency is, for the most part, towards reduced inequality or stability. The contrast between the races with respect to income and value of housing – the most direct indicators of material affluence or poverty – are particularly revealing: the 1970s saw greater inequality among black tracts and less among white tracts.

As in the case of trends in inequality between the race groups (see discussion of Table 2 and 3 above), it is necessary to examine the data more closely before the trends revealed are accepted as firm findings. Reference has already been made to the possible effect on figures for white parts of Atlanta of selective population movement to suburbs beyond the city limits, and this appears to have had a bearing on the trends revealed in Table 5. The reduced coefficients of variation during the 1970s for income and housing values, along with the sharp increase in mean values (Table 2), are consistent with an outward population movement disproportionately involving middle-income whites, thus leaving the remaining white areas more uniformly rich, as exemplified by the wealthy Northside residential areas still solidly white in 1980.

Black population growth and residential expansion has been much more confined to the city of Atlanta, however. This means that the trends in inequality among predominantly black tracts may be interpreted largely at face value. The spread of black residential space outwards from the inner-city ghetto and now incorporating most of the southern part of the city has opened up large areas of suburbia to blacks, thereby increasing the quality of housing occupied by many blacks. Greater inequality among black residential areas will have resulted, if the poorer blacks remain trapped in low-value inner-city housing. This appears to have been the case, for the so-called urban renewal programmes of the 1960s did not generate the scale of benefits to Atlanta's poor blacks which might have been expected. The details of what actually happened are recorded elsewhere (see Stone 1976, Smith 1981, 47–57); it is sufficient here to point out that only about one-third of the 67,000 inner-city blacks

displaced by 'urban renewal' were rehoused by the city, that the public housing projects which replaced the slums were improvements in a physical sense (e.g. access to complete plumbing facilities) but arguably not which respect to neighbourhood environmental quality and social conditions, and that for the majority of the displaced population rehousing simply meant a move into the next zone of deteriorating property. Thus it would be hard to judge a relative (or even absolute) improvement in the housing conditions of many of Atlanta's poor blacks during the 1960s and 1970s, when compared with the increase in housing quality experienced by most of the city's population including the upwardly and outwardly mobile section of the black community.

The fact that the available data comprise summary conditions for population aggregates defined by area of residence limits what can be said about the experience of specific groups, especially in circumstances where the racial composition of some parts of the city has changed dramatically during the two decades under review. However, something can be learned from looking again at the 'racial transition' tracts which turned over from largely white to largely black occupation. As was indicated above, income and housing values in these tracts in 1960 were on average less than for all predominantly white tracts; with one notable exception (tract 79) these were not among the most affluent white areas. However, they were overall markedly superior to the existing black residential areas: their average for median housing value of $ 11,962 exceeded the $ 8,942 for tracts with over 90 per cent black population in 1960 and only two of the seventeen tracts had a median value less than this figure, while the average for median income in these tracts in 1960 when occupied predominantly by whites ($ 5,750) was more than double the $ 2,369 in all tracts with over 90 per cent blacks. Moving into these areas thus represented a substantial improvement in housing and general environmental quality for most blacks.

What happened in these tracts between 1960 and 1980 is significant to the interpretation of trends in inequality among the predominantly black parts of Atlanta. Table 7 shows values for the five indicators, and compares the change over the two decades with changes in all tracts in the city. Median value of owner-occupied housing units is the most interesting to consider, as it relates to fixed structures and not to a mobile population. While new building has taken place in some tracts, elsewhere the racial transition represented mainly the reoccupation by blacks of dwellings vacated by whites, whereas the other indicators relate to a population which itself changed between 1960 and 1980. In passing it should be noted that the census measures housing value as assessed by the owner-occupier, so figures for 1960 and 1980 reflect respectively what the original (usually white) owner-occupier thought that the property would sell for at a time when racial transition was probably not an expectation in most areas and the present (usually black) owner-occupiers view which is no doubt based in part on the relatively recent price of aquisition. In a situation of racial transition there are two possible distorting effects on the housing market: housing in a white area opened up to blacks may increase disproportionately in value because it is scarce in relation to black demand, or it may be depressed in value as whites engage in panic selling in the face of black advances in the neighbourhood. Anecdotal evidence suggests that the latter tendency characterised the process of property transfer in much of Atlanta's race transition areas.

Table 7 shows that the average increase of median housing values in race transition tracts was only slightly more than two-thirds of that in all tracts. This is consistent with the interpretation that racial transition had a relatively depressing effect on housing values (though it could also be that new housing in these tracts after black occupation was more modest than it would have been if the area had still been in white hands, white incomes being generally higher than black incomes). A reasonable inference would be that the actual qualitative improvement in housing occupied in

racial transition tracts was somewhat greater than the 1980 median values would suggest. If this is correct, two things follow. First, the gap between the races in housing quality (see Tables 2 and 3) is smaller than indicated by (depressed) 1980 housing values in predominantly black areas. Secondly, disparities in housing quality among predominantly black tracts in 1980 are greater than indicated by

TABLE 7. Mean values for social indicators, 1960 and 1980, for "Racial Transition" tracts [1]

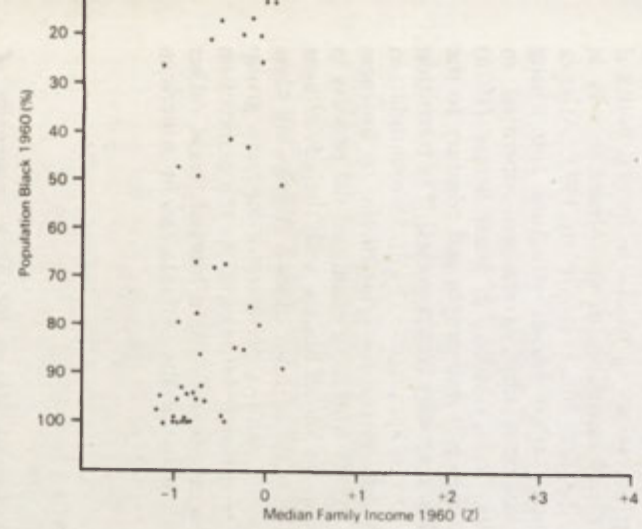
Indicator	1960	1980	1960 1980	1960–1980 all tracts
1. Median family income	5.750	13.137	2.28	2.90
2. Median values of owner-occupied housing units	11.962	26.288	2.19	2.93
3. Housing with more than 1.0 persons per room	8.78	7.83	1.12	2.32
4. Median school years completed	10.78	11.73	1.09	1.17
5. Infant deaths per 1000 live births	20.94	20.35	1.03	1.54

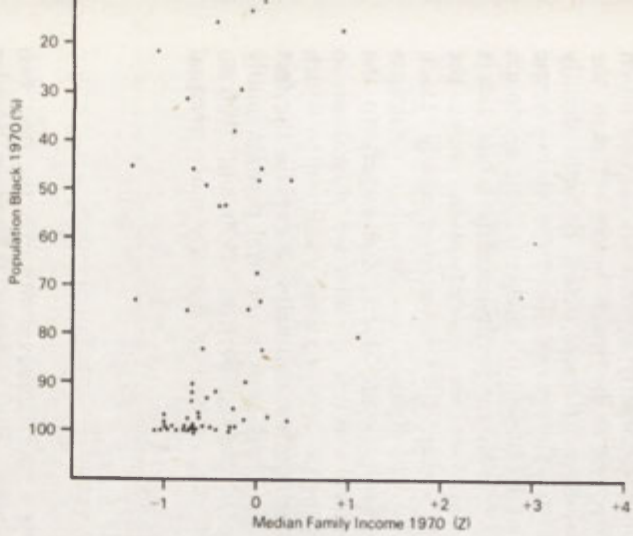
Source: US Census of Population and Housing, and Fulton County Health Department.
Note: [1] as defined in Figure 1 and text.

census housing values, because these were artificially depressed in the race transition areas into which many higher income blacks moved. However, such observations must be regarded as at best tentative, in view of the various uncertainties which available data are not capable of resolving.

The other four indicators are all consistent in showing changes in the race transition tracts to be smaller than in all tracts. While average median income in the race transition tracts in 1980 was well above the $ 9,473 for all tracts with over 90 per cent blacks, the increase compared with the figure for the (predominantly) whites in these tracts in 1960 was considerably less than the 1960–1980 change for all tracts in the city. Housing with more than one person per room showed only a very small improvement in these tracts as a whole, and in seven of the seventeen tracts the proportion of dwellings in this category actually increased between 1960 and 1980 — no doubt a reflection of larger family sizes among the blacks who replaced the whites. Improvements in the education indicator were similarly modest, and in three tracts median school years completed in 1980 by the (predominantly) black inhabitants were no more than for the (predominantly) whites in 1960. Infant mortality in the transition tracts as occupied by blacks in 1980 was only marginally less than the 1960 figure, despite the substantial general improvement over the two decades. All this suggests that, while the quality of housing and its neighbourhood occupied by blacks improved as they colonised previously white areas, they brought with them and retained some of the characteristics which distinguish the black population in general from that of the whites. Thus the overall improvement in life quality for the upwardly and outwardly mobile black has probably been less than the quality of housing and neighbourhood occupied would suggest.

The trends which have been observed in race-space inequality in the city of Atlanta over the two decades under review are summarised graphically in Figure 2.





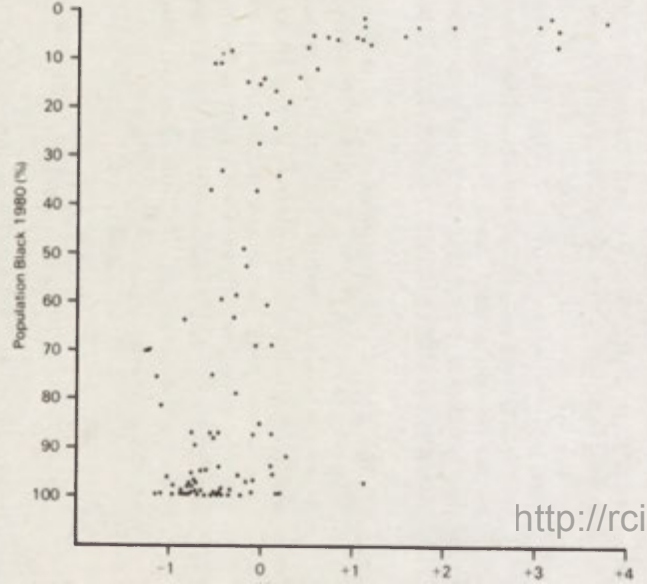


Fig. 2. The relationship between racial composition of tract populations and median family income (transformed into standard deviates), 1960–70–80. *Source: US Census of Popula-*

Here median family income by census tract is plotted against racial composition of the population, with data on income transformed into standard deviates (Z) to allow for the general increase in values. In 1960 the predominantly black areas were all poor, with little variation between them, while the predominantly white areas showed much more variability. Although the white areas tended to be much better off than the black areas they did include a substantial number of tracts below or only slightly above the overall tract mean (where $Z = 0$). The graph for 1970 shows some spreading out of the predominantly black tracts, as those with higher income approach and in a few cases exceed a value of $Z = 0$. Among predominantly white tracts there is also an indication of greater spread, as the concentration about the mean thins out. Further spreading of the values for the predominantly black tracts is suggested in the graph for 1980. More obvious, however, is a reduction in variability among the remaining predominantly white tracts, due largely to the loss of the bottom end of the distribution as a result of selective migration to new suburbs beyond the city association with the process of racial transition to which reference has already been made. Population migration also helps to explain the fact that the suggestion of some convergence of predominantly white and predominantly black tracts between 1960 and 1970 has been reversed between 1970 and 1980 to produce what in this aggregate sense is a racially as well as spatially more unequal city.

CONCLUSION

The observations that Atlanta has become a more unequal city over the past two decades, especially in its black residential areas, runs counter to certain popular expectations with respect to progress towards greater social justice in American society. In particular, the assumption that the ascendacy of blacks to formal political power will somehow solve the problems of racial inequality in the American city is called into question. Before the election of the first black mayor in 1973, Atlanta was run by what Hunter (1953) identified as a white power structure comprising representatives of the business elite who saw that city government operated in a manner consistent with business objectives. This resulted in what Stone (1976) described as system bias, working to the advantage of some people and contrary to the interests of others (mainly the poor, largely black inner-city communities). The transition from white to black formal political control has been characterised by an accommodation on the part of the business elite to a black administration sympathetic to business interests. Burman (1979), Eisinger (1980) and others who have examined the process in detail find only a modest redistributive impact in favour of blacks, with the advantages accruing to the middle class rather than to the mass of poor blacks. A growing class cleavage among the black population is evident, with a prosperous business group alligned economically if not socially with the traditional white elite. As the association between race and socio-economic status becomes steadily more blurred, class rather than race emerges as the fundamental source of inequality Atlanta, as in American society at large.

REFERENCES

Bederman S. H., 1974, The stratification of 'quality of life' in the black community of Atlanta, Georgia, *Southeastern Geographer*, 14, 26–37.

Burman S., 1979, The illusion of progress: race and politics in Atlanta, Georgia, *Ethnic and Racial Studies*, 2, 441–454.

Clarke M. M., 1971, *Black-white ghettos: quality of life in the Atlanta inner city*, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Dickinson J. C., Gray R. J., Smith D. M., 1972, The quality of life in Gainesville, Florida: an application of territorial social indicators, *Southeastern Geographer*, 12, 121–132.

Eisinger P. K., 1980, *The politics of displacement: racial and ethnic transition in three American cities*, Academic Press, New York.

Hartshorn T. A., Bederman S., Davis S., Dever G. E. A., Pillsbury R., 1976, *Metropolis in Georgia: Atlanta's rise as a major transaction center*, Ballinger Publishing Company, Cambridge, Mass.

Hunter F., 1953, *Community power structure: a study of decision makers*, The University of North Carolina Press, Chapel Hill.

Smith D. M., 1973, *The geography of social well-being in the United States: an introduction to territorial social indicators*, McGraw-Hill, New York.

Smith D. M., 1981, *Inequality in an American city: Atlanta, Georgia, 1960–1970*, Occasional Paper No. 17, Department of Geography, Queen Mary College, University of London.

Smith D. M., 1983, *Race-space inequality in Atlanta, Georgia, 1960–1980*, Occasional Paper, Department of Geography, Queen Mary College, University of London (forthcoming).

Smith D. M., Gray R. J., 1972, *Social indicators for Tampa*, Florida, Urban Studies Bureau, University of Florida.

Stone C. N., 1976, *Economic growth and neighbourhood discontent: system bias in the urban renewal program of Atlanta*, The University of North Carolina Press, Chapel Hill.

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THE SOCIO-SPATIAL STRUCTURE OF RADOM CITY IN 1978

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This paper represents a trend in urban geography in which the aim is to describe and explain the city's internal socio-spatial structure. The socio-spatial structure of cities described by factor ecology is treated here as a product of the socio-economic system. The main element of that system is the strategy of socialist industrialization and this determine the results to be discussed. Some Polish economists (Pajestka, 1975) and sociologists (Morawski, 1978, 1980) define that strategy as an imposed one.

I assume that the specific character of imposed industrialization exerts a significant influence on the shaping of the socio-spatial structure of cities. To identify specific elements it would be necessary to carry out many comparative studies between socio-spatial structure of socialist and capitalist cities. In studies of this type a significant aim would be to determine which elements of the spatial structure are universal and which ones are the product of the political and socio-economic system or of the history and culture of a given country. Processes of urbanization and industrialization seem to be common enough to be a good subject for research aimed at identifying both universal and specific structures.

An analysis of the socio-spatial structure of one city does not make it possible to make wider generalizations. It only provides material for comparison with results of other studies and, thus, permits a limited identification of specific features. The aim of this paper is simply to describe and try to interpret those phenomena which have led to the formation of the socio-spatial structure identified for the city in question.

Industrialization is a phenomenon which exerts a final influence on socio-spatial changes in Poland in the post-war period. A characteristic feature of socialist countries is the domination of politics over the economy. This was reflected in the fact that the production of means of production dominated over the production of means of consumption in the process of industrialization. As time elapsed, this resulted in ever growing divergencies between the proportions of expenditure on the expansion of industry, mostly manufacturing investment goods on the one hand, and improvement of the conditions for reproduction of man power on the other. On a city-scale the concentration of expenditure on the expansion of industry resulted in an insufficient expansion of the building industry in relation to needs. Housing resources were becoming scarce to an ever growing extend and as such they were made the subject of the housing policy pursued by the state authorities, and were frequently an object of political manipulation by local authorities in cities. This accounts for the fact that access to dwellings, their standards and location, varied for different occupational and social groups and become one of the sources of contradictions and

political tensions in Polish cities. Those contraditions and tensions, in my opinion, resulted from a permanent shortage of dwellings and from the fact that ever wider circles of society were becoming aware of the existing and rapidly intensifying socio-spatial differentiations. The awareness of differentiation and one's own place within it is a precondition for the occurrence of a situation where the population living in a specific socio-spatial structure may become the centre of political struggle and social transformation.

Thus, the socio-spatial structure may not only be an object explained by social processes, but also an instrument for explaining those processes. In other words, space may be not only a dependent variable but also an independent one.

From previous analysis of twenty-seven cities (Węclawowicz, 1980, 1981) based on the National Census of 1970, Radom had the clearest spatial pattern of intra-urban structure. At that time I used to interpret it as the clearest example of social segregation among all the Polish cities investigated. Among Polish cities Radom has been particulary neglected in terms of expenditure on housing. Research carried out in the late 1970s showed that the living conditions and housing conditions of the inhabitants of Radom were the worst among cities with more than 100,000 people (Muziol, 1981, 1982). This testifies to the fact that housing resources and infrastructure were not modernized in Radom early enough. The inhabitants of new housing estates were provided with fairly homogeneous but relatively good housing. However, there still remained that part of the population who lived in large areas characterized by bad housing. The chances of leaving such areas was greater for higher socio-occupational groups. I stated at that time that, unless a large-scale renovation was carried out or large areas of the city were reconstructed, the socio-spatial segregation would intensify in Radom (Węclawowicz, 1981).

The years 1970–1978, however, witnessed much progress. The number of dwellings went up by 12,509 which account for 25.05 per cent of all the dwellings in Radom in 1978. The indices of housing conditions improved but a rapid population growth from 159,277 people in 1970 to 185,509 in 1978 and an increased number of households from 47,165 to 60,131 alone made the shortage of dwellings go up from 7,853 in 1970 to 10,290 dwellings in 1978. This figure does not reflect the full shortage of housing. It should be remembered that a considerable number of dwellings in Radom are small, overpopulated and without basic facilities. For example, over 31 per cent of households share their flats, only 59 per cent of dwellings is equipped with central heating and only 72 per cent with water closets. In absolute numbers this represents 45 thousand people in households sharing flats, over 71 thousand people without central heating and over 50 thousand people occupying dwellings without water closets. New apartments, however, do not always solve housing problems. A survey carried out among people who received new apartment in the early 1970s (Zwierzchowski, 1976) showed that 35 per cent of those asked described their apartments as too small and 25 per cent regarded the standard of technical equipment as too low. Thus, it is possible to see a growing disproportion in the 1970s between the level of housing needs and aspirations and the opportunity to satisfy them. The present economic crisis has intensified those disproportions and removed the prospect of overcoming them.

A question arises, then, whether those changes which occurred in Radom in the 1970s applied to the space of the whole city or only to some areas, whether they referred to the whole population or only to some social groups. A question also arises which social groups profited by those spatial changes and which ones lost by them.

Thus, the research based on the National Census of 1978 is aimed to define the trend of changes in the structure of Radom, especially because that was a period of fairly dynamic change. I also suspect that it was not an accident that Radom –

that pole of urban poverty – became one of the main centres of political struggle in 1970's and early 1980's. Another significant objective is to get to know the present socio-spatial structure of the city, especially because the socio-economic crisis has checked the rise of the living standard and revealed larger areas of neglect.

The research on these issues was based on the concept of factor ecology. An analysis of the principal components serving merely as a method of registering changes and describing the spatial structure of the city.

The material for discussion is provided by four analyses of principal components. The first analysis was carried out for forty variables from the National Census of 1970. The results of that analysis have already been partially published (Węclawo-

TABLE 1. Input variables for analysis in 1978

1. People aged under 14 years as % of total population
2. People aged 15–24 years as % of total population
3. People aged 25–34 years as % of total population
4. People aged 35–64 years as % of total population
5. People aged over 65 years as % of total population
6. Female population as % of total population
7. Working women as % of total population
8. Occupation – managerial and highly professional staff as % of total employees
9. Occupation – specialists and middle professional staff as % of total employees
10. Occupation – clerks as % of total employees
11. Occupation – workers as % of total employees
12. Occupation – doctors as % of total employees
13. Occupation – research workers as % of total employees
14. Occupation – journalists, writers, artists, etc. as % of total employees
15. Social position – white-collar workers as % of total population
16. Social position – blue-collar workers as % of total population
17. Social position – contract or commission agents as % of total population
18. Social position – self-employed as % of total population
19. People with university or equivalent education as % of total population aged 15 years and over
20. People with secondary education as % of population aged 15 years and over
21. People with vocational education as % of population aged 15 years and over
22. People with standard education as % of population aged 15 years and over
23. One-person households as % of total households
24. Two-person households as % of total households
25. Three-four preson households as % of total households
26. Five or more person households as % of total households
27. Two or more households in one dwelling as % of total household
28. Pensioners' households as % of total households
29. One-family households as % of total households
30. Privately owned dwellings as % of total dwellings
31. Dwellings owned by co-operative housing organization as % of total dwellings
32. Dwellings owned by state or local authorities as % of total dwellings
33. Dwellings built before 1944 as % of total dwellings
34. Dwellings built in 1945–1970 as % of total dwellings
35. Dwellings built in 1971–1978 as % of total dwellings
36. Number of persons per room
37. Living area in dwellings in m^2 per person
38. Dwellings with central heating as % of total dwellings
39. Dwellings with water closet facility as % of total dwellings
40. Dwellings with running water facility as % of total dwellings
41. Dwellings supplied with gas as % of total dwellings

wicz, 1981). The second analysis was carried out for forty-one variables from the National Census of 1978 (Table 1). The variables chosen from both censuses overlapped to a great extent, though their division into spatial units differred the number involved were similar. My next step was to examine thirty-one identical variables for both time periods, which provided the basis for two separate analysis of principal components (Table 2). To summarise we have the results of four analysis: for forty-one variables and thirty-one variables for 1970; and for forty-one variables and thirty one variables for 1978. On the basis of these results I shall proceed to analyse changes in the structure of the major dimensions of differentiation of socio-economic space within the city.

TABLE 2. Input variables for comparative analysis 1970–1978

1. People aged under 14 years as % of total population
2. People aged 15–24 years as % of total population
3. People aged over 65 years as % of total population
4. Female population as % of total population
5. Working women as % of total population
6. Occupation – managerial and highly professional staff as % of total employees
7. Occupation – specialists and middle professional staff as % of total employees
8. Occupation – clerks as % of total employees
9. Occupation – workers as % of total employees
10. Social position – white-collar workers as % of total population
11. Social position – blue-collar workers as % of total population
12. Social position – contract or commission agents as % of total population
13. Social position – self-employed as % of total population
14. People with university or equivalent education as % of total population aged 15 years and over
15. People with secondary education as % of population aged 15 years and over
16. People with standard education as % of population aged 15 years and over
17. One-person households as % of total households
18. Two-person households as % of total households
19. Three-four person households as % of total households
20. Five or more person households as % of total households
21. Two or more households in one dwelling as % of total households
22. Privately owned dwellings as % of total dwellings
23. Dwellings owned by co-operative housing organization as % of total dwellings
24. Dwellings owned by state or local authorities as % of total dwellings
25. Dwellings built before 1944 as % of total dwellings
26. Number of persons per room
27. Living area in dwellings in m^2 per person
28. Dwellings with central heating as % of total dwellings
29. Dwellings with water closet facility as % of total dwellings
30. Dwellings with running water facility as % of total dwellings
31. Dwellings supplied with gas as % of total dwellings

The basic dimension of differentiation of social and economic space in Radom in both time periods is the component called *socio-occupational position* (Table 3). Variables which describe the components are nearly identical in both periods. Nevertheless changes in the composition and values of the loadings give some indication of possible changes in the socio-occupational structure of Radom. One should note a general growth of differentiation and intensified socio-occupational segregation of inhabitants accompanied by greater differentiations of housing conditions. In the component structure such occupational group as managers and clerks and such social groups

TABLE 3. Socio-occupational position in Radom

Variables	1970 40	1970 31	1978 31	1978 41
managerial and highly professional staff	0.8818	0.8993	0.8345	0.8349
specialists and middle professional staff	0.8660	0.7913	0.8929	0.8981
clerks	0.9126	0.9186	0.7062	0.6867
workers	−0.8694	−0.8184	−0.9453	−0.9377
white-collar workers	0.9704	0.9523	0.9484	0.9458
blue-collar workers	−0.8984	−0.8433	−0.7971	−0.7859
doctors	×	×	×	0.6611
self-employed	–	–	−0.5780	−0.5726
people with university education	0.8765	0.8139	0.9018	0.9131
people with secondary education	0.8871	0.8430	0.9181	0.9130
people with vocational education	×	×	×	−0.5251
people with standard education	–	–	−0.9106	−0.9052
number of person per room	–	–	0.7391	0.7498
living space of dwellings in m^2 per person	–	–	0.5780	0.5833
dwellings with central heating	0.6512	0.7607	0.7985	0.7990
dwellings with water closet facility	0.8428	0.9271	0.9040	0.8961
dwellings with running water facility	0.8125	0.8768	0.8356	0.8229
dwellings with gas	0.8312	0.9056	0.8468	0.8432
five person households or larger	−0.5594	−0.4523	–	–
two or more households in one dwelling	–	−0.4107	−0.7269	−0.7248
privately owned dwellings	−0.7063	−0.8215	−0.8350	−0.8264
co-operative owned dwellings	0.5984	0.5947	0.7836	0.7922
state owned dwellings	–	0.4433	–	–
λ	11.8901	11.2221	13.9265	15.278
percentage of explained variation	29.7	36.2	44.92	37.26

as white-collar workers and blue-collar workers slightly decreased in significance (i.e. the value of their loadings went down). On the other hand, the significance of such occupational groups as specialists, workers and the social group consisting of those who are self-employed increased. Thus the significance of some variables as a diagnostic feature for socio-occupational position fell, that of the other variables increased. For example, the significance of education increased. The development of the building industry in the city reduced the significance of loading for indices of housing standards, while the fact that the increase in the number of dwellings lagged behind the increase in the number of households resulted in crowding of families and this was reflected in increased loadings for such variables as the number of persons per room, the size of dwellings in m^2 per person and the proportion of two or more households in one dwelling. Similarly, increased values of the loadings for those variables concerned with the ownership of dwellings testify to increasing differences between the co-operative and private sectors and the falling significance of the state-owned sector. It should be repeated however, that dimensions of socio-occupational position overlapped to a great extent in both periods as the coefficient of determination ($r^2 \times 100\%$) amounted to 80.44 per cent for the two periods.

It is impossible to calculate the degree to which the components calculated from analysis of forty variables in 1970 overlapped with the results of analysis of forty-one variables from 1978. It should be emphasized that it was these components which provided the basis for calculating matrices of factor scores and mapping them for the spatial analysis. The similar composition of their dimensions, however, makes it

possible to say that we are speaking about very similar dimension of socio-occupational position. Thus, while comparing the spatial distributions of components scores of socio-occupational position in 1970 and 1978, one should be aware of the fact that we are comparing very similar, but not fully identical, dimensions. This permits us only to detect radical changes which occured over a large area of the city. Minor changes are less detectable owing to different spatial units in both periods (Figs. 1 and 2).

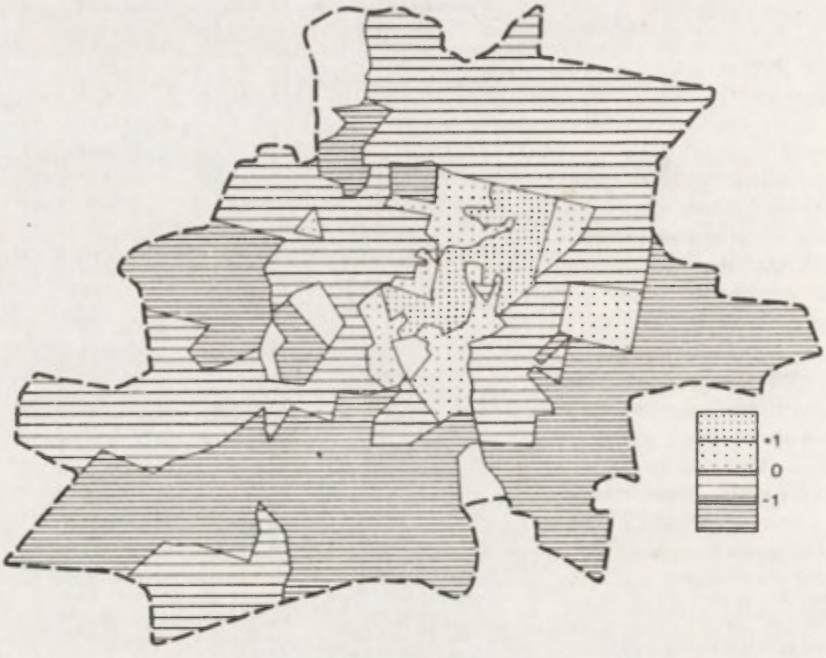

Fig. 1. Radom 1970. Component 1

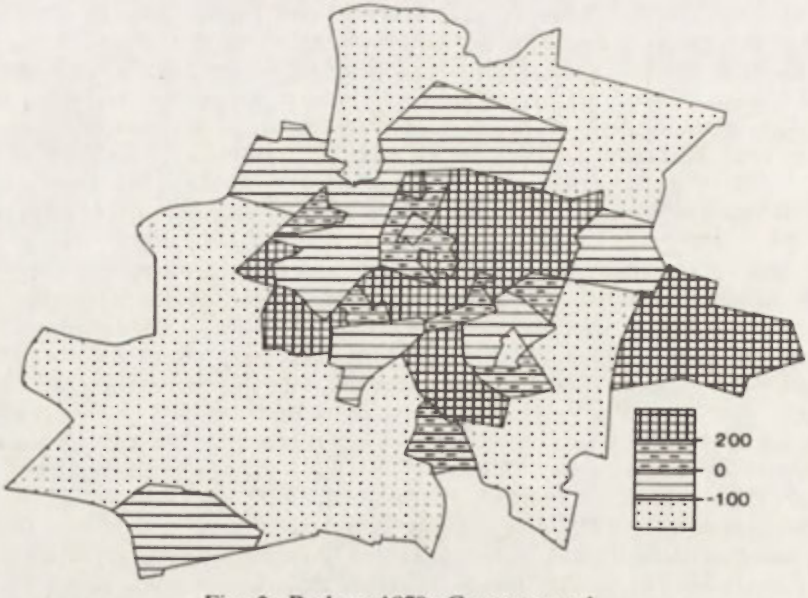

Fig. 2. Radom 1978. Component 1

The second, most significant dimension occuring in all the four analysis is the *housing conditions of households* (Table 4). In analysis based on thirty-one identical variables for both periods, those dimensions overlap to 74.77 per cent ($r = -0.865$). Similarly as in the case of socio-occupational position, the changes which occured in the composition and values of loadings make it possible to speak about a statistical expression of transformation of dwelling conditions of households (Table 4). The

TABLE 4. Housing conditions of households

Variables	1970 40	1970 31	1978 31	1978 41
people aged under 14 years	−0.7237	−0.7503	0.7406	0.7505
people aged 35–64 years	×	×	×	−0.4132
people aged over 65 years	0.7099	0.7041	−0.7328	−0.8618
female population	0.3152	0.2843	−0.4468	−0.4440
service workers	0.3247	×	×	×
blue-collar workers	–	–	0.4299	0.4344
contract or commission agents	–	0.3474	–	–
self-employed	0.4842	0.5703	–	–
people with university education	0.3928	–	–	–
people with vocational education	×	×	×	0.5068
one-person households	0.7951	0.8116	−0.8851	−0.8661
two-person households	0.8413	0.8372	−0.8495	−0.8145
three-four person households	−0.6890	−0.5872	0.5601	0.7768
five-person households	−0.5553	−0.6591	0.6990	0.6381
women in one-person households	0.7586	×	×	×
two or more households in one dwelling	0.6721	0.6540	−0.3462	−0.2980
pensioners' households	×	×	×	−0.8869
one-family households	×	×	×	0.9021
privatel owned dwellings	0.4035	–	–	–
co-operative housing owned dwellings	−0.4304	−0.3017	0.3927	0.3126
state owned dwellings	–	–	−0.4475	−0.4364
dwellings built before 1944	0.8383	0.8872	−0.7905	−0.7331
dwellings built in 1961–1970	−0.7741	×	×	×
dwellings built in 1971–1978	×	×	×	0.6119
dwellings with central heating	−0.6519	−0.6212	–	–
dwellings with water closet facility	−0.3265	–	0.4331	0.3855
λ	7.7464	5.872	5.4178	8.175
percentage of explained variation	19.4	18.94	17.48	19.94

intensified differentiation may be interpreted as an increase in spatial segregation brought about by a greater spatial segregation of elderly people in small households and inhabiting old buildings from younger population in bigger households and inhabiting more modern dwellings of a higher standard. It can be stated, then, that this phenomenon, observed for the first time in Radom and other Polish cities for the year 1970 intensified in 1978 (Figs. 3 and 4).

The remaining components have a totally different composition for 1970 and 1978, and so represent different dimensions of spatial differentiation.

The third component of the analysis of forty-one variables for 1978 was called *demographic and housing situation*. This component is of a complementary character and confirms the phenomena revealed by the second component – *housing conditions of households*. Both dimensions show a strong connection between the age of buildings,

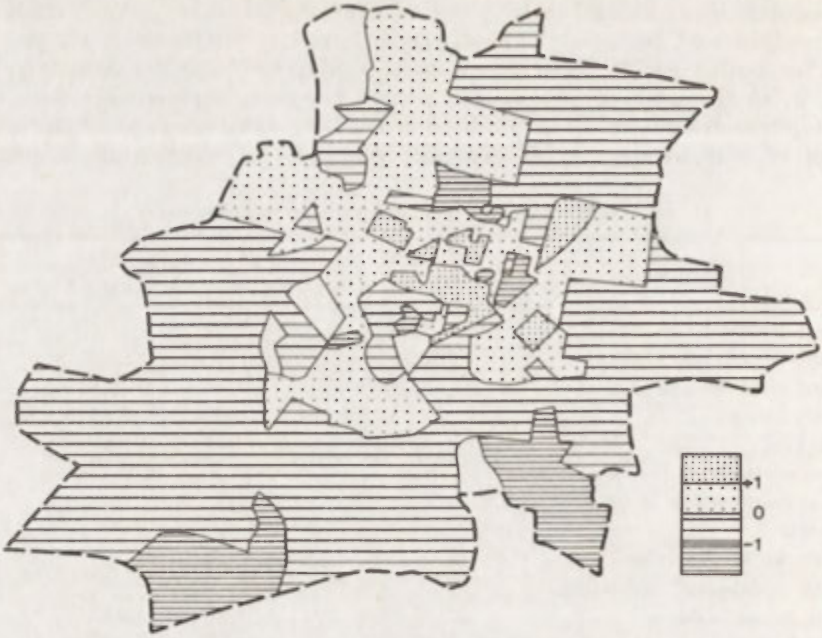

Fig. 3. Radom 1970. Component 2

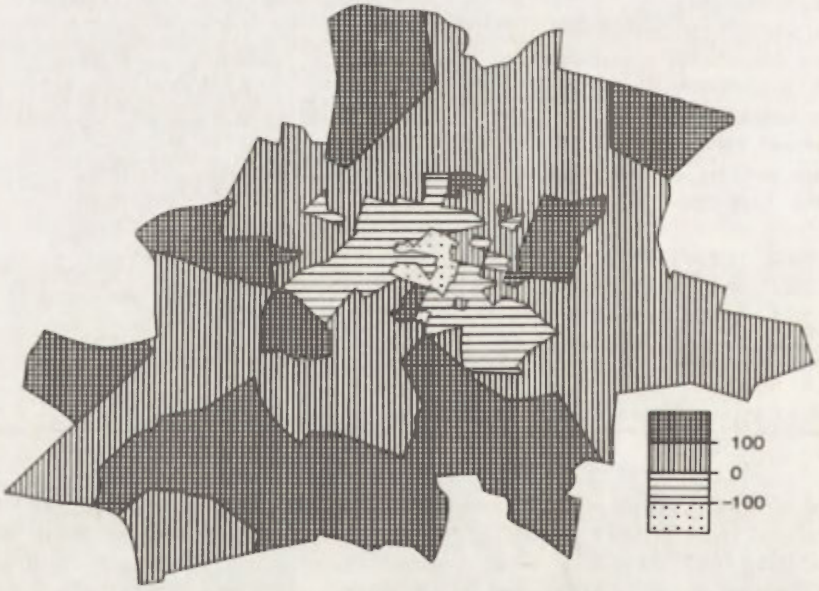

Fig. 4. Radom 1978. Component 2

age of inhabitants, form of ownership of dwellings and their rate of occupancy. The third major component made it also possible to detect two structures of life cycle. The composition of this dimension (Table 5) may be interpreted in the following way. On the one hand, we have variables with negative signs of loadings referring to the group of population aged 35–64 years and 15–24 years, i.e. these age

groups which are characteristic for mature families, living mainly in state-owned flats built in the years 1945–1970. The age of children in those families makes it possible for women to be more active professionally. On the other hand, we have variables with positive signs of loadings, describing people who are at the stage of setting up families or young couples aged 25–34 years with their children aged 0–14 years. Those families are living, to a great extent, in more spacious dwellings built in 1971–1978 and in some of dwellings built before World War II. This interpretation can be confirmed by a comparison of the distribution of component scores and a map of the age of buildings (Fig. 5).

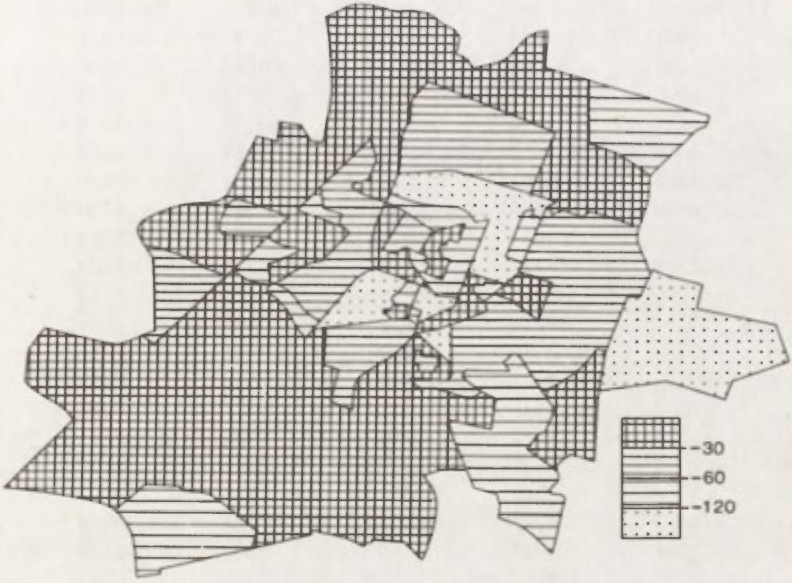

Fig. 5. Radom 1978. Component 3

The fourth component *housing* also shows co-occurrence of different housing structure with the structure of population age, though the composition of this dimension (Table 5) is less intelligible and its spatial distribution harder to interpret clearly.

What is the greatest interpretative value in the fifth component called *private sector* is the variable — self-employed people — however, the explanatory value of this component is the lowest and only amounts to 4.34 per cent of total variation.

It should be remembered that this socio-spatial intra-urban structure is based on data coming from the National Census which do not show diurnal changes. This structure changes depending on the time of the day and location of work places, schools, dwellings and services. This phenomenon was described for British cities in a study of Taylor and Parkers (1975). Some insight in diurnal changes in Radom has been provided by an analysis of commuting to work and schools between forty-five town-planning units. It was possible to calculate night-time (Fig. 6) and day-time (Fig. 7) density of population for different units (Budzynowska and Węclawowicz, 1984). The balance of population during working hours shows an increased number of population in two central units, but also an equally increase in some suburban units. In general, the density of population in central areas of the city is higher at night-time than at day-time.

Such a pattern seems to be characteristic for industrial cities, which expanded considerably under the conditions of post-World War II industrialization. The reasons

TABLE 5. Principal components matrix, Radom 1978

Variables	I	II	III	IV	V	%
1.	.0254	.7505	.5383	−.0829	.0768	86.64
2.	−.3834	.0115	−.6515	.4888	−.2590	87.75
3.	.1116	.3372	.7385	.1659	.0905	70.73
4.	.4352	−.4132	−.4928	−.5481	.0888	91.15
5.	−.2131	−.8618	.2684	−.0542	.0701	86.80
6.	.3007	−.4440	.3054	−.2425	.2533	50.38
7.	.4937	.1379	−.2977	−.5022	.1106	61.58
8.	.8349	−.1585	−.0891	−.0555	−.2216	78.24
9.	.8981	−.1910	.0853	.1197	−.1931	90.19
10.	.6867	−.0720	−.0978	.0733	−.0656	49.60
11.	−.9377	.1925	.0229	−.0629	.1873	95.59
12.	.6611	−.2734	.1100	−.0270	−.2829	60.47
13.	.3055	.0452	.0160	.2024	−.1412	15.65
14.	.2349	.0363	.1905	.0379	.0816	10.09
15.	.9458	.0300	−.0541	.0067	−.1716	92.78
16.	−.7859	.4344	.0145	−.1055	.2765	89.41
17.	−.2322	−.1127	.1181	−.3397	.3123	29.35
18.	−.5726	.0974	.0286	.0990	−.5118	61.00
19.	.9131	−.0120	.1543	.0469	−.2018	90.06
20.	.9130	−.2446	.0120	−.0211	−.1085	90.58
21.	−.5251	.5068	−.0711	.0547	.0133	54.07
22.	−.9052	.1119	−.1417	.0037	.1287	86.85
23.	−.1288	−.8661	.2509	.1138	−.0485	84.50
24.	−.1712	−.8145	−.1411	−.0949	−.0132	72.17
25.	.4768	.7768	−.0738	.1132	−.1007	85.93
26.	−.3602	.6381	−.0872	−.2158	.2075	63.42
27.	−.7248	−.2980	−.1070	.0360	−.1410	64.68
28.	−.3587	−.8869	.0578	.0178	.0992	92.88
29.	.0706	.9021	−.1819	−.1068	−.0060	86.33
30.	−.8264	.0118	.2653	−.2922	−.3135	93.71
31.	.7922	.3621	.0849	.0037	−.1621	79.22
32.	.0812	−.4364	−.4206	.3637	.5558	81.51
33.	−.3950	−.7331	.3557	.1672	−.0141	84.81
34.	−.0647	.0578	−.7899	−.4655	−.1943	88.58
35.	.4264	.6119	.4361	.2830	.2037	86.80
36.	.7498	.0599	.3572	−.4052	.0483	85.99
37.	.5833	−.2536	.4130	−.5002	−.0027	82.53
38.	.7990	.3855	−.3208	−.0120	.1933	92.75
39.	.8961	−.0426	−.2228	.1715	.2400	94.14
40.	.8229	−.2577	−.1326	.2807	.2826	91.98
41.	.8432	−.1032	−.1803	.1911	.2617	85.92
λ	15.278	8.175	3.737	2.296	1.781	
% cumul.	37.26	57.20	66.32	71.92	76.26	
%	37.26	19.94	9.12	5.60	4.34	

for the occurrence of such a pattern which is the opposite of that discussed in classical models of industrialized capitalist cities may be sought for in the history of investment policy within the city. Central areas of the city, with a large share of dwellings from before World War II, were neglected to a great extent. A permanent

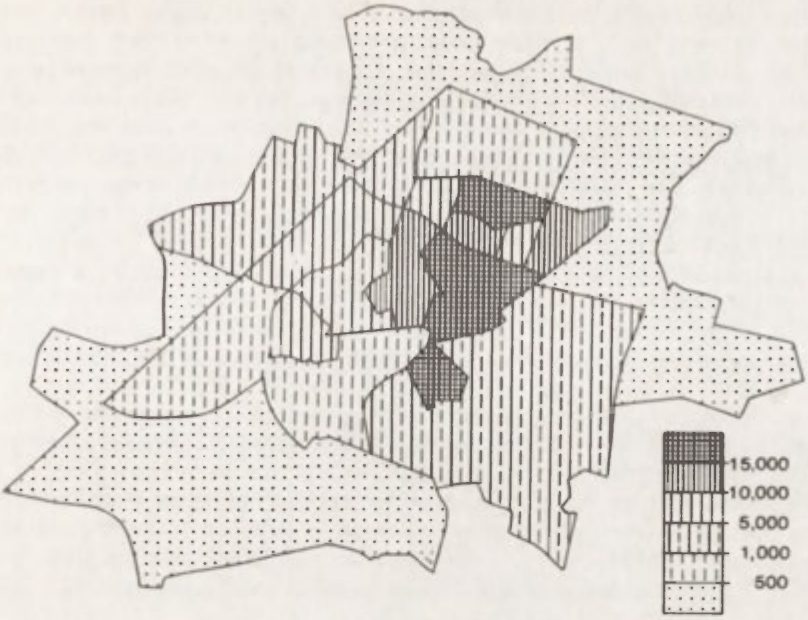

Fig. 6. Density of population in Radom. Night

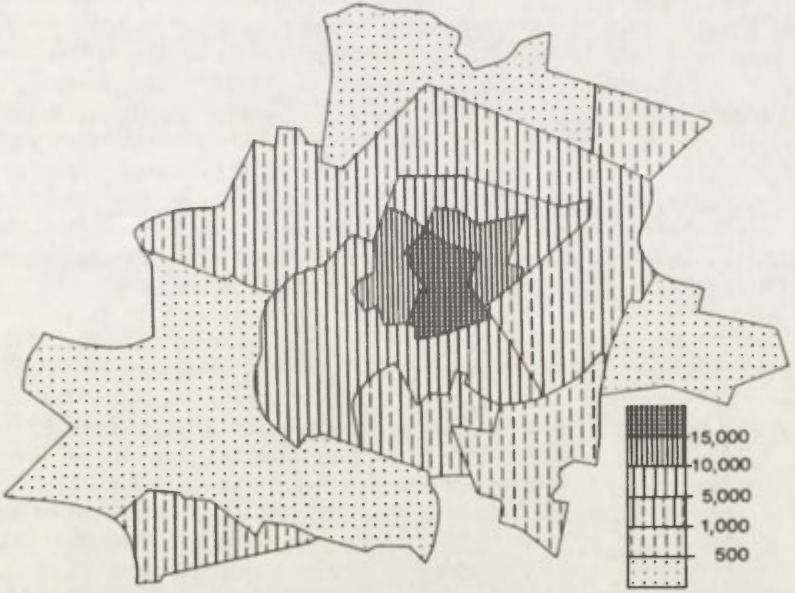

Fig. 7. Density of population in Radom. Day

shortage of dwellings accounted for the fact that housing was maintained wherever it was possible in any available buildings, including even those which were not suitable for habitation. Housing in central areas was therefore extended by erecting buildings to fill small empty spaces between existing buildings and by locating new housing estates as close to the city-centre as possible (in areas with urban infrastructure). New

large industrial plants were interspersed among the newest housing estates in the zone surrounding central areas. Thus the main investment effort was concentrated on the expansion of industry and on the low cost housing. Meanwhile, service functions were partly neglected and tended to be dispersed because there was not enough space to concentrate them in the centre. In addition their provision was considerably delayed in new housing estates. Dispersion and neglect of services as well as the location of work and new housing contribute to the criss-cross movement of commuters passing through the old centre but also make many advantages on housing located in the center.

The day-time and night-time distribution of population suggests a model of an industrial city which has its population concentrated mainly in central areas, with sectors of housing radiating from the centre with industry located in the suburbs or between the sectors of housing and with services dispersed in the centre and within housing estates.

A consequence of such a physico-spatial structure of the city is the intensification of socio-spatial differentiation during the day as compared with night. During working hours higher socio-occupational groups are concentrated in central parts of the city, while lower socio-occupational groups are moving out to industrial plants situated in the suburbs. A similar phenomenon can be observed in relation to demographic groups. In housing estates there are more elderly people and small children during working hours, while the central parts of the city are dominated by the professionally active population and the younger generation.

The results of an analysis of principal components show that the socio-spatial structure of Radom was changing as a result of the city's expansion. New dwellings grouped in housing estates were an object of rivalry between different groups of population. Better access to new housing of a good standard is given to the part of the population representing professions which are higher in the social hierarchy or economically and politically stronger. It should be pointed out, however, that not everyone competed for these new dwellings, as housing needs of a part of the population were already met. The analysis for 1970 demonstrated that higher socio-occupational groups were better off in terms of housing. From the analysis for 1978 it is impossible to state unequivocally which groups improved their conditions. However, some indication can be provided by a comparison of the percentages which different occupational and social groups living in new housing estates (Fig. 8) accounted from of the total number of those groups living in the city.

Three spatial complexes composed of housing estates built in 1971–1978 were inhabited in 1978 by 23.7 per cent of specialists and middle professional staff, 21.5 per cent of clerks, 23.5 per cent of physicians, 24.2 per cent of research workers, 26.9 per cent of people representing the professional group of writers, journalists, artists and actors and only 16.8 per cent of all the manual workers living in the city. Workers, though dominating the new estates in absolute numbers, improved their dwelling conditions to the smallest extent in relation to other occupational groups. Similarly in the division into social groups, new areas are inhabited by 24.4 per cent of white-collar workers and only 16.3 per cent by blue-collar workers. On the other hand, those developments were inhabited by a relatively small number of contract or commission agents (only 16.3 per cent) and by the self-employed (10.7 per cent). This can be explained by the fact that dwellings allocated by the local authorities and state-owned enterprises were not available to them unless they had been members of housing co-operatives for many years. Those groups which were economically fairly strong, were not too interested in living in blocks of flats and satisfied their housing needs with individual private houses to a great extent.

I am aware of the fact, that if one wants to get to know the true problems of the city and its spatial structure one must look at it not only in statistical

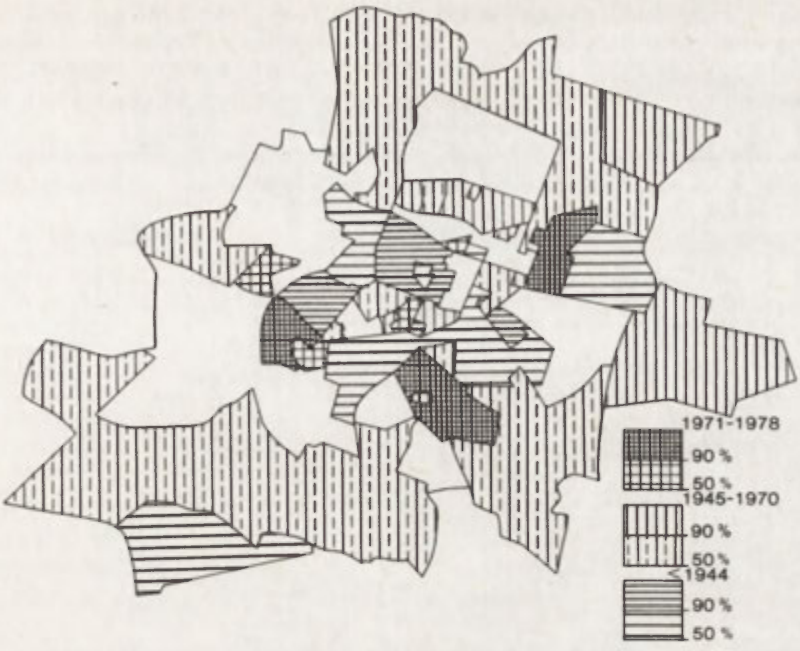

Fig. 8. Town development

and mathematical or morphological and functional categories. It is also necessary to confront the descriptive and theoretical spatial models of geographers with the perception and feelings of the inhabitants themselves about the spatial structure. It is necessary to get to know the mechanisms by which economic and spatial decisions are taken by the political authorities and by economic and planning bodies. Similarly, it is necessary to get to know the hopes, aspirations and interests of individuals and families. In this way a more humanistic geography will make it possible for us to get to know the phenomenon of the city better.

REFERENCES

Budzynowska O., Węclawowicz G., 1984, Zmiany gęstości zaludnienia w Radomiu w ciągu doby (Changes in the Radom-city population density during 24 hours), *Przegląd Geograficzny*, 56, 1–2.

Morawski W., 1978, Socialist industrialization in Poland: the doctrine, the system of decision-making, uncontrolled phenomena, *The Polish Sociological Bulletin*, 1.

Morawski W., 1980, Society and the strategy of imposed industrialization. The Polish case, *The Polish Sociological Bulletin*, 4.

Muziol A., 1981, Statystyczna analiza zróżnicowania warunków życia ludności w miastach wojewódzkich (A statistical analysis of differences in the living conditions of the population inhabiting the voivodship cities), *Przegląd Geograficzny*, 53, 4.

Muziol A., 1983, Typologia miast Polski na podstawie zróżnicowania warunków życia ludności (Typology of the Polish towns as based on differences in the standard of living), Instytut Geografii i Przestrzennego Zagospodarowania PAN, *Biuletyn Informacyjny*, 42.

Pajestka J., 1975, *Determinanty postępu* (The determinants of progress), PWE, Warszawa.

Taylor P. J., Parkes D. N., 1975, A Kantian view of the city: a factor-ecology experiment in space and time. *Environment and Planning* A, 7.

Węcławowicz G., 1980, Intra-urban structure of chosen Polish cities. Studies in factorial ecology, in: *Settlement systems and regional planning. Proceedings of the Third Polish-Scandinavian RSA Seminar*, Kazimierz Dolny, May 10–12, 1978. Studia KPZK PAN, 75, PWN, Warszawa.

Węcławowicz G., 1981, Towards a theory of intra-urban structures of Polish cities, *Geographia Polonica*, 44.

Zwierzchowski K., 1976, Ocena potrzeb mieszkaniowych ludności Radomia w latach 1976–1990 (An appraisal of housing needs estimates at Radom, 1976–1990), *Biuletyn Kwartalny Radomskiego Towarzystwa Naukowego*, 13,4.

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SOME ASPECTS OF CRISIS IN HOUSING IN POLAND

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INTRODUCTION: IDENTIFICATION OF A CRISIS IN HOUSING

In Poland's current economic and social situation there is no doubt that housing is affected by a crisis. Various aspects of the crisis in house construction and housing conditions can be examined geographically. As well as the statistical documentation of the extent of the crisis in house construction it contains, the present study also attempts to assess its consequences. Special attention is paid to regional differences in housing conditions and to the cumulation of unsatisfied housing needs. It has been assumed that the study should be an empirical work. Conclusions are based upon data illustrating the number of dwellings completed in 1975–1981 in regional cross-sections, separately for the public and private sectors.

First, it seems advisable to describe briefly housing in post-war Poland. Its character, similarly as that of agriculture, is dual, as far as tenure and use are concerned; namely that there is the socialized housing stock (the public sector, i.e. a state or co-operative property) and the non-socialized (i.e. private). Though immediately after the end of hostilities only those who owned small, one-family houses, had entire disposal of their property, while the State kept control over other dwellings. Up to 1956 and to some extent in the subsequent years any private construction was curbed by State and administrative-economic policy. Up to 1970 private dwellings were built predominantly in villages and small towns. However, subsequently the policy regarding construction out of private funds was changed in order to increase the population's share of the costs of house construction. The activity of co-operative owners building societies (requiring much higher money contributions) was then expanded and the private sector was encouraged to build their own houses both in urban and rural areas. In fact, after World War II the burden of house building was taken over by the State administration and local authorities, and only subsequently (after 1956) has the co-operative form of house construction been developed. Starting from the 1970s the co-operative sector has taken over a majority of tasks including investment. Simultaneously, a socially undesirable tendency emerged to separate construction from distribution and to allow local authorities and the management of the big factories, with a relatively high economic potentials, to seize the right to distribute the dwellings.

Up to 1970 the development of housing in Poland had been subordinated to the needs of economic expansion and house construction to processes associated with industrialization. The improvement of the existing housing stock and the satisfaction of housing needs connected with intensive demographic growth had been put in the

second place (Andrzejewski, 1979). The share of investment in construction either slowly increased though at a lower rate then industrial investment, or in the following period of the curbed economic growth even decreased. Moreover, in the first half of the 1960s such disadvantageous restraints (as lower norms and standards) were introduced in construction.

Because of difficulties in house construction, disadvantages inherited after the pre-war period and destruction during the war, demographic and social changes leading to a substantial increase of housing needs caused improvements in housing in Poland were very slow and did not keep pace with society's higher aspirations, especially with the increased purchasing power of the population in the 1970s.

The post-1970 economic development was aimed at the introduction of some changes in its social objectives. Housing was recognized as one of the most important social questions. As Andrzejewski (1979) maintains, its importance is clearly shown by the adoption of a long-term programme (up to 1990) for the improvement of housing conditions, which was approved by the Party in 1971 and by the Polish Seym in 1972. The programme was impressive: all basic problems (an independent dwelling for every household, a much lower number of persons per room) concerned with the number of dwellings were to be solved in the second half of the 1980s. At the same time quantative changes were to be accompanied by qualitative ones, such as more advanced standards in house construction, renovation of the existing housing stock in towns and settlements, substantial funds for repairing older houses. In the presence of such an ambitious programme the current crisis in housing in Poland is worrying. Though the 1971–1975 plans for construction of new dwellings were slightly exceeded, 'qualitative' investments were growing more slowly than total investment. In the subsequent years, however, there was a drop in the number of completed dwellings.

It seems that the symptoms of the mounting crisis in housing were recognized neither by the central economic-political administration nor by research workers. In a highly optimistic forecast, published in 1981, on changes in the population's housing conditions, Brzuchacz and Wasążnik implied that the national index of growth of the housing stock (1985:1975) would be 132 and would vary between 117 (Biała Podlaska voivodship) and 155 (Legnica voivodship). This forecast, besides analysing changes in the housing stock and the programme of house construction, also contains a demographic forecast on the basis of which the authors maintain that practically all housing needs will be satisfied by 1985. They suggest that on the national scale there will be 102 households per 100 dwellings, in nine voivodships the index will be under 100 and in the western and northern voivodships with their usually larger dwellings in the old stock it will reach 110–112.

Actually, the national index of the growth of the housing stock 1981:1975 is only

TABLE 1. Indices of housing situation, 1950–1981

		Total	Towns	Villages
Number of households per 100 dwellings:	1950	122	132	115
	1960	118	122	113
	1970	116	119	112
	1981	115	116	113
Average number of persons per 1 room:	1950	1.75	1.54	1.94
	1960	1.66	1.53	1.80
	1970	1.37	1.32	1.44
	1981	1.10	1.04	1.19

Source: Information for 1950–1970 after Andrzejewski (1979, p. 171), for 1981 after Statistical Yearbook 1982.

107, that for the voivodship of Biała Podlaska 101 and of Legnica 122. The ratio between the number of households and the number of dwellings is given in Table 1. It appears that reality is far less optimistic than both the prognosis and the programme for the improvement of housing conditions in Poland.

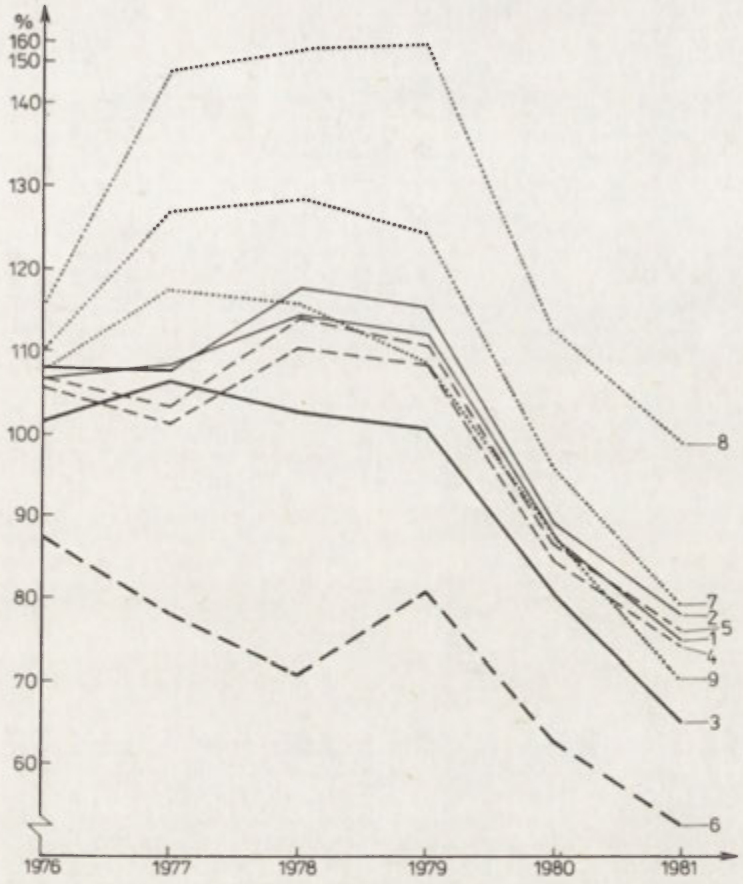

Fig. 1. Dwellings completed in 1976–1981 (1975 = 100%). National economy: 1 – total, 2 – towns, 3 – villages; Public sector: 4 – total, 5 – towns, 6 – villages; Private sector: 7 – total, 8 – towns, 9 – villages

Out of 1900–2100 thousand dwellings planned (Andrzejewski, 1979) for the period 1976–1980 only 1308 thousand new dwellings were completed (969 thousand in the public sector and 339 thousand in the private sector). The expansion in house building slowed during the second half of the 1970s; from year to year the number of completed dwellings declined and often it was even lower than in 1975. Tables 2 and 3 and Fig. 1 illustrate this collapse in house construction on the national scale for both sectors and according to towns (arranged in order of their sizes) and villages. The following conclusions can be deduced from an analysis of that material:

– House construction by the private sector shows a smaller reduction in production: the number of dwellings completed in 1981 was the same (and in larger towns even higher) than that in 1975; however, in the rural areas this number decreased by 30 per cent;

TABLE 2. Dwellings completed in 1975-1981

	1975	1976	1977	1978	1979	1980	1981
NATIONAL ECONOMY							
Total	248,117	262,537	266,071	283,588	277,967	217,090	187,003
previous year = 100	99.3	106.2	101.0	106.6	98.0	78.1	86.1
1975 = 100	100.0	106.2	107.2	114.3	112.0	87.5	75.4
Towns	192,122	206,732	206,610	226,177	221,585	171,862	150,478
previous year = 100	98.6	107.6	99.9	109.5	98.0	77.6	87.6
1975 = 100	100.0	107.6	107.5	117.7	115.3	89.4	78.3
Villages	55,995	56,805	59,461	57,411	56,382	45,228	36,525
previous year = 100	101.7	101.4	104.7	96.5	98.2	80.2	80.8
1975 = 100	100.0	101.4	106.2	102.5	100.7	80.8	65.2
PUBLIC SECTOR							
Total	190,184	200,054	192,498	209,260	205,977	161,426	140,922
previous year = 100	98.7	105.2	96.2	108.7	98.4	78.4	87.3
1975 = 100	100.0	105.2	101.2	110.0	108.3	84.8	74.1
Towns	173,828	185,742	179,671	197,697	192,742	151,180	132,319
previous year = 100	98.2	106.8	96.7	110.0	97.5	78.4	87.5
1975 = 100	100.0	106.8	103.4	113.7	110.9	87.0	76.1
Villages	16,356	14,312	12,827	11,563	13,235	10,246	8,603
previous year = 100	105.0	87.5	89.6	90.1	114.5	77.4	84.0
1975 = 100	100.0	87.5	78.4	70.7	80.9	62.6	52.6
PRIVATE SECTOR							
Total	57,933	63,483	73,573	74,328	71,990	55,664	46,081
previous year = 100	101.2	109.6	115.9	101.0	96.8	77.3	82.8
1975 = 100	100.0	109.6	127.0	128.3	124.3	96.1	79.5
Towns	18,294	20,990	26,939	28,480	28,843	20,682	18,159
previous year = 100	103.0	114.7	128.3	105.7	101.3	71.7	87.8
1975 = 100	100.0	114.7	147.3	155.7	157.7	113.0	99.3
Villages	39,639	42,493	46,634	45,848	43,147	34,982	27,922
previous year = 100	104.4	107.2	109.7	98.3	94.1	81.1	79.8
1975 = 100	100.0	107.2	117.6	115.7	108.8	88.2	70.4

Source: on the basis of statistical publication 'House construction in 1970-1981' (GUS, Materialy Statystyczne No 13, Warsaw 1983).

– In house construction by the public sector, producing approximately two-thirds of the new stock, increase was already lower in the first half on 1975–1981. This was followed by a severe decrease; in 1981 the number of completed dwellings was 76 per cent of that in 1975, and in the rural areas only 53 per cent;

– Production of new public-sector dwellings was firstly curbed in small towns and villages, the rural areas being particularly badly stricken.

Statistical data, such as the number of new dwellings completed in separate years, do not illustrate all phenomena associated with the crisis in housing. The problem of the relationship between the crisis in housing and housing needs as well as the spatial differentiation of housing conditions will be discussed below. At present, it should only be emphasized that the downward tendencies have not yet been checked. Thus, in 1982 129 thousand dwellings were completed by the public sector, which accounts for 91.5 per cent of the previous year's production and for 67.9 per cent of that in 1975. In spite of corrections to the current plans, only 89 per cent of the planned dwellings were completed. The 1983 plan foresees the completion of 115 thousand dwellings, i.e. 89 per cent of the 1982 figure and 60.5 per cent of that in 1975.

Since this analysis is limited by data availability, i.e. up to 1981, the problem of highly increased prices and their changed structure has not been treated. It is quite likely that difficulties concerning the supplies of building materials and their higher prices will largely reduce the rate of house construction by the private sector. As far as socialized construction is concerned, its drastic reduction will badly affect the rural areas. These negative consequences are difficult to exemplify statistically. But, chances for improved housing conditions, less satisfactory in the rural than in the urban areas, will be seriously limited. This will, of course, affect predominantly the poorer tenants, lacking the financial means to build their own houses. Moreover, a chance to obtain a new dwelling was deemed to be a *sui generis* 'power of attraction' in the efforts to improve employment structure in small towns and in the countryside, especially for educated people like physicians, teachers, and agriculturalists.

Crisis phenomena in house construction, analysed according to the spatial system (by voivodships) are more complex. To present the regional differences schematic maps were constructed showing when first since 1975 the number of completed dwellings had been lower than that in the preceding year, consecutively in Poland as a whole, in the public sector and in the private sector (Figs. 2A, B, C). A drop in the number of new dwellings was however not a steady trend. Initially the crisis affected two groups of voivodships: those characterized by a high concentration of houses, usually endowed with more advanced standards (e.g. Warsaw, Cracow, Wroclaw), and those with quite opposite characteristics (e.g. Ostrołęka, Przemyśl) – Fig. 2A. In general, the crisis affected simultaneously house construction in urban as well as rural areas. In 1980 it was widely felt in the voivodships of Leszno, Tarnobrzeg and Krosno. These regions are characterized by intensive construction by the private sector.

Also late on in the period the decrease became noticeable in some central and eastern regions, i.e. in the so-called 'new' voivodships, established in 1975. Previously, the house construction in new regional capital cities was probably stimulated by the housing needs and aspirations of the decentralized local authorities and political administration. In the public sector the crisis began in 1976–1977 (Fig. 2B). The crisis was felt earlier in the countryside: in 1976 the number of new dwellings was there lower in 30 voivodships, whereas in towns a drop was identified in 12 voivodships only. In the private sector (Fig. 2C), the drop in the production of dwellings was evident later, namely in 1978–1980, and took place simultaneously in the urban and rural areas.

TABLE 3. Dwellings completed in towns in 1975–1981

Towns according to number of inhabitants:	1975	1976	1977	1978	1979	1980	1981
NATIONAL ECONOMY							
less than 4999	5452	6431	6439	6198	5070	4488	3421
previous year = 100	109.1	118.0	100.1	96.3	81.8	88.5	76.2
1975 = 100	100.0	118.0	118.1	113.7	93.0	82.3	62.7
5000–9999	11,055	12,106	11,271	13,129	11,349	8440	7714
previous year = 100	91.5	109.5	93.1	116.5	86.4	74.4	91.4
1975 = 100	100.0	109.5	101.9	118.8	102.7	76.3	69.8
10,000–19.999	21,213	22,012	22,768	22,329	22,142	18,991	16,269
previous year = 100	90.6	103.8	103.4	98.1	99.2	85.8	85.7
1975 = 100	100.0	103.8	107.3	105.3	104.4	89.5	76.7
20,000–49.999	35,368	40,090	36,044	43,109	39,079	32,863	28,469
previous year = 100	103.2	113.3	89.9	119.6	90.6	84.1	86.6
1975 = 100	100.0	113.3	101.9	121.9	110.5	92.9	80.5
50,000–99,999	25,033	28,637	30,355	33,034	34,319	22,681	21,521
previous year = 100	97.4	114.4	106.0	108.8	103.9	66.1	94.9
1975 = 100	100.0	114.4	121.3	132.0	137.0	90.6	86.0
100,000 and more	94,001	97,456	99,733	108,378	109,626	84,399	73,084
previous year = 100	99.6	103.7	102.3	108.7	101.1	77.0	86.6
1975 = 100	100.0	103.7	106.1	115.3	116.6	89.8	77.7
PUBLIC SECTOR							
less than 4999	3687	4540	3952	3867	2774	2521	1759
previous year = 100	110.9	123.1	87.0	97.8	71.7	90.9	69.8
1975 = 100	100.0	123.1	107.2	104.9	75.2	68.4	47.7
5000–9999	8350	8971	7722	9618	8222	6116	5651
previous year = 100	86.1	107.4	86.1	124.5	85.5	74.4	92.4
1975 = 100	100.0	107.4	92.5	115.2	98.5	73.2	67.7
10,000–19,999	17,271	17,975	17,867	17,369	16,626	14,607	12,707
previous year = 100	87.8	104.1	99.4	97.2	95.7	87.9	87.0
1975 = 100	100.0	104.1	103.4	100.6	98.3	84.6	73.6

20,000–49,999	31,263	35,421	30,027	36,556	32,942	28,280	24,217
previous year = 100	104,0	113.3	84.8	121.7	90.1	85.8	85.6
1975 = 100	100,0	113.3	96.0	116.9	105.4	90.5	77.5
50,000–99,999	23,150	26,560	26,711	28,757	30,448	20,158	19,274
previous year = 100	97.2	114.7	100.6	107.7	105.9	66.2	95.6
1975 = 100	100.0	114.7	115.4	124.2	131.5	87.1	83.2
100,000 and more	90,107	92,275	93,392	101,530	101,730	79,498	68,711
previous year = 100	99.6	102.4	101.2	108.7	100,2	78.1	86.4
1975 = 100	100.0	102.4	103.6	112.7	112.9	88.2	76.2
PRIVATE SECTOR							
less than 4999	1765	1891	2487	2331	2296	1967	1662
previous year = 100	105.5	107.1	131.5	93.7	98.5	85.7	84.5
1975 = 100	100.0	107.1	140.9	132.1	130.1	111.4	94.2
5000–9999	2705	3135	3549	3511	3127	2324	2063
previous year = 100	113.3	115.9	113.2	98.9	89.1	74.3	88.8
1975 = 100	100.0	115.9	131.2	130.1	115.6	85.9	76.3
10,000–19,999	3942	4037	4901	4960	5516	4384	3562
previous year = 100	105.4	102.4	121.4	101.2	111.2	79.5	81.2
1975 = 100	100.0	102.4	124.3	125.8	139.9	111.2	90.4
20,000–49,999	4105	4669	6017	6553	6137	4583	4252
previous year = 100	97.3	113.7	128.9	108.9	93.6	74.7	92.8
1975 = 100	100.0	113.7	146.6	159.6	149.5	111.6	103.6
50,000–99,999	1883	2077	3644	4277	3871	2523	2247
previous year = 100	100.2	110.3	175.4	117.4	90.5	65.2	89.1
1975 = 100	100.0	110.3	193.5	227.1	205.8	134.0	119.3
100,000 and more	3894	5181	6341	6848	7896	4901	4373
previous year = 100	100.9	133.0	122.4	108.0	115.3	62.1	89.2
1975 = 100	100.0	133.0	162.8	175.9	202.8	125.9	112.3

Source: on the basis of statistical publication 'House construction in 1970–1981' (GUS, Materialy Statystyczne No 13, Warsaw 1983).

Fig. 2. Diffusions of the crisis in housing construction (year when first time since 1975 the number of completed dwellings has dropped). A – national economy, B – public sector, C – private sector

It is, however, difficult to discover interrelationships between the levels of urban, economic and political development in specific regions at specific times and the level of housing crisis on the basis of spatial analysis alone.

CRISIS IN HOUSING AND THE POPULATION'S HOUSING CONDITIONS

Differences in the standards of dwellings are quite substantial. In general, the division lies between the western and northern territories on the one hand, and the so-called 'former' areas having lower housing standards on the other. Another division line separates the urban areas from the rural ones, since housing standards are much higher in towns, particularly larger ones. Altogether, the housing situation was better in 1970–1978, though the number of dwellings was still insufficient and differences between the housing conditions of the urban and rural populations were still noticeable (Żarski, 1980; Kulesza, 1982). However, the classic macrospatial pattern in housing conditions of the inhabitants of medium and large towns has become more complicated (Muziol, 1982), because towns in certain eastern voivodships succeeded in raising substantially the standards of dwellings and thus in outstripping the neighbouring

TABLE 4. Housing conditions indices in 1978 and dynamics of housing construction in 1979–1981 in voivodships

Voivodships	1	2	3	4	5	6
1. Warszawa	1.09	20.1	1.17	38.4	43460	18.6
2. Biała Podlaska	1.20	75.3	1.14	52.0	4733	16.4
3. Białystok	1.10	59.3	1.17	48.0	15408	23.8
4. Bielsko-Biała	1.16	45.4	1.21	51.3	15642	18.6
5. Bydgoszcz	1.16	45.1	1.21	51.3	17458	16.7
6. Chełm	1.24	71.3	1.16	54.8	4405	18.9
7. Ciechanów	1.26	70.0	1.17	56.3	6636	16.3
8. Częstochowa	1.19	54.3	1.15	47.8	13235	17.6
9. Elbląg	1.17	38.5	1.19	47.8	7188	16.1
10. Gdańsk	1.15	25.4	1.23	48.4	24116	17.9
11. Gorzów Wlkp.	1.07	45.2	1.18	44.7	9585	20.7
12. Jelenia Góra	1.04	51.7	1.18	45.2	6258	12.6
13. Kalisz	1.20	57.4	1.18	52.3	9987	14.8
14. Katowice	1.05	34.7	1.16	39.3	109405	28.7
15. Kielce	1.29	62.3	1.15	53.1	19346	18.0
16. Konin	1.24	66.6	1.14	51.4	7146	16.1
17. Koszalin	1.10	40.5	1.18	44.7	7138	15.3
18. Kraków	1.19	32.9	1.20	48.3	21585	18.3
19. Krosno	1.26	64.3	1.15	52.7	7793	17.2
20. Legnica	1.09	42.9	1.18	44.9	11721	25.1
21. Leszno	1.14	58.6	1.16	48.2	6879	19.0
22. Lublin	1.24	53.7	1.21	56.2	19868	21.0
23. Łomża	1.23	71.6	1.12	50.0	6229	19.0
24. Łódź	1.08	37.0	1.12	36.4	24406	21.5
25. Nowy Sącz	1.34	61.5	1.14	53.8	8687	13.7
26. Olsztyn	1.17	44.8	1.20	50.4	14405	20.9
27. Opole	1.01	46.9	1.15	39.6	14404	14.7
28. Ostrołęka	1.34	72.2	1.16	58.6	6340	17.0
29. Piła	1.14	50.9	1.17	47.5	7370	16.7
30. Piotrków Tryb.	1.26	69.8	1.15	54.0	12855	21.0
31. Płock	1.23	58.5	1.14	49.1	8646	17.4
32. Poznań	1.13	37.5	1.23	50.5	25183	20.2
33. Przemyśl	1.34	68.2	1.14	55.4	5141	13.5
34. Radom	1.37	64.4	1.17	58.9	12506	17.7
35. Rzeszów	1.32	56.8	1.15	53.1	12164	18.5
36. Siedlce	1.31	76.5	1.16	58.5	8946	14.4
37. Sieradz	1.22	71.0	1.14	51.7	6609	16.9
36. Skierniewice	1.23	66.5	1.13	49.9	7757	19.4
39. Słupsk	1.15	43.1	1.20	49.3	5764	15.4
40. Suwałki	1.18	53.8	1.14	46.2	8397	19.7
41. Szczecin	1.10	34.0	1.24	49.8	17340	19.1
42. Tarnobrzeg	1.35	67.2	1.14	55.5	8424	15.0
43. Tarnów	1.38	59.7	1.17	58.2	7990	13.0
44. Toruń	1.17	48.3	1.20	51.3	11044	17.9
45. Wałbrzych	1.13	54.4	1.14	44.6	8421	11.7
46. Włocławek	1.23	60.9	1.14	49.7	7423	17.9
47. Wrocław	1.12	33.8	1.23	49.4	19872	18.2
48. Zamość	1.28	76.6	1.15	56.3	6979	14.7
49. Zielona Góra	1.07	48.8	1.17	44.4	9949	16.2

Source: on the basis of the results of National Census 1978 and statistical publication 'Housing construction in 1970–1981'. 1 – Average number of persons per 1 room (1978). 2 – Percentage of dwellings without lavatories (1978). 3 – Average number of households per 1 dwelling (1978). 4 – Index of housing conditions 1978. 5 – Number of dwellings completed in 1979–1981. 6 – Dwellings completed in 1979–1981 per 1000 inhabitants (1981).

units. The greatest progress in house construction was, however, achieved in southern towns, leaving behind the western voivodships, with their older unrenovated and increasingly less useful housing stock.

The cartographic picture, presenting the 'beginnings' of the crisis, though quite simple, shows that crisis affected simultaneously voivodships with relatively better housing conditions, as well as those where housing standards were lower. A comparison of the two elements: the existing housing conditions (on the basis of the data from the latest National Census of December 1978) and the dynamics of construction in the later period of the crisis in 1979–1981, might be of interest. This may provide the answer to the question as to whether the current crisis in housing has aggravated regional disparities in housing conditions.

This comparison can be made by means of a simplified analysis of housing conditions (Table 4, Fig. 3A), according to voivodships in 1978. It is based upon the following three statistical properties:

- dwelling density: the average number of people per room,
- standard of amenities: percentage of dwellings without lavatories,
- housing independence: the average number of households per dwelling.

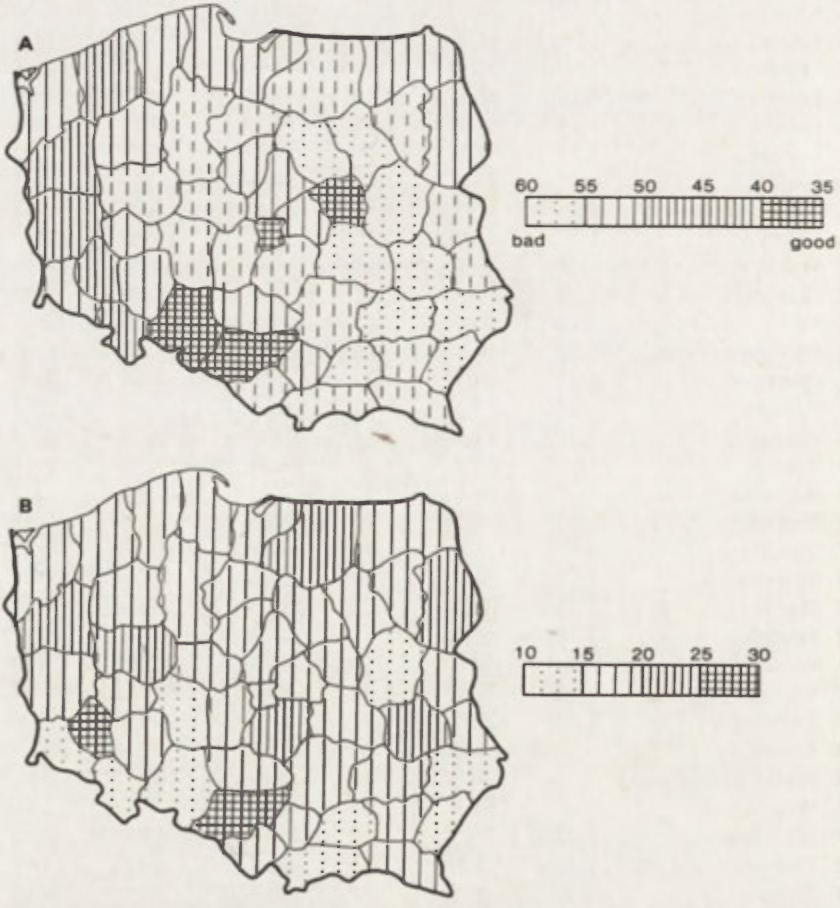

Fig. 3A. Housing conditions index (1978). B. Number of dwellings completed in 1979-1981 per 1000 inhabitants (population in 1981)

So that the higher the sum total of standardized values of those properties[1], i.e. the index of housing conditions, the worse housing conditions in the given voivodship. The dynamics of house construction is illustrated by the number of dwellings completed in 1979–1981 per 1000 inhabitants according to the population number in 1981 (Table 4, Fig. 3B). The coefficient of correlation between those values in quite low ($r = -0.329$). The negative score indicates more dynamic construction in these regions which in 1978 had better housing conditions. Therefore, in voivodships with the poorest housing conditions (e.g. Siedlce, Zamość, Przemyśl, Tarnów) the situation has lately become even worse than in other regions. This is because in the units whose housing conditions were the best of all in 1978, construction has been maintained at relatively high level throughout the housing crisis (e.g. Katowice, Legnica, Łódź, Warsaw, Gorzów). As far as the voivodships of Legnica and Katowice are concerned, the development of construction can be partly explained by the fact that these administrative units attract the highest percentage of migration associated with employment in their strongly developed industry.

The policy regarding regional locations of new construction is however – in spite of official declarations – not aimed at a reduction of regional disparities in housing conditions. The main factor in the location of the new socialized housing stock is to provide an adequate number of dwellings for the labour force which is to be employed in the newly started industrial enterprises. It seems that the problem of equalising housing conditions will remain and that disparities will persist throughout the crisis in construction.

The presented indices of housing conditions and dynamics of construction refer to the voivodships as a whole and as such do not make it possible to analyse differences between the urban and rural population. A decrease in the number of new dwellings built by the public sector in the rural areas indicates that this traditional housing conflict has been even graver in recent years since socialized construction was stopped first of all in the technically most backward areas.

CRISIS IN HOUSING AND UNMET HOUSING NEEDS

As has already been mentioned, instead of a planned reduction in the shortage of dwellings in relation to the number of households, it is likely that this shortage will persist. In other words there exist unmet housing needs, although these can be determined only approximately. Difficulties in the assessment of actual unmet housing needs (cf. Sobczak, 1974) are associated with the problems of analysing future phenomena and of the method used to register those needs. The only source providing data on effective housing needs is the number of members and candidates on the waiting lists in the co-operative building societies, since these are the registered needs of people who have already paid the necessary subscriptions. Changes in the regulations concerned with the membership and status of the candidate, and differences in the methods of the distribution of dwellings (cf. Jocz, 1980) are, however, handicaps to a comparative analysis of changes in unmet housing needs. A uniform statistical category for 1975 and 1981, which is not satisfactorily exact, is the number of members and candidates, registered on the waiting lists of the co-operative building societies. In 1975 their housing needs represented 1.5 million dwellings and in 1981 2 million. The ratio between these values according to voivodships and the number of dwellings completed by the public sector in the given year is the index of unmet housing needs. This ratio may also be called a probable measure of waiting

[1] The so-called Perkal's index $w_i = \frac{1}{n} \sum_{j=1}^{n} z_{ij}$.

(in years) for a dwelling (Kulesza, 1982). In 1975 this index was 8.0 for Poland as a whole and increased to 14.5 in 1981. The respective values per voivodship are included in Figs. 4A and 4B; the indices being calculated on the basis of statistical data published in the Voivodship Statistical Yearbooks. In a majority of units in 1975 the ratio between the number of people waiting for a dwelling and the number of completed dwellings ranged from 5.0 to 10.0 (Fig. 4A).

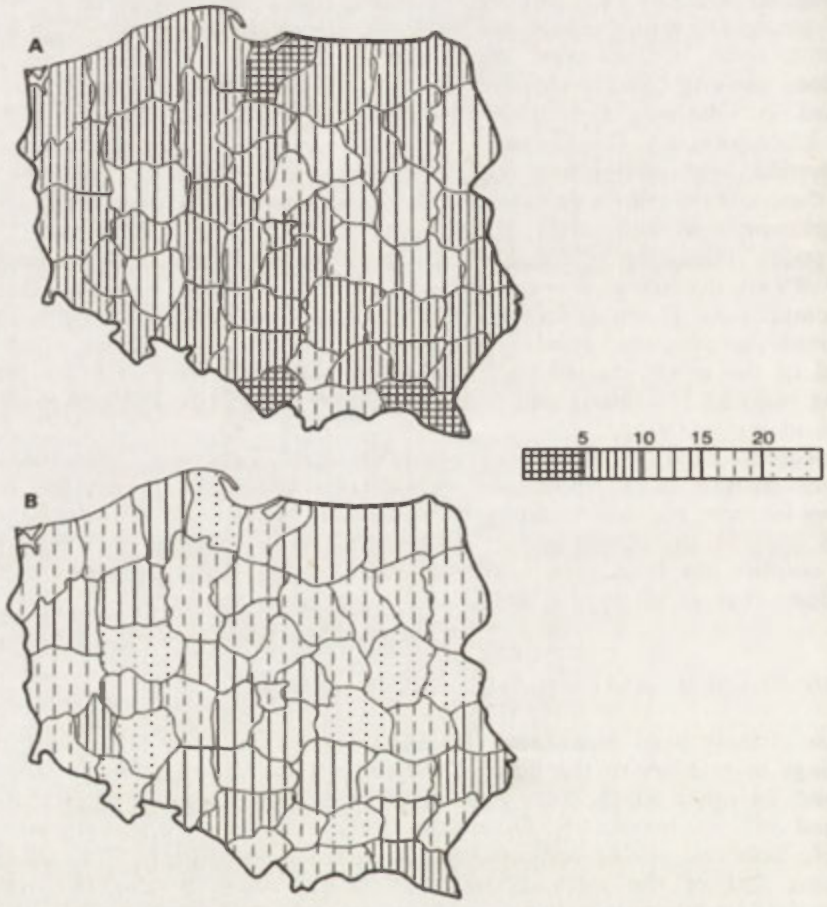

Fig. 4. Unsatisfied housing needs. Number of members and candidates registered in co-operative building societies per 1 dwelling completed in public sector. A – 1975, B – 1981

The index covers both the area with a high economic and demographic potential as well as the less developed voivodships. The spatial distribution of unmet housing needs is in fact quite regular, though slightly higher ratios may be noted in the voivodships of Płock, Poznań, Wroclaw, Ciechanów, Warsaw, Białystok, Siedlce, Radom, Lublin, Cracow and Nowy Sącz. The situation, however, became much worse in 1981 (see Fig. 4B). The increase in the number of people registered on the waiting lists par one completed dwelling is a result of two tendencies: the increased number of registered housing needs and the reduction in house production. Differences in this trend are often by two or three classes of values. A similar scale of needs in 1981 and in 1975 is noted in only four voivodships: Zamość and Przemyśl

(poorly urbanized) as well as Legnica and Katowice. In the last two voivodships the dynamic of socialized construction and the percentage of new dwellings distributed by the factories were quite high in the period under investigation (Jocz, 1980). This fact may have caused people to be less interested in joining the co-operative society. In the remaining regions the index increased, this being a sign that the waiting lists became longer and longer. If we adopt Kulesza's definition (1982) and take into account the present-day level of housing needs and of construction, we may arrive at the gloomy conclusion that in the voivodships of Biała Podlaska, Siedlce, Radom, Tarnów, Wałbrzych, Wrocław, Poznań and Gdańsk the waiting period is likely to be over 20 years!

These difficulties in meeting unfulfilled housing needs are undoubtedly associated with the resignation of the decision-making organizations to implement the socio-economic premises of a rapid solution of the housing problem. This situation has brought about an accumulation of crisis effects in housing. Moreover, an element which also makes the balance-sheet of current housing needs even more difficult is population's wants as the consumers of housing production. These wants seem to exceed the capacity of economy. In fact, the increase in the demand for dwellings in 1970s was due to demographic transformations, a growing purchasing power, and the population's higher aspirations.

CONCLUSION

The empirical stratum of this study has been greatly simplified. For example, real needs for new dwellings may be lower in future in relation to the effective needs presented above because of marriages between the members of the co-operative building societies, or intensification of construction in the private sector. Moreover, current trends in the demography of society are not presented in this study. At present, these show a growing tendency in the demand for new dwellings, though this situation may be changed in the near future.

However, there are well-documented basic tendencies: a recent reduction in the amount of housing construction and the growing need for independent dwellings as well as a more acute spatial differentiation in the housing conditions indicate that the housing situation for Poland's population is not only inauspicious but also downward. Completed dwellings are a *sui generis* final product of the construction industry. It is quite likely that delays in the improvement of efficiency in the construction industry and in communal investment – a subject which is not within the scope of the present study – may be equally damaging. Moreover, a continued increase of prices since 1982 has made it necessary for social policy to protect the poorest population and help them in their housing needs. Prices and current social moods make the chances for rapid implementation of the premises of investment pluralism in housing (the so-called small housing co-operatives, return to construction by local authorities) quite questionable.

Therefore, the final conclusions to the discussed aspects of the crisis in housing are pessimistic. It will be a difficult task to solve the housing problem in Poland in a short time.

REFERENCES

Andrzejewski A., 1979, *Polityka mieszkaniowa* (Housing policy), PWE, Warszawa.

Brzuchacz H., Wasążnik H., 1981, Prognoza zmian w sytuacji mieszkaniowej ludności w układzie przestrzennym (A prognosis of changes in the housing situation of the population in the spatial pattern), in: *Problemy organizacji przestrzennej budownictwa*, Studia KPZK PAN, 77, 33–58.

Jocz E., 1980, Rozdział mieszkań w latach 1976–1978 (Distribution of dwellings in 1976–1978), *Sprawy Mieszkaniowe*, 1, 65–76.

Kulesza H., 1982, Geografia niezaspokojonych potrzeb mieszkaniowych (The geography of unmet housing needs), in: *Problemy polskiej przestrzeni*, Biuletyn KPZK PAN, 118, 84–127.

Muzioł A., 1982, *Warunki mieszkaniowe w miastach (ponad 10000 mieszkańców) – zróżnicowania przestrzenne* (Housing conditions in towns of over 10,000 inhabitants, a spatial differentiation), a typescript, KPZK PAN, Warszawa, 11 pp.

Sobczak A., 1974, *Statystyczna estymacja potrzeb mieszkaniowych* (A statistical assessment of housing needs), PWN, Warszawa – Poznań.

Żarski T., 1980, Zmiany warunków mieszkaniowych w latach 1970–1978 w świetle ostatecznych wyników NSP 1970 i 1978 (Changes in housing needs in 1970–1978 in the light of the final results of the National Census 1970 and 1978), *Sprawy Mieszkaniowe*, 3–4, 83–100.

Budownictwo mieszkaniowe w latach 1970–1981 (House construction in 1970–1981), GUS, Materiały Statystyczne, 13, Warszawa 1983.

Narodowy Spis Powszechny 7 XII 1978. Ludność, gospodarstwa domowe i warunki mieszkaniowe (The National Census. Population, households and housing conditions), GUS, Statystyka Polski, 128, Warszawa 1980.

Roczniki Statystyczne 1976 i 1982 (Statistical Yearbooks 1976 and 1982), GUS, Warszawa.

Roczniki Statystyczne Województw 1981 i 1982 (Voivodship Statistical Yearbooks 1981 and 1982), GUS, Warszawa.

SPATIAL STRUCTURE OF FUNCTIONAL URBAN REGIONS IN POLAND

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INTRODUCTION

Studies on functional urban regions initiated in the 1970s by Berry (1973) and Hall et al. (1973), are still being continued in many countries (e.g., Coombes et al., 1979). International comparative studies have also now been started by Hall (1974) and Hansen (1978), in recent years at IIASA referred to in Kawashima and Korcelli (1982). These studies show that functional urban regions (FURs) are a good system of reference in empirical analyses of processes and phenomena of urbanization. From the theoretical viewpoint the closest concept in the context of FUR analysis is the theory of social spatial interaction.

The theoretical foundations of research and empirical studies of FURs were developed in Poland by Korcelli (1977, 1981, 1982). Korcelli shows how FUR can be defined in the light of the theoretical concepts. When trying to distinguish univocally such regions their diagnostic features, representing the essential type of links of the urban place with its hinterland should be determined. Such an adequate diagnostic feature is provided by daily commuting, and especially to work, school, and service centers. The present study is mainly concerned with the delimitation of FURs which balance places of work and places of residence. The daily journey to work is adopted as the diagnostic feature. The research also identifies and analyses the spatial structure of urban regions in Poland in the years 1970–1973–1978. It should also be noted that a new administrative division of Poland was adopted on 1 June 1975. The identification of the FURs is based on data gathered by the Central Statistical Office for the intermediate crossection for the period under study, i.e. 1973–1974, and published in the Labour Census of 1973. These data concern the occupational structure and commuting to work in the socialized (state and cooperative) sector of economy, and the estimates of housing resources, the demographic structure and certain selected population characteristics for the new administrative divisions (towns and communes). In addition, statistical data from the 1970 and 1978 National Censuses and estimated data converted according to the comparable administrative patterns are analysed. In an analysis of the internal structure of urban regions it is possible, and advisable, to also use regional and administrative divisions. This approach facilitates a shift from FURs to administrative areas and vice versa.

DETERMINATION OF FUNCTIONAL URBAN REGIONS

The FURs have been delimited in several stages to single out the basic morphological units (the regional core areas and the surrounding zones, such as the commuting zone and the peripheral zone). In compliance with other studies the standard FUR size criteria were adopted, namely cities of at least 50,000 inhabitants and employing at least 20,000 people being considered as core areas. In the case of polycentric agglomerations the adjacent or nearby cities were recognized as common core areas when they had common commuting flows. In this way some 37 core areas of the regions were delimited, to which 70 urban units were included (Korcelli et al., 1982).

In order to obtain national coverage it was necessary to apply two additional criteria related to the role played by individual cities as central places, defined economically as well as demographically, in accordance with the national plan of spatial development. Some 10 centers were singled out, among which five (Konin, Piła, Nowy Sącz, Siedlce, Stalowa Wola) attained the required size of 50,000 inhabitants at the end of the period considered, i.e. in 1978 (Table 1), while two (Chełm and Zamość) approached this limit. The following two-centric units: Ełk—Suwałki, Łomża—Ostrołęka, Krosno—Jasło-and Sanok, constitute the three other regional core areas; these were considered the 'national growth centers' in the 1970s (Korcelli, 1977). The maximum ranges of commuting to work to the 47 regional centers delimit the boundaries of the FURs. A more detailed analysis of the resulting spatial configurations (Korcelli et al., 1981, 1982) shows frequent overlapping of commuting areas of several centers. This overlapping of labour-supply areas can be interpreted hierarchically, assuming that the lower level center's labour supply shed is wholly contained in the shed of a neighbouring upper level center. As a result additional analysis aimed to identify individual elements of the hierarchical spatial structure of commuting to work. Figure 1 shows the hierarchy of commuting centers in the Polish urban system obtained by graph theory according to the maximum flow criterion (Nystuen and Dacey, 1961). The resultant dominating patterns reflect the general structure of connections between workplaces and residences in a complex system of interaction. This analysis makes it possible to delineate separate levels within the hierarchical structure of connections. The patterns emerging are territorially non-overlapping, their centers being first order nodes. (These nodes together with the units subordinated to them may be identified with the nodal commuting regions in the national system.)

The patterns indicate a distinct differentiation of regions based on territorial range and internal hierarchical structure. Thus, 11 dominating regional subsystems were classified as having a complex multilevel (four and five levels) hierarchical structure. Their first order nodes are considered supraregional centers constituting elements of the system of main centers (Warsaw, Katowice, Bydgoszcz, Gdańsk, Łódź, Lublin, Cracow, Poznań, Wrocław, Szczecin and also Kielce, Rzeszów; Dziewoński, 1979). These are mostly the largest urban centers in the country having more than 200,000 inhabitants and strong centers of employment, or a balance in employment and residence indicating well developed local labour markets (Jerczyński, 1977).

The above nodal regions of supraregional character occupy a relatively high position with regard to other regional subsystems, and their broad territories, exceeding their present voivodship areas, are similar to the previous areas of their voivodships.

Lower in the hierarchy, the second order regional centres are directly subordinated to the first order nodal centres. Thus, for instance, three centers of regional importance: Płock, Siedlce and Ostrołęka are subordinated to Warsaw, Toruń is subordinated to Bydgoszcz, Gdynia and Elbląg – to Gdańsk, Tarnów to Cracow, Radom and Skarżysko-Kamienna – to Kielce, Piotrków Trybunalski to Łódź, Ełk – to Białystok.

TABLE 1. Basic characteristics of the functional urban regions, 1973–1978–1979

Centers of the regions and urban cores*	Centers of regions according to functional dominance	Population '000		Employment '000		Function of distribution of the link indicator according to distances in the region	r	Index of service development level		Index of housing resources and conditions	Index of average housing conditions
		1973	1978	1973	1978	1973		1973	1979	1978	1978
1	2	3	4	5	6	7	8	9	10	11	12	13
1. WARSZAWA	IS**	1387.8	1555.4	784.5	829.8	$y = 496.2x^{-0.8}$	−0.64	6.51	8.90	5.01	−3.11
2. ŁÓDŹ	I	780.8	823.3	429.9	414.3	$y = 298.3x^{-0.8}$	−0.61	−5.00	−4.12	−2.67	−1.28
Pabianice	I	64.9	68.5	34.1	32.8			−7.15	−8.11	−8.60	−1.63
Zgierz	I	46.3	50.8	23.2	23.2			−4.96	−7.78	−4.39	−1.81
CORE		892.1	942.7	487.2	470.4			−5.70	−6.89	−5.22	0.27
3. KRAKÓW	IS	657.3	693.6	345.3	363.0	$y = 816.5x^{-1.1}$	−0.71	−2.55	0.92	2.00	1.82
4. WROCŁAW	IS	560.3	597.8	282.4	298.4	$y = 2818.1x^{-1.57}$	−0.72	−0.34	0.83	3.29	0.59
5. POZNAŃ	IS	498.9	537.2	265.8	273.5	$y = 1314.7x^{-1.22}$	−0.82	0.63	2.02	4.24	0.42
6. GDAŃSK	IS	397.7	442.2	200.1	209.5	$y = 265.7x^{-0.75}$	−0.70	−2.22	−2.78	4.15	0.08
Gdynia	SI	209.4	227.1	104.4	113.7			−0.75	−0.26	5.03	−0.30
Sopot	S	50.6	51.6	13.6	14.2			21.55	18.10	8.78	−1.19
CORE		657.7	720.9	318.0	337.4			6.19	6.18	5.98	−1.41
7. SZCZECIN	SI	357.9	384.9	173.3	184.4	$y = 29.9x^{-0.30}$	−0.35	−0.57	0.83	3.34	1.54
Stargard Szczeciński	IS	48.6	55.0	24.6	24.8			1.20	1.35	4.07	0.13
CORE		406.5	439.9	197.9	209.2			0.31	1.09	3.70	0.83
8. KATOWICE	IS	337.1	348.6	226.5	240.8	$y = 1.2x^{-0.1}$	−0.10	6.45	5.95	1.12	−1.66
Bytom	I	230.7	230.8	106.1	105.9			−5.36	−3.05	−1.98	−1.47
Zabrze	I	201.2	194.2	74.9	76.6			−6.16	−6.26	−3.19	−1.69
Sosnowiec	I	191.9	229.8	91.3	93.4			−5.83	−8.48	−0.73	−1.63
Gliwice	I	190.4	194.2	109.8	118.9			−1.52	−1.45	−1.13	−2.34
Chorzów	I	154.4	150.1	72.0	68.5			0.30	0.26	−4.78	0.16
Ruda Śląska	I	146.8	154.9	57.9	64.1			−7.50	−9.97	−2.81	−1.37
Tychy	I	127.5	154.2	47.8	62.8			−5.26	−8.20	4.83	−1.32

1	2	3	4	5	6	7	8	9	10	11	12	13
	Rybnik	I	100.6	114.9	56.8	61.2			−1.25	−1.58	3.23	−1.84
	Wodzisław Śląski	I	98.8	102.4	40.1	41.5			−6.53	−4.72	5.25	−1.28
	Dąbrowa Górnicza	I	78.2	133.7	39.1	83.8			−5.71	−7.68	−3.65	2.57
	Jastrzębie Zdrój	I	76.9	95.6	42.3	55.3			−9.05	−11.1	7.43	−1.11
	Jaworzno	I	72.3	87.5	34.0	53.7			−6.24	−8.24	1.77	0.47
	Siemianowice Śląskie	I	70.4	74.0	27.8	27.3			−6.11	−7.52	−3.06	−0.13
	Piekary Śląskie	I	61.6	62.9	21.3	26.7			−8.58	−7.03	−2.30	−0.28
	Mysłowice	I	60.6	76.9	25.2	33.2			−3.66	−2.42	−0.62	0.03
	Tarnowskie Góry	IS	60.3	64.1	32.3	34.4			−0.73	0.54	2.67	−2.15
	Świętochłowice	I	58.0	56.1	22.5	22.5			−5.59	−6.80	−7.94	0.50
	Będzin	I	57.9	74.0	26.5	31.8			−4.59	−5.51	−0.84	−1.58
	Czeladź	I	34.3	33.8	11.0	11.5			−10.7	−10.0	−1.06	−0.89
	CORE		2410.0	2633.1	1165.4	1377.5			−4.68	−5.16	−0.27	−0.85
9.	BYDGOSZCZ	I	308.1	338.0	156.5	167.0	$y = 491.1x^{-0.97}$	−0.68	−1.70	−1.69	−0.70	1.97
10.	LUBLIN	SI	258.3	290.4	131.2	145.0	$y = 256.9x^{-0.64}$	−0.51	0.43	−1.32	−0.37	1.63
11.	CZĘSTOCHOWA	I	194.2	228.3	97.9	112.8	$y = 169.1x^{-0.69}$	−0.51	−3.05	−2.52	−0.83	0.05
12.	BIAŁYSTOK	IS	184.6	211.2	93.9	108.5	$y = 557.8x^{-1.05}$	−0.67	−2.06	−2.42	0.99	1.12
13.	RADOM	I	166.9	183.5	86.2	94.5	$y = 1224.7x^{-1.23}$	−0.74	−3.83	−3.44	−4.14	3.92
14.	TORUŃ	IS	140.3	165.3	75.1	85.6	$y = 279.2x^{-0.83}$	−0.67	−5.03	−0.45	0.65	1.05
15.	KIELCE	IS	139.9	163.2	86.3	100.1	$y = 1130.3x^{-1.18}$	−0.76	3.65	1.84	0.19	0.82
16.	WAŁBRZYCH	I	127.4	131.8	57.3	61.1	$y = 360.0x^{-1.20}$	−0.62	−3.09	−0.63	−5.78	1.32
	Świdnica	I	49.4	54.5	27.3	28.5			1.71	4.71	0.45	0.56
	Dzierżoniów	I	34.4	35.3	21.8	22.7			4.29	4.69	−3.62	1.32
	Bielawa	I	31.7	31.9	15.5	15.2			−7.67	−9.21	−8.42	2.45
	CORE		242.9	253.6	121.8	127.5			−1.19	−0.11	−4.34	1.41
17.	BIELSKO BIAŁA	I	114.9	156.1	94.2	106.8	$y = 108.5x^{-0.48}$	−0.49	2.04	−1.83	1.39	−0.28
18.	OLSZTYN	SI	105.6	126.6	62.5	70.4	$y = 356.0x^{-0.87}$	−0.68	5.99	7.77	4.80	−0.09
19.	OPOLE	SI	94.6	111.3	62.5	71.2	$y = 2317.1x^{-1.56}$	−0.79	9.31	7.88	5.30	−3.49

1	2	3	4	5	6	7	8	9	10	11	12	13
20.	ELBLĄG	I	93.7	105.1	39.6	46.4	$y = 89.2x^{-0.66}$	−0.79	−5.87	−5.09	2.88	0.07
21.	TARNÓW	I	92.1	100.9	59.7	65.4	$y = 530.2x^{-0.98}$	−0.63	0.36	3.89	1.14	0.86
22.	RZESZÓW	IS	89.5	112.7	76.3	87.1	$y = 1305.7x^{-1.28}$	−0.77	12.3	7.78	4.07	−2.12
23.	WŁOCŁAWEK	I	85.0	95.8	42.7	54.3	$y = 315.3x^{-0.9}$	−0.72	−3.55	−4.67	−2.52	0.25
24.	KALISZ	I	84.5	96.2	44.7	54.4	$y = 108.9x^{-0.49}$	−0.37	−1.44	−1.09	−2.80	1.49
	OSTRÓW WIELKOPOLSKI	IS	52.3	56.4	32.6	34.7			2.02	2.12	2.60	0.74
	CORE		136.8	152.6	77.3	89.1			0.29	0.51	−0.10	1.11
25.	PŁOCK	I	81.5	96.7	47.6	56.1	$y = 398.2x^{-1.97}$	−0.7	2.90	0.30	2.21	1.26
26.	GORZÓW WIELKOPOLSKI	I	81.1	98.7	43.5	53.7	$y = 420.1x^{-0.94}$	−0.69	−2.09	−2.39	3.43	−0.30
27.	ZIELONA GÓRA	IS	79.7	94.3	50.3	57.2	$y = 483.4x^{-1.07}$	−0.81	6.97	3.20	2.61	−1.10
28.	LEGNICA	IS	79.2	86.7	36.8	41.5	$y = 206.5x^{-0.77}$	−0.77	2.33	5.06	−0.51	1.40
	Lubin	I	41.6	57.4	23.5	24.1			−3.56	−5.66	−6.49	−2.86
	Głogów	IS	28.5	45.1	11.7	14.3			3.66	2.14	7.35	−3.84
	CORE		149.4	189.3	71.9	79.9			0.81	0.51	4.44	−1.77
29.	GRUDZIĄDZ	I	79.1	87.4	36.9	39.2			−2.07	0.14	0.78	1.23
30.	SŁUPSK	IS	73.5	82.4	36.5	42.2	$y = 125.8x^{-0.76}$	−0.82	1.24	0.58	1.74	1.70
31.	KOSZALIN	SI	72.8	86.4	40.9	46.7	$y = 115.2x^{-0.63}$	−0.73	7.68	5.36	4.64	1.17
32.	PIOTRKÓW TRYBUNALSKI	I	62.4	69.0	34.5	41.1	$y = 205.8x^{-0.74}$	−0.57	−1.86	−0.65	−6.75	1.77
	Tomaszów Mazowiecki	I	56.9	62.2	32.6	33.5			−6.56	−7.30	−8.92	2.21
	CORE		119.3	131.2	67.1	74.6			−4.21	−3.97	−7.83	1.99
33.	JELENIA GÓRA	IS	57.8	84.6	30.9	41.9	$y = 219.7x^{-0.96}$	−0.73	6.32	9.50	0.74	0.35
34.	INOWROCŁAW	SI	57.3	63.5	23.9	30.3			1.95	3.90	−0.40	0.45
35.	PRZEMYŚL	IS	55.8	58.8	22.7	27.8	$y = 301.5x^{-0.96}$	−0.57	3.04	6.43	−7.07	2.03
36.	OSTROWIEC ŚWIĘTOKRZYSKI	I	54.5	60.4	32.4	40.8			−1.83	−0.77	−2.23	0.68
	Skarżysko-Kamienna	I	44.6	42.7	30.4	31.0			2.60	2.33	1.24	−0.79

1	2	3	4	5	6	7	8	9	10	11	12	13
	Starachowice	I	40.9	47.5	29.9	30.5			−0.54	1.64	−1.22	0.19
	CORE		140.1	150.6	92.8	103.3			0.08	1.07	−1.56	0.03
37.	GNIEZNO	IS	53.8	59.2	25.1	26.4			−2.90	−0.94	−1.46	0.70
38.	KONIN	IS	46.5	62.6	17.7	32.8	$y = 180.0x^{-0.91}$	−0.59	1.77	2.35	1.58	−1.23
39.	PIŁA	IS	46.3	54.9	19.1	26.3	$y = 152.3x^{-0.84}$	−0.50	−1.25	0.01	3.67	0.82
40.	NOWY SĄCZ	SI	45.6	61.1	28.2	37.8	$y = 234.6x^{-0.71}$	−0.69	8.58	6.85	−1.66	2.16
41.	CHEŁM	IS	42.6	49.3	22.9	27.8	$y = 228.4x^{-0.73}$	−0.42	−2.61	0.35	−3.40	1.64
42.	SIEDLCE	IS	41.6	50.3	23.5	33.5	$y = 1043.2x^{-1.28}$	−0.81	7.56	7.95	−5.41	1.09
	Biała Podlaska	SI	29.1	35.3	13.6	18.7			4.90	5.02	−6.16	2.23
	CORE		70.7	85.6	37.1	52.2			6.23	6.48	−5.78	1.66
43.	ZAMOŚĆ	IS	37.1	43.7	19.9	29.9	$y = 404.6x^{-1.0}$	−0.66	5.49	8.42	−2.25	2.03
44.	TARNOBRZEG	IS	24.8	33.6	7.0	22.1	$y = 658.9x^{-1.66}$	−0.94	1.34	7.11	1.43	−0.89
	STALOWA WOLA	I	36.7	50.4	32.1	37.5			5.20	2.42	4.98	−3.14
	CORE		61.5	84,0	39.1	59,6			3.27	4.80	3.20	−2.01
45.	KROSNO	I	31.3	36.6	28.0	34.5	$y = 1016.6x^{-1.38}$	−0.70	5.38	10.12	−0.53	−0.32
	JASŁO	IS	20.7	28.8	19.2	22.6			15.22	8.01	0.44	−0.99
	SANOK	IS	30.1	28.5	21.1	23.1			5.49	7.44	1.31	−0.74
	CORE		82.1	93.9	68.3	80.2			8.70	8.52	0.41	−0.68
46.	SUWAŁKI	SI	28.3	35.8	11.2	18.3	$y = 121.9x^{-0.68}$	−0.70	−0.51	1.53	−3.76	1.85
	EŁK	IS	29.4	35.8	14.0	16.7			6.07	4.91	2.06	1.55
	CORE		57.7	71.6	25.2	35.0			2.78	3.22	−0.85	0.33
47.	ŁOMŻA	IS	26.9	36.6	12.7	18.8	$y = 189.8x^{-0.8}$	−0.64	2.52	6.31	−0.79	0.33
	OSTROŁĘKA	IS	25.1	32.9	14.4	21.4	$y = 152.3x^{-0.84}$	−0.55	5.54	2.50	1.17	−0.34
	CORE		52.0	69.5	27.1	40.2			4.03	4.40	0.19	−0.05

* Names of the regions correspond to the urban cores, e.g. WARSZAWA, except for the following: regions 2, 6, 7, 8, 16, 28, 36, and 42 – their cores include also other cities, e.g. region 2, whose core includes also the cities of Pabianice and Zgierz; region 6, whose core also includes the cities of Gdynia and Sopot, etc.

** Types of centers: I – industrial, IS – industry and services, SI – services and industry, S – services, after M. Jerczyński, 1977.

Sources: Statistical yearbook of cities. 1980, GUS, Warsaw, Labour force census, 1973.

The subsequent group of patterns consists of the regional centers of first order nodes at level three in the hierarchical structure having much smaller spatial ranges. These patterns divide this territory of the country which is outside the spheres of influence of the supraregional centers.

These subsystems form the functional wholes, and usually are urban cores of the regions or their essential elements. The first order nodes, which represent strong centers of employment, often have subordinate centers fulfilling residential roles. Additionally labour supply sheds, when considered hierarchically, are nested with the lower level center subordinate to an upper level center.

On this basis, maximum commuting ranges to previously determined centers of urban regions define the boundaries. The internal zones of the regions, differing with regard to intensity of their links, were delineated using commuting proportions of the economically active, non-agricultural population living in a given unit. In order to generalize the internal structure of the regions the boundary of the commuting zone was delimited according to the index isoquant of 10 per cent. The whole internal zone was divided into subzones of intensive commuting (index exceeding 50 per cent) and less intensive commuting, also caled external (index between 50 and 10 per cent). The areas outside the link index isoquant of 10 per cent were termed peripheral.

The spatial structure of these urban regions is shown in Figure 2, and the full list of centers, together with their statistical characteristics, is given in Table 1. According to their spatial scale, the number of inhabitants and economic potential of the units obtained correspond generally with the concept of functional urban regions displaying a high degree of balance between the places of work and places of residence. Half of the centers of these regions are cities over 100,000 inhabitants, while a majority of centers of other regions may reach this limit during the next decade.

SPATIAL STRUCTURE OF FUNCTIONAL URBAN REGIONS

Urban regions are differentiated with regard to their population size, economic and service linkages and the spatial extent of links between the centers and their hinterland. In most regions peripheral zones also constitute sources of daily commuting to second order centers. In spite of the fact that these links are weaker (below 10 per cent of in-commuters among the total of professionally active non-agricultural population), they often occur over substantial distances. This type of connection is characteristic of most regions of Northern and North-Eastern parts of Poland, where usually relatively less developed regional internal zones are compensated for by large peripheral zones. Zonal relations between the workplaces and residences may be described by a function of linkages between workplaces and residences and distances in the region. This function has the following form

$$Y_{ij} = \frac{D_{ij}}{L_i} = ad_{ij}^{b}$$

where: D_{ij} is commuting from the i place of residence (town or commune) to the j place of work (regional center),
L_i is the number of professionally active population living in the given unit i,
d_{ij} is distance in kilometers between places i and j, a and b are function parameters.

This function measures the force of the influence exerted by the regional centers, making it possible, to identify the shape of the regional ranges (Potrykowska, 1979).

In Southern and Central parts of Poland, in the areas of intensive commuting to

work, the internal zones occupy a major share of regional areas, while the peripheral zones account for only a small share. Commuting distances are shorter as indicated by the values of parameter *b* of the approximating function (Table 1). South-Eastern and Southern regions of the country are characterized by the highest parameter *b* absolute values, while the Western and Northern regions record the lowest values, since the shares of zones of less intensive commuting are bigger in these regions. Relatively low absolute values of the parameter *b* were obtained for such urban agglomerations as Warsaw (−0.8), whose area of influence is large, in fact the biggest in the country (15,509 km^2), reaching far beyond the capital voivodship. Similar values of this parameter characterize the regions of Łódź and Lublin, each spreading over the neighbouring voivodships. In the cases of Katowice, Bielsko-Biała and Częstochowa low values of parameter *b* were found, and the exponential, or – for Bielsko-Biała – linear functions best approximated the dependence of the number of trips upon distances.

Regions obviously differ as regards their formation, population potential and settlement structure. There is a distinct correlation between the population size and the population density of a region (Fig. 3). An implicit hierarchy of urban regions, whose upper level is occupied by the top 10 centres, can be envisaged. These are

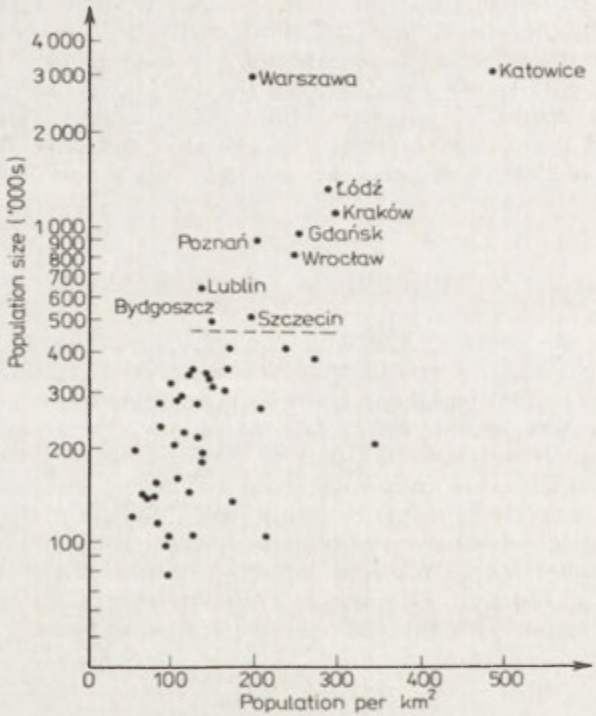

Fig. 3. Distribution of functional urban regions by population size and density

simultaneously the regions whose centers of supraregional importance occupy the highest positions in the hierarchical structure of the Polish urban system (Fig. 1).

Size of centers may be used as a measure of the degree of development and maturity of urban regions (Kawashima and Korcelli, 1982) and the functional regions of Poland were classified on this basis. Relationships between rates of population growth in the cores during the period 1970–1978 and population size were analyzed

(Fig. 4A). In the years 1970–1974 a relatively low rate of population increase can be observed. Slightly higher rates occured in the center of regions of 150,000 inhabitants and less. Growth rates in larger centers were lower. In the subsequent period, 1974–1978, population growth rates were lower than before in urban places of 0.5–1 million inhabitants and in centers of smaller regions, 50–75,000 people. Population growth rates in other centers, including the two largest, Warsaw and Katowice, but also the smallest ones, below 50,000, were higher than in the preceding period.

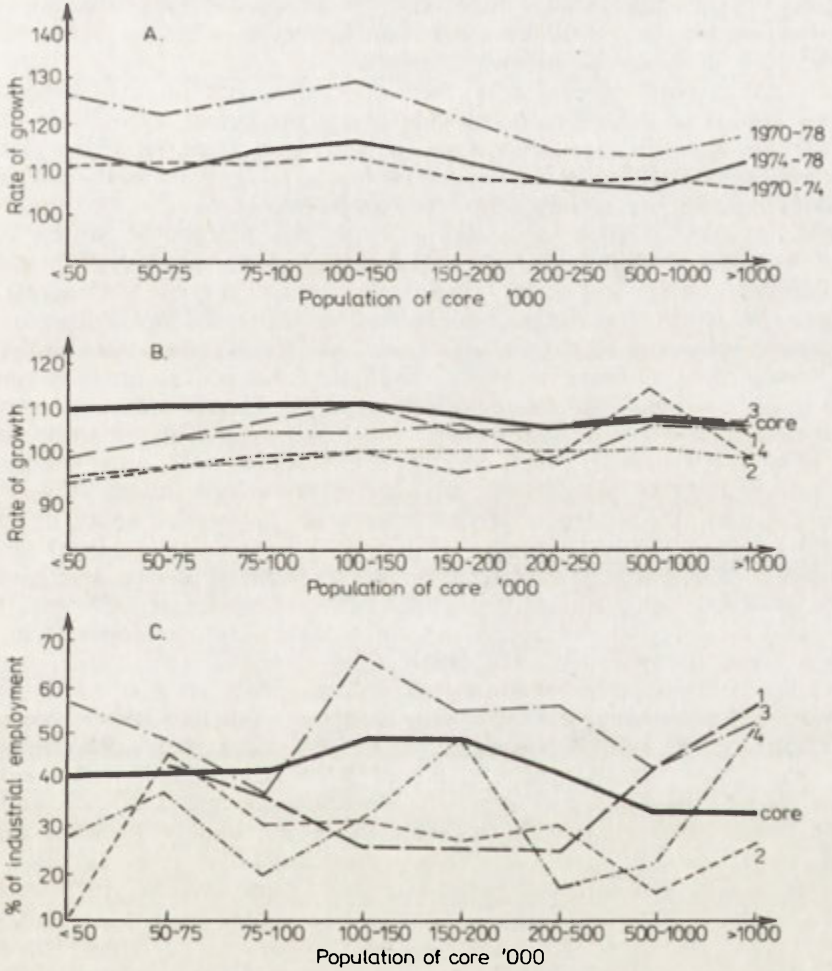

Fig. 4A. Population change by cores of FURs for 1970–1978; B. Population change by zones of FURs for 1970–1974: 1 – internal zone – towns, 2 – internal zone – communes, 3 – external zone – towns, 4 – external zone – communes; C. Distribution of industrial employment by zones of FURs, 1973. 1–4 cf Fig. 4B

Population growth in centers of urban regions was also analyzed in terms of the changes in rank position of centers during the period 1970–1978. Rank orders for two periods: 1970–1974 and 1974–1978 were established, which enabled determination of positional changes over time. Rank differentials for the first period were denoted

R_1, and for the second period – R_2. Comparison of the two characterizes types of urban regional centers on the basis of growth, assuming that rank shift of at most one position is a sign of stagnation (Zagożdżon, 1978). The list of urban regional centers according to growth types is given in Table 2. Type I, i.e. stable rank, encompasses eleven biggest regional centers and Zamość (one of the smallest centers). Type II, i.e. steady rank increase, contains centers of three fast developing newly created industrial regions, namely Konin, Legnica and Płock. The other types represent all other regional centers, having less than 200,000 inhabitants, in which during the period under study there were unidirectional rank changes, such as drop-and-stagnation, or growth-and-stagnation (sequence of the two types of changes accounted for), or bidirectional rank changes.

Demographic trends in core areas were compared with those of other regional zones and indices of these changes calculated for the period 1970–1974. Figure 4B shows that in fact on a regional scale growth rates were relatively stable with perhaps some concentration in the centers, especially taking place in the internal zones of intensive commuting, mainly within the urban places.

Population concentration is connected with the process of strong industrial employment concentration in the regional centers, which were usually industrial or service-industrial based, and strong employment centres (Fig. 4C). Concentration of industrial employment in regional cores and in the cities belonging to internal zones differed according to the size and functional type of the center analyzed. The highest rate of industrial employment occurred in the zones of most intensive commuting in the regions containing urban agglomerations. The lowest industrial employment rates were observed in the largest centers, which are usually of the service-industrial functional type. Additionally, there were lower percentage rates in the smaller centers having less that 75,000 inhabitants. In view of these conclusions it was deemed important to analyze the degree of development of the service sector in centers of individual regions. The latter towns, as indicated by another study (Korcelli and Potrykowska, 1979), were characterized by a high level of service development and therefore occupied high positions in the rank order of service development. This was corroborated by the results of analysis of the service sector development in regional centers in the years 1973 and 1979 (Table 1).

The level of development of the service sector in core areas of urban regions is measured by Z-score summations of nine variables related to service functions per capita (Smith, 1975, 1977).[1] Higher values of this index indicate higher levels of service development. In the years 1973 and 1979 high values of this index were obtained for centers of the two largest regions: Warsaw and Katowice, and for the core areas of urban regions with less than 75,000 inhabitants (previous capitals of poviats), both representing the service-industrial functional type. In most of these centers the service development index increased from 1973 to 1979. Other core areas, i.e. medium and large cities were characterized by much lower index values. Among these towns there also were industrial centers of the Upper-Silesian conurbation, i.e. Sosnowiec, Ruda Śląska, Tychy, Rybnik, Dąbrowa Górnicza, Jaworzno, in which the index values significantly decreased in comparison with 1973. This

[1] The values of the index of service development was determined on the basis of nine variables: (1) retail outlet number per 1,000 inhabitants; (2) food and beverage establishments per 10,000 inhabitants; (3) sales in the socialized retail trade in 10^3 zlotys per capita; (4) sales in the socialized restaurants in 10^3 zlotys per capita; (5) cinema seats per 1,000 inhabitants; (6) hotel beds per 1,000 inhabitants; (7) number of high school students per 1,000 inhabitants; (8) number of technical high school students per 1,000 inhabitants; and (9) telephones per 1,000 inhabitants.

TABLE 2. Types of the centers of urban regions (cores)

Types of centers according to population growth	Population size of the core (×1,000)							
	Above 1,000	500–1,000	200–500	150–200	100–150	75–100	50–75	Below 50
1. Centers with stable rank $R_1 = R_2 = 0$	Warszawa Katowice	Łódź Kraków Wrocław Poznań Gdańsk	Szczecin Lublin Bydgoszcz Wałbrzych		Olsztyn			Zamość
2. Centers with steady rank increase $R_1 > 0$ and $R_2 > 0$					Legnica	Płock	Konin	
3. Centers with steady rank decrease $R_1 < 0$ and $R_2 < 0$					Ostrowiec Świętokrzyski	Elbląg Krosno	Piła Inowrocław Przemyśl	
4. Centers without growth (decrease and stagnation) $R_1 < 0$ and $R_2 = 0$					Kalisz	Grudziądz	Gniezno	
				Radom				
$R_1 = 0$ and $R_2 < 0$					Piotrków Trybunalski	Słupsk Tarnów		
5. Centers without decrease (increase and stagnation) $R_1 > 0$ and $R_2 = 0$						Koszalin	Stalowa Wola	
$R_1 = 0$ and $R_2 > 0$					Toruń Bielsko-Biała	Gorzów Wlkp. Zielona Góra Rzeszów	Łomża – –Ostrołęka	
6. Centers with bidirectional changes increase-decrease $R_1 > 0$ and $R_2 < 0$				Białystok	Kielce	Włocławek	Ełk – Suwałki	Chełm
decrease-increase $R_1 < 0$ and $R_2 > 0$				Często-chowa		Opole	Jelenia Góra Nowy Sącz Siedlce	

R_1 – change of rank in 1970–1974; R_2 – in 1974–1978.

observation corroborates an earlier statement that the centers mentioned, primarily industrial, attracted population and industry in the period to a greater degree than they attracted service functions (Korcelli and Potrykowska, 1979).

Workplace – residence connections through daily commuting may reflect a broader spectrum of relations resulting from a complex structure of other social and economic variables. These include tertiary-sector linkages, the organization of the technical infrastructure, housing resources and conditions, and other social and economic characteristics of the population including occupational and demographic structure and levels of education. An accurate analysis of relations between the indicated features, i.e. interdependences between the patterns of workplaces described by commuting flows their intensity and structure on the one hand, and the patterns of places of residence described by housing resources and living conditions, as well as demographic and social characteristics of the population on the other hand, carried out on the example of Warsaw urban region fully confirmed the above hypothesis (Potrykowska, 1979). This question of the degree of interdependences between the two types of patterns has also been researched on the level of functional urban regions (Korcelli et al., 1982). In order to determine the interdependences between the systems of places of work and places of residence multiple regression analysis has been used. Interdependences between the following set of the independent variables have been calibrated: distance, population density, number of the non-agricultural population, housing recources and conditions (i.e. number of housing units and rooms per 1,000 inhabitants as well as dwelling density – the average number of persons per 1 room). The dependent variable was commuting to work as a percentage of the number of professionally active population. The results also corroborated the conclusions and hypotheses presented before. In all of the 47 regions studied, the role of variables such as distance, percentage of non-agricultural population or housing resources and conditions should be especially emphasized.

The results of the regression analysis confirm the previous conclusions relating the distribution of regional commuting flows to distance, as well as indicating the adequacy of the studies of relations concerning magnitudes, locations and growth of population within the regions considered. The relevance of the variables describing housing resources and condition in the regression analysis constitutes a basis for further analysis of housing at the intra-regional scale. Data contained in Table 1 define the level of housing resources and conditions in the core areas of regions in 1978. Again *Z*-score summations were used and the index measured: (a) housing resources and conditions, on the basis of seven variables and (b) average housing conditions, on the basis of three representative characteristics (Kulesza, 1982).[2] In the first case higher values of the index represent greater housing resources and better dwelling equipment. These higher values occur mainly in the core areas of larger regions, containing urban agglomerations. Generally there exists a significant positive correlation between the size of regional centers and the level of housing resources and living conditions. A relatively rapid improvement of housing conditions in internal zones as compared to other parts of the regions accompanies this phenomenon (Korcelli, 1981).

[2] An index of housing resources and conditions was calculated on the basis of the standardized values of seven indicators: (1) number of dwellings per 1,000 inhabitants, (2) number of rooms per 1 dwelling, (3) floor-space of dwellings in m^2, (4) per cent of dwellings provised in water, (5) per cent of dwellings provised in WC, (6) per cent of dwellings with own bathroom, (7) per cent of dwellings with central heating. The average housing conditions index was determined on the basis of sums of the standardized values of three variables: (1) average number of households per 1 dwelling, (2) average number of persons per 1 room, (3) per cent of dwellings without WC.

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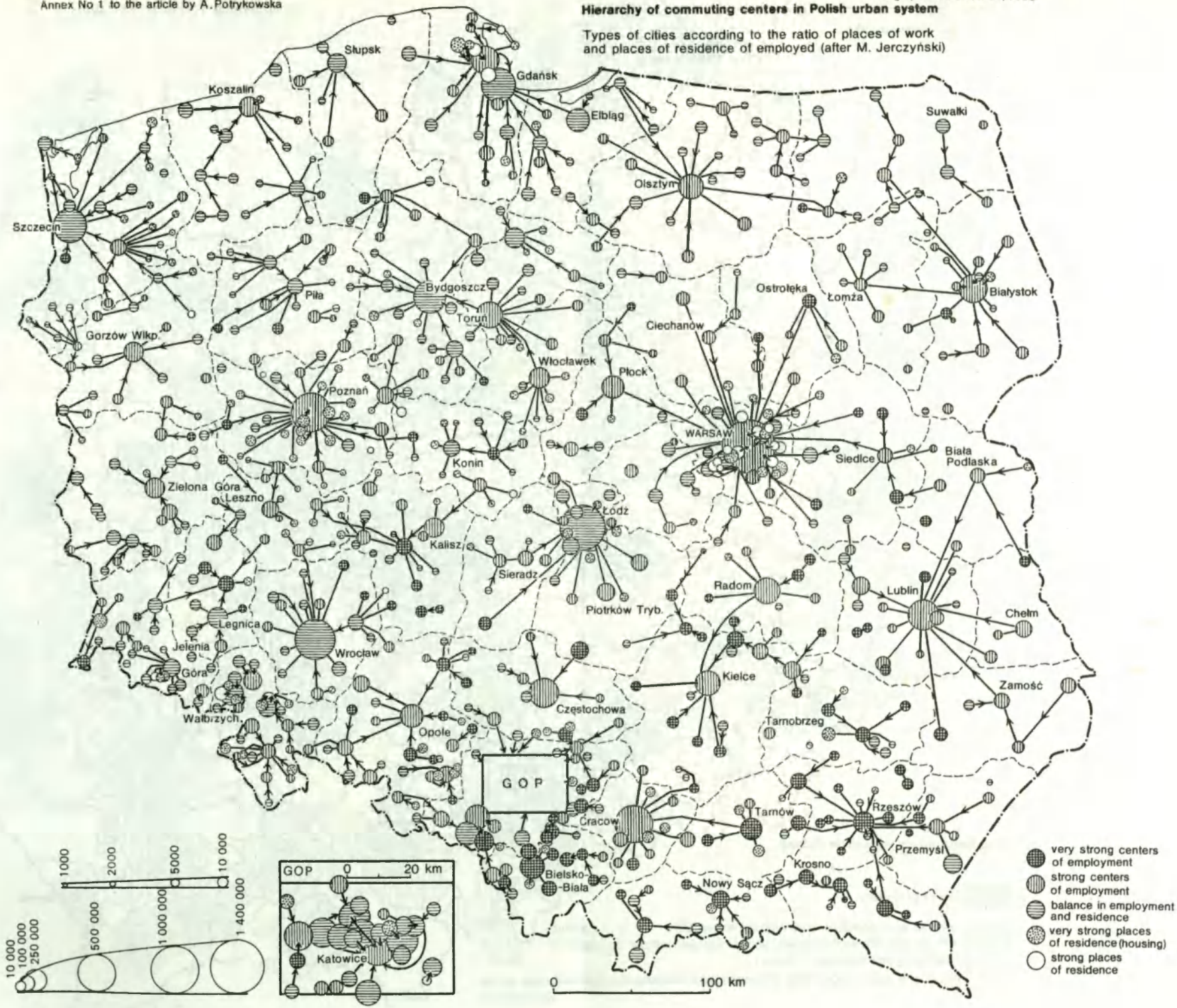
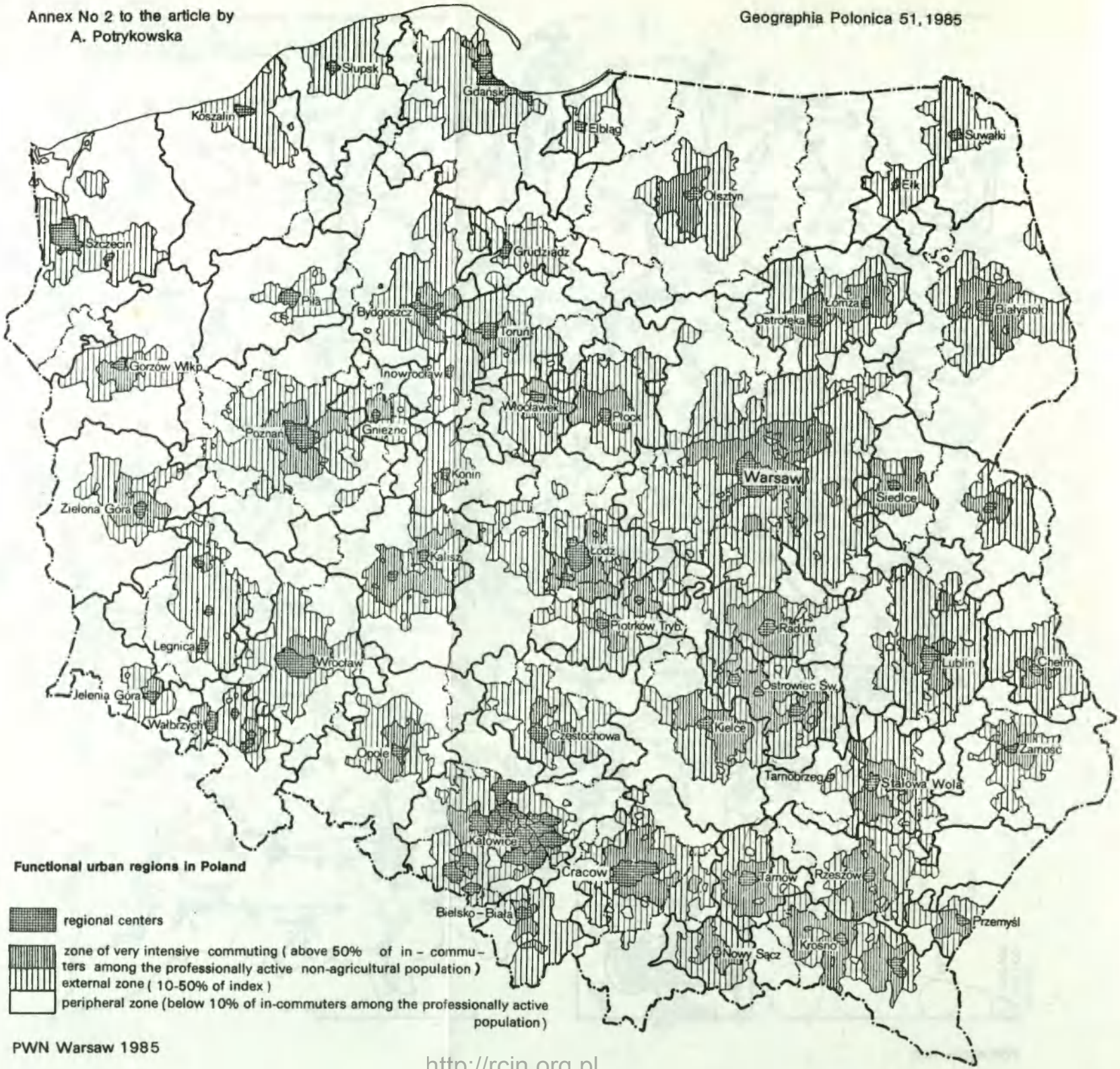
Hierarchy of commuting centers in Polish urban system

Types of cities according to the ratio of places of work and places of residence of employed (after M. Jerczyński)



PWN Warsaw 1985

Fig. 1



Functional urban regions in Poland

regional centers

zone of very intensive commuting (above 50% of in - commuters among the professionally active non-agricultural population)

external zone (10-50% of index)

peripheral zone (below 10% of in-commuters among the professionally active population)

PWN Warsaw 1985

Fig. 2

The above can be complemented with an analysis of values of average housing conditions. This index has values decreasing with the improvement of housing conditions. Higher values of this index refer principally to smaller regional centers and are characteristic of external and peripheral zones. This indicates that the housing conditions in the two zones are significant factors influencing the range of daily commuting to work even over long distances. There exists a spatial differentiation of housing conditions on a country-wide scale, significantly better in the Northern and Western parts of the country compared to Central and Eastern parts, where the majority of population dwells in bad housing conditions both in urban and rural areas. This phenomenon of differentiation, although historically explained, also has a bearing on the current interregional migration levels.

CONCLUDING REMARKS

The analysis of changes in the internal structure of functional urban regions indicates that they differ as regards to their formation, which corresponds to the hierarchical ordering of regional centers based on size. At least three hierarchical levels can be distinguished: supraregional, which covers the ten largest centers of regions, constituting the system of main cities, and the regional and local levels accounting for the rest of the regions.

Changes in the internal structure of functional urban regions are complex. As a result the paper contains only a simplified analysis of interdependences between population distribution, employment structure, service functions, development level and housing resources and conditions on the inter- and intra-regional scale. Even within this simplified framework, however, it has again been shown that functional urban regions are proper units of reference in studies of urbanization phenomena and processes.

REFERENCES

Berry B. J. L., 1973, *Growth centers in American urban system*, vols. 1–2, Ballinger, Cambridge, Mass.

Coombes M. G., Dixon J. S., Goddard J. B., Openshaw S., Taylor P. J., 1979, Daily urban systems in Britain: from theory to practice, *Environment and Planning* A, 11, 565–574.

Dziewoński K., 1971, *Program badań systemu osadniczego Polski* (A program of research in the settlement system of Poland), Instytut Geografii PAN, Warszawa (typescript).

Dziewoński K., 1977, Współczesne procesy urbanizacji w Polsce (Urbanization in contemporary Poland), in: *Statystyczna charakterystyka miast. Funkcje dominujące*, Statystyka Polski, 85, 5–19.

Dziewoński K., 1979, System miast głównych w Polsce (A system of main cities in Poland), Instytut Geografii i Przestrzennego Zagospodarowania PAN, Warszawa (typescript).

Hall P., Gracey H., Drewett R., Thomas R., 1973, *The containment of urban England*, vols 1–2, George Allen and Unwin, London.

Hall P., 1974, *International urban systems: outline of a research project*, International Institute for Applied Systems Analysis, Laxenburg.

Hansen N., 1978, *Human settlement systems: international perspective on structure, change and public policy*, Ballinger, Cambridge, Mass.

Jerczyński M., 1977, Funkcje i typy funkcjonalne polskich miast. Zagadnienia dominacji funkcjonalnej (Functions and functional types of Polish cities. Problems of functional dominance), in: *Statystyczna charakterystyka miast. Funkcje dominujące*, Statystyka Polski, 85, 20–116.

Kawashima T., Korcelli P., eds., 1982, *Human settlement systems: spatial patterns and trends*, CP-82-S1, International Institute for Applied Systems Analysis, Laxenburg.

Korcelli P., 1977, *An aproach to the analysis of functional urban regions: a case study of Poland*, RM-77-52. International Institute for Applied Systems Analysis, Laxenburg.

Korcelli P., 1981, Regiony miejskie w systemie osadniczym Polski (Urban regions in the settlement system of Poland), in: *Studia nad migracjami i przemianami systemu osadniczego w Polsce*, Prace Geograficzne IGiPZ PAN, 140, Warszawa, 189–212.

Korcelli P., 1982, Migration and urban change, *International Regional Science Review*, 7, 193–216.

Korcelli P., Potrykowska A., 1979, Rozwój funkcji usługowych a hierarchia administracyjna miast w Polsce (Development of tertiary functions and administrative hierarchy of urban places in Poland), *Przegląd Geograficzny*, 51, 209–233.

Korcelli P., Potrykowska A., Bodzak D., 1981, Układ przestrzenny i współzależności ośrodków dojazdów do pracy (Spatial patterns and relations between commuting centers), in: *Studia nad migracjami i przemianami systemu osadniczego w Polsce*, Prace Geograficzne IG i PZ PAN, 140, Warszawa, 213–233.

Korcelli P., Potrykowska A., Bodzak D., 1982, *Przestrzenna struktura regionów miejskich w Polsce* (Spatial structure of urban regions in Poland), Instytut Geografii i Przestrzennego Zagospodarowania PAN, Warszawa (typescript).

Kulesza H., 1982, Geografia niezaspokojonych potrzeb mieszkaniowych (Geography of unmet housing needs), in: *Problemy polskiej przestrzeni*, Biuletyn KPZK PAN, 118, Warszawa, 84–127.

Nystuen J. D., Dacey M. F., 1961, A graph theory interpretation of nodal regions, *Papers and Proceedings of the RSA*, 7, 29–42.

Potrykowska A., 1979, Współzależności między dojazdami do pracy a strukturą społeczno-demograficzną regionu miejskiego Warszawy w latach 1950–1973 (Interdependences between commuting to work and socio-occupational and demographic structure in the urban region of Warsaw), *Dokumentacja Geograficzna*, 2, 1983.

Smith D. M., 1975, *Patterns in human geography. An introduction to numerical methods*, David and Charles, Newton Abbot.

Smith D. M., 1977, *Human geography. A welfare approach*, Edward Arnold, London.

Zagożdżon A., 1978, Ośrodki regionalne i subregionalne Polski (Regional and subregional centers in Poland), Instytut Geografii Uniwersytetu Wrocławskiego, Wrocław (typescript).

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AN APPROACH TO THE STUDY OF URBAN CHANGE

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BACKGROUND

This paper attempts to summarize the objectives and results of a research project: namely, the Task on Urban Change carried out at the International Institute for Applied Systems Analysis (IIASA) in Laxenburg, Austria, 1980–1982. The Task represented just one stage in IIASA's involvement in the field of urban studies that started in 1973, soon after the Institute itself was established. Hence, it seems appropriate to describe its work against a broader background, and to sketch in some of the activities that preceded the Urban Change Task.

In 1975 the Urban and Regional Project at IIASA [1] became involved in a comparative study of urban regions, as a joint effort with a research group at the University of Reading, UK. The study was based on the concept of the functional urban region (FUR) developed by Berry (1973) and by Hall et al. (1973), and it attempted to identify such units for all European countries as well as North America and Japan.

The concept itself followed in a long tradition of urban-centered regional definitions developed by such authors as R. Blanchard, P. Geddes, N. S. B. Gras, R. McKenzie, D. Bogue, J. Friedmann, J. Miller, and others. It also drew on more pragmatic notions such as the Standard Metropolitan Areas, the conurbations, the urban agglomerations, etc., which have been used in a number of countries as spatial statistical reference units. The attractiveness of the FUR concept was its ability to match the pragmatic with the theoretical objectives, FUR divisions were meant to be operational and internationally comparable, while their skeleton developed out of the theory of spatial interaction. This union was not, however, without cost: implicitly, the commuter flows were assumed to be a proxy for a much wider range of spatial interactions including those related to service, education, and leisure, i.e. activities characterized by spatial and temporal scales of contact quite different from that of labour-related activities.

Initially, the identification of functional urban regions was treated in the IIASA-Reading project as the first stage in an analysis which was subsequently to focus on the changing distribution of people and jobs, the occupational structure, and land-occupancy patterns, and to produce generalized social as well as resource-oriented indexes for the urban regions (Hall, Hansen and Swain, 1975). At a later

[1] The Project was merged in 1977 with another group at IIASA to form a larger unit – the Human Settlements and Services Area. The HSS Area, under the leadership of A. Rogers, existed until subsequent reorganization at the Institute in 1982/1983.

stage the conceptual justification for the project shifted toward a study of relationships between urbanization and economic development over space (Hansen, 1976, 1978). More specifically, it was intended to provide an extended empirical test of prevailing hypotheses dealing with urban and regional systems development, including the concept of the hierarchical diffusion of innovation (J. Lasuen), polarized development (J. Boudeville), and the regional growth-convergence syndrome (J. Williamson).

In fact, the data assembled in the course of the project for some twenty countries were mostly restricted to population distribution, and change, over the 1950–1975 period, between the cores, hinterlands, and non-urban regions. Despite its limitations, this material became quite relevant in the disputes on 'counter-urbanization' versus 'trend continuity' in urban development that took place in the late 1970s (Vining and Kontuly, 1978; Gordon, 1978). The project was concluded in 1979 with a volume (Kawashima and Korcelli, eds., 1982) complementary to the book by Hall and Hay (1980).

Another research effort at IIASA which influenced the scope of the Urban Change Task was the study on Migration and Settlement, also carried out during the period 1975–1979. The aim of this project was to test and apply, in a policy context, a set of multistate demographic models (Willekens and Rogers, 1979). The Migration and Settlement Task demonstrated the importance of demographic variables in the analysis of factors and consequences of urban development, and, more specifically, the roles of population ageing and declining fertility in large-city contraction in the developed countries (for a summary publication see Rogers and Willekens eds., 1984).

Based on the two research projects briefly described above, the Task on Urban Change aimed at interpreting the urbanization trends of the late 1970s/early 1980s and the new policy problems they posed. The project predominantly relied on the analysis of population variables, although attempts were also made to account for the economic, technological, and environmental dimensions of urban development. The roles of, and interaction between, these factors of urban change will be discussed in the last section of this paper. The next section will introduce more specific assumptions that underlay the study as a whole; it will also present a working overview of recent urbanization patterns that served as a factual reference base throughout the study.

THE PROCESS OF URBAN CHANGE

Spatial deconcentration of settlement in developed countries has been a widespread phenomenon since the mid-1970s but its forms have varied between different countries and regions. Deconcentration on a national scale is typically manifested in the slowing-down of growth or absolute decline of the population size of the largest urban agglomerations and/or in a resurgence of the growth of cities situated within traditional out-migration regions. In some countries long-term interregional shifts in the distribution of population and economic activity are major contributors to urban change and account for the observed variations in urban growth performance within individual city-size categories. Nevertheless, the overall relation between city population size and rate of growth for middle-sized and large cities has become increasingly negative.

However, the evidence of faster aggregate growth of nonmetropolitan, as compared with metropolitan populations is so far limited to a few, very highly urbanized countries; moreover, even this evidence is questioned by some authors who point to the deficiencies of the spatial reference units used for statistical purposes, as well as the analytical divisions established within the framework of international comparative

studies of urbanization. Owing to the high share of the urban population within the total, even a substantial drop in the number of rural-to-urban migrants does not necessarily entail a decrease in the out-migration probability for a rural dweller to below the corresponding value for an inhabitant of an urban area. Nowhere can rural population growth be attributed to an increase in agriculture-related employment; hence the observed transformations of settlement systems cannot be labelled as deurbanization.

On the regional scale, the deconcentration of large metropolitan areas (urban agglomerations) has further advanced. However, while their core areas have generally witnessed sharply reduced growth rates, net out-migration and, in many instances, absolute population contraction, decline at the urban agglomeration level has been typically restricted to older, industrial regions (mainly those that emerged and rapidly expanded during the Industrial Revolution). Growth within the regions has shifted from the intermediate zone to small and medium-sized cities situated in the outer zone, but still generally within commuting range of a large metropolitan core. In the centrally planned economies large-city contraction is not a characteristic phenomenon, and, in the few cases observed, it results primarily from low rates of population growth at the national level. Intra-regional deconcentration is also less pronounced for corresponding levels of urbanization. These trends, partly produced by urban and regional policies over the past decades (to be discussed in more detail in a policy subsection below), may be expected to continue during the next decade, although they will be counterbalanced by demographic change as well as policies aiming at interregional deconcentration of economic activity.

Settlement changes which have occurred since the beginning of the 1970s mark in many respects a reversal, or turnaround of long-established patterns, but, somewhat paradoxically, they also result from a continuation of past trends. For example, the observed reversal of the pattern of net migration flows from smaller to larger cities was preceded by a gradual decrease in small-city out-migration and large-city in-migration rates during earlier decades. This evolution became gradually more accentuated between 1970 and 1980. The continuity of trends suggests that recent urban change may be a sustained phenomenon, rather than a short-term disturbance in the evolution of human settlement systems. This last question, however, i.e. one pertaining to the future course of settlement change, and its range of validity, should only be posed within an explanatory framework. High urbanization levels and declining population growth at the national level may induce, but by no means predetermine, settlement deconcentration.

This rather compressed and perhaps overgeneralized picture of recent urbanization trends in the developed, highly urbanized countries (for a more extensive discussion and sources see Korcelli, 1983) may be derived from the multitude of national reports and international comparative studies that have proliferated during the last decade or so. Although quite consistently identified, these trends have not yet really been accepted by the wider community of scholars and planners. Four major reasons for this situation may be identified:

(a) *The divergence of urban change patterns between countries and regions.* The continuous growth of large cities and urban agglomerations was formerly accepted as a universal phenomenon that transcended different political systems and levels of socioeconomic development. Indeed, prior to the late 1970s, urbanization trends were broadly similar for both the highly urbanized and the less urbanized (less developed) countries, with positive urban growth indexes and a positive correlation between city size and growth rate. These long-established developments are still reflected in recent urbanization projections published by the United Nations (1980). For example, the number of cities with over 4 million inhabitants in the more developed world regions is projected to increase from 13 to 25 between 1975 and

the year 2000, and the number of cities of over 0,5 million from 110 to 149. Hence, the hypothesis of urbanization turnaround may be questioned when the scale of inquiry moves from individual cities and countries to world regions.

(b) *The state of urban and regional growth theory*. The secular urbanization trends discussed above have a rather firm explanatory basis, which is lacking in the case of the urban turnaround phenomenon. Except for some recent work (for example Buhr and Friedrich, eds., 1981; Nijkamp and Rietveld, eds., 1981), the bulk of economic urban theory supports the notion of comparative advantages of large cities versus smaller towns and rural areas. Such advantages were believed to become reinforced over time as a consequence of the established hierarchical patterns of innovation diffusion and the growing attractiveness of large urban areas as magnets for the tertiary and quaternary activities (for a survey of concepts see Hansen, 1976).

(c) *The nature of urban planning models*. The models that urban planners have mostly been working with, i.e. the land use-transportation models, are at best 'neutral' with respect to the growth versus decline issue. While focusing on the allocation of activities within an urban area they say little about how and why such activities originate within, and migrate into or out of the given area, and what likely consequences such moves may have for the areas of origin and destination.

(d) *Urban policy inertia*. Since urban theory has emphasized urban growth, and growth together with growth-related problems was actually experienced for decades, urban policies were (and, by and large, still are) designed so as to cope with expansion, rather with urban contraction. For example, throughout Europe (in the United Kingdom, Sweden, the Netherlands, Hungary, the German Democratic Republic, etc.) urbanization policies have aimed at deconcentration of population and economic activity away from the large urban agglomerations and at net resource relocation toward the suburban and less developed regions (see Eriplan, 1979).

In view of the observed stagnation and population decline in many large urban agglomerations, such policies may in fact be working against their basic purpose, i.e. spatially balanced development. The welfare problems encountered in the 'new' problem-areas (see Klaassen, 1981) may be no less acute and perhaps more important for national social and economic development than those in the 'old' problem-areas. (Indeed, it is sometimes feared that the former, i.e. large-urban areas may evolve from being 'engines of growth' into 'negative-growth poles' on the national scale.) These delays and contradictions between observed urban development and current urban policy are believed by some authors (Hall and Metcalf, 1978) to be a perennial situation.

Aside from the inertia factor, a reorientation of urban and regional policies has been hampered due to the economic stagnation prevailing during the late 1970s and early 1980s. In the past, jobs and capital that were attracted, owing to policy measures, toward the peripheral regions typically represented only a fraction of the net addition to the system as a whole. But in a situation of stagnation net resource flows towards the agglomeration core imply a decline occurring in the periphery, or token job relocations, as some firms may view the policy offer as a matter of temporary, rather than sustained benefit.

The interdependence between recent urban change and urban policies in the centrally planned economies would require a more extensive discussion; however, one of its aspects, particularly relevant in the present context, will be briefly touched upon here. It has been noted that deconcentration of population and economic activity away from large urban agglomerations is an exceptional, rather than a typical phenomenon in the planned economies. Processes of spatial concentration still prevail and are notably stronger than those identified in market economies at comparable urbanization and development levels. Reasons for such differences are typically sought in the intersectoral proportions; while emphasizing the expansion and retention of

the industrial base, and of large industrial employment, a centrally planned economy discourages rapid growth in the tertiary sector. Being relatively scarce, service activities tend to maintain a clustered pattern or to concentrate even further, which produces disincentives against residential deconcentration.

Urban and regional policies introduce another dimension into this interplay between spatial concentration and deconcentration forces in a planned economy. It is not generally the case that policies aim against, or actually do prevent, the decline of a city or group of cities. By aiding interregional deconcentration they have, over past decades, indirectly restrained the growth of the largest agglomerations to below their 'normal' rates. Explicit policies to limit the growth of large cities have had parallel effects. Taken together, these policy measures, supported by the absence of formal land-rent structures, have produced a 'flat' trajectory of spatial concentration with the resulting delayed and small-scale intraregional deconcentration, which still inevitably appears as the subsequent phase in the cycle of spatial growth and redistribution.

FACTORS OF URBAN CHANGE

The process of urban change has often been represented in terms of stages of urban transition, or city life-cycles (Klaassen and Paelinck, 1979; Hall and Hay, 1980; van den Berg et al., 1982). These concepts capture at least one crucial aspect of the process, i.e. the interdependence between intra-urban structure and city growth performance; or, alternatively, between urban forms and the evolution of regional and national settlement systems. The appeal of such approaches (also evident in the theory of demographic and mobility transition) is their ability to account for secular change and to place various regional and local experience within a broad spectrum of urban (or population) development.

One conclusion that can be derived from the urban transition concept is that a contraction of some of the present-day urban agglomerations does not imply a decline of the large city in general. However, in order to find out why so many cities in the highly urbanized countries moved to more advanced stages in their life-cycles during the 1970s, while relatively few have apparently entered the earlier stages, characterized by greater population dynamics, one must resort to more specific demographic, economic, and policy-related factors.

In the IIASA Urban Change Task an attempt was made to analyze the impacts of individual factors and only then to try to combine these effects in a scenario framework (Korcelli, 1980a).[2] The study was based on international cross-sectional data available from the previous tasks (see first section of this paper), as well as on several case studies carried out at both national and regional scales. The short-list of factors, or correlates of urban change, included:

(a) demographic factors: long-term decline of birth rates and the ageing of the population, changing family composition, declining interregional mobility;

(b) economic factors: competition and specialization in open economies, business and investment cycles, changing intersectoral proportions and locational preferences of industries, decreasing role of agglomeration economies;

(c) quality-of-life factors: widening variations in the efficiency of the internal organization of cities and urban agglomerations;

(d) policy factors: differential impacts of past policies (both sectoral and spatial) on individual cities and urban regions.

Figure 1 represents some linkages between population dynamics and urban change.

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[2] This approach was somewhat similar to the one followed by Bradbury et al. (1982).

Multistate demographic projections based on age-specific fertility, mortality, and migration patterns (Rogers, 1975) may be expressed in terms of evolving city-size distributions at a national level, or as evolving core-ring proportions within individual urban agglomerations. Inputs to such projections, with respect to migration flows at least, should be endogenous rather than identified with observed data. In other words, projections of inter-urban and intra-metropolitan migrations, based on economic, environmental, and age-composition considerations, pass through a filter of multistate population accounting to yield 'new' distributions between urban units[3]

A considerable proportion of the total effort in the Task focused on the demographic-economic interactions represented in the upper part of Figure 1 and on implications of various aspects of population development for urban structure and hierarchy.

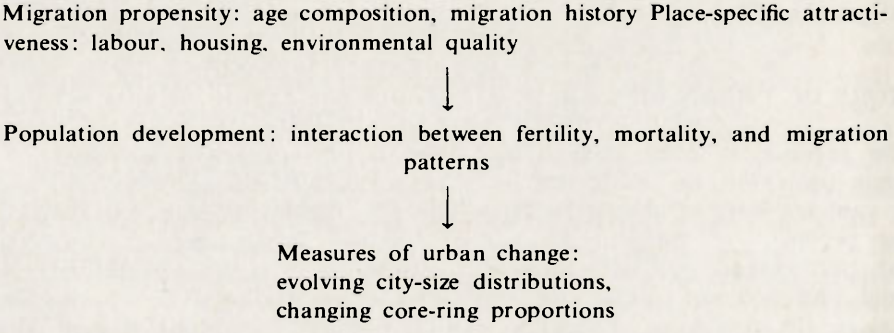

Fig. 1. A framework for studying inter-urban and intra-metropolitan migrations

Gordon and Ledent (1980) proposed a model of trade and migration interactions within a system of metropolitan areas which integrates elements of the Garin-Lowry model, the interregional input-output model, and the multiregional cohort-survival model. The empirical feasibility of implementing such a framework is still to be demonstrated. Subsequently, Ledent (1981) analyzed the consistency problem that arises from the joint and simultaneous consideration of four variables of the model: employment, population, the labour force participation rate, and the unemployment rate. In another paper Ledent (1980) developed a methodology for fitting Alonso's theory of movement to data on interregional migrations and hence accounted for the impacts on place-to-place migration flows of alternative origins and destinations. With respect to socioeconomic determinants of population movement, daVanzo (1980) applied concepts of location-specific capital and information costs to an interpretation of return and repeat migration.

Some related work attempted to extend the scope of the multistate demographic model so that relations between migration and commuting could be considered (Termote, 1980), and to build a hierarchical version of the model that includes both interregional and intraregional (city-suburb) flows (Frey, in Long and Frey, 1982). The viability of the latter approach has been demonstrated empirically for several large city-regions in the United States.

Finally, a few authors used multistate projections to investigate the impacts of alternative trajectories of population change on large-city development patterns. Korcelli (1981) tested several hypotheses pertaining to urban change in highly urbanized

[3] For a survey of economic models of migration see Andersson and Philipov (1980). Model age schedules of migration were developed by Rogers and Castro (1981).

countries, using data for 35 urban regions. These hypotheses were concerned with interrelations between population growth and urban size, the role of migration and natural increase as components of urban population change, overall spatial mobility, hierarchical migration, and the age distribution of migrants moving between, out of, and into the urban regions. Scherbov and Usbeck (1983) simulated six scenarios of population development (based on changing rates of fertility, mortality, and migration) to analyze alternative migration policies in the German Democratic Republic, and in particular the urban south of the country.

Among the various economic correlates of recent urban change in highly urbanized countries, the evolutions of scale and agglomeration economies perform a crucial role. Richardson (1978) suggests that information linkages are becoming relatively more important than physical input-output and infrastructural linkages, and hence the common association between agglomeration economies and urban size may have to be revised. With regard to scale economies, Leven (1978) demonstrated that these are not present in some specific productive sectors, and, perhaps more importantly, that they are restricted to a small and declining fraction of all goods and services as far as consumption is concerned.

Such findings throw more light on the changing functions of the large cities in the process of economic growth as seen from two interrelated perspectives: technological progress and interregional specialization (division of labour). Both of these asspects were examined by authors associated with the Urban Change Task; the former within the framework of the industry-product cycle (for an extensive review see Thomas, 1981) and the latter in connection with international trade theory (see Bergman and Ohlsson, 1981).

In traditional spatial representations of an industry-product cycle an industrial innovation and its implementation in the production process typically occur in the large city. This phase of industrial or product growth is followed by the phase of

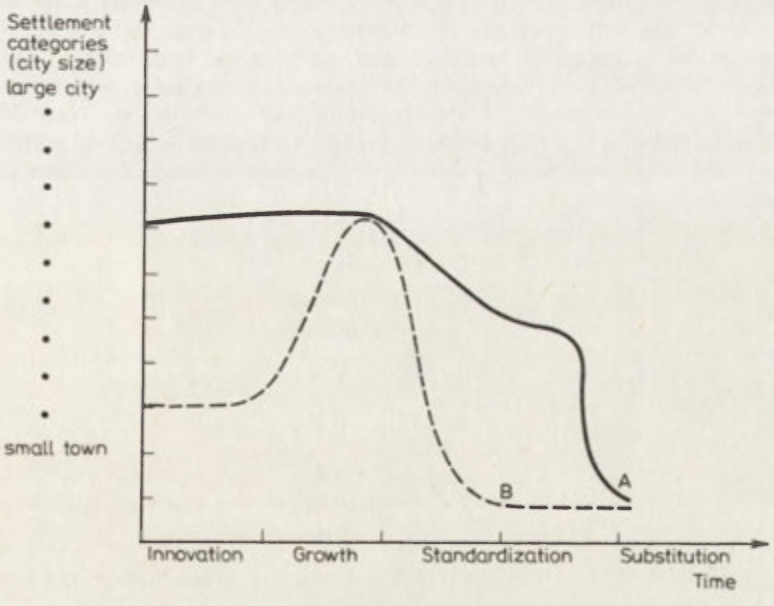

Fig. 2. Alternative spatial trajectories of an industry-product cycle: *A* – under the dominance of scale and agglomeration economies, *B* – under the dominance of information linkages and environmental factors in the location process

standardization (i.e. mass production), which, driven by the search for cheaper labour, energy, and land inputs, transfers the process to the city's hinterland or to smaller towns situated in other, typically peripheral regions. These latter places and regions eventually bear the costs associated with the last phase of the product's (or industry's) life cycle, i.e. its withdrawal and substitution by a new commodity. Such a process corresponds to trajectory *A* in Figure 2, and follows some classical precepts of urban economics that associate with the large city the function of incubator for innovations and new industries. After the initial development phase, such industries filter down to smaller cities and other regions (Thompson, 1968).[4]

As a consequence of improvements in communications and a range of negative externalities faced by the large cities, these innovative functions have become considerably impaired. New industry-product cycles may indeed now be more frequently generated in smaller urban locations (see some of the findings of Rees et al., 1983, who studied innovating firms in the Southwest of the United States). This shift is represented by trajectory *B* in Figure 2. The large city may still participate in the later stages of an industry-product cycle, but this may now be solely due to its functions as consumption market and labour market.

Concepts of economic structural change and interregional (international) trade theory offer an alternative perspective on the observed changes in location-specific functions. Shifts within or among sectors have spatial imprints owing to functional differentiation of the settlement system. Within large countries these shifts tend mainly to be on an interregional scale; the industrial restructuring of the 1970s has negatively affected in particular those large cities that were situated in older industrial regions, relying on stagnating and declining industries. In smaller countries that are highly open to world markets, the intersectoral shifts more often involve movement across international boundaries.

A case study in the Urban Change Task focussed on the industrial adjustment performance of Sweden's major urban agglomerations and has demonstrated how external trade relations were transmitted down to the urban economy scale. During the period 1965–1975, the urban regions of Göteborg and Malmö were generally unable to switch over their industrial employment to sectors with either high market growth rates or comparative advantages. The region of Stockholm, which had a favourable employment composition at the beginning of the period, recorded further structural improvements, but this was due mainly to a contraction of employment in those sectors that ranked low in both of the growth criteria mentioned (Ohlsson, 1979a, b, c).

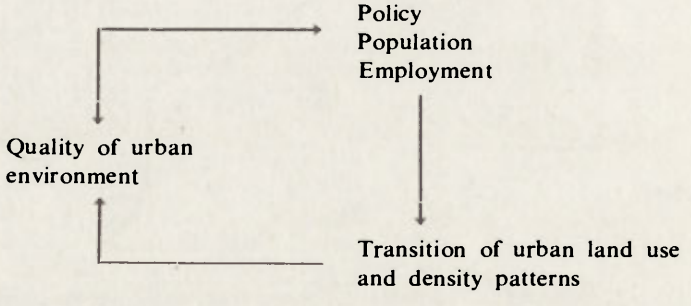

Fig. 3. Interdependence between intra-metropolitan structure, urban policy, and urban change

[4] But what is true at a national level may not necessarily apply on a broader comparative scale. Thus, Sheppard (1982) found no evidence linking city-size distributions with level of economic development.

A simple representation of the impact of quality-of-life and policy factors on the patterns of urbanization is given in Figure 3. Under sustained population increase at a national level and a prevalence of rural-urban migrations, the internal structural characteristics do not seem to constitute a major determinant of growth possibilities for an individual city (urban agglomeration). With declining overall urban population dynamics, however, such features may lead to greater differentiation of the rates of growth among otherwise comparable (in terms of size, employment composition, etc.) urban locations. As inter-urban migrations account for an increasing share of all interregional moves, the large cities tend to become polarized into categories of net gainers and losers. When environmental factors enter prominently into the migration-decision process, the quality of intra-urban spatial organization also becomes a major factor in such a polarization. City size may generally be considered as a negative correlate of the quality of urban environment, but the latter may still vary substantially (and so it is perceived) when city size is held constant. Specific quality criteria include, in addition to 'traditional' environmental criteria such as air and water quality, a number of elements of the social and technological environment: the cost of intra-urban transportation (ease of spatial interaction), the segmentation of housing markets, the availability of specialized quaternary functions, protection against crime, etc. These features are rather strongly responsive to urban policy efforts, for example in the field of transit and urban renewal, so that policies are listed in Figure 3 among the primary determinants of quality of the urban environment.

The interdependence of spatial interaction and urban change was discussed in several contributions to the Urban Change Task, in particular the papers by Sheppard (1980) and Korcelli (1981). Nijkamp (1980) analyzed the other linkage mentioned by focusing on the effects of past and present policies. He concluded with a plea for integrated urban quality plans based on urban impact analysis which allows for an evaluation of alternative development plans and projects using welfare profiles. The methodology of urban systems analysis and problems found at the interface between urban planning and urban modeling were also discussed by Shmulyian (1980) and, more extensively, in the volume of papers originating from the Workship on Urban Systems Modeling (held in Moscow) within the framework of the Task (Korcelli, ed., 1983). As regards empirical analysis based on urban models, work focused on the extension and simulation of the modeling framework developed for the Dortmund region of the Federal Republic of Germany, a system including, *inter alia*, housing, transportation, household structure, and migration components (Wegener, 1982; Schönebeck, 1982).

FINAL REMARKS

This brief survey demonstrates the rather broad spectrum of interests represented by individual contributions to the Urban Change Task. Therefore, a few of their common characteristics deserve mentioning here. Firstly, the demographic component of urban change and demoeconomic models of migration and urban structure were generally emphasized. Such approaches represented, at least initially, relatively underdeveloped areas of urban analysis. Secondly, macro approaches represented the mainstream in the study. This was, in part, a consequence of its international scope and the variety of social and economic conditions that were examined. Thirdly, although the overall objectives were couched in policy terms, the Task did not attempt to study urban policies directly. Urban policy improvements were seen as being dependent upon conceptual developments and empirical generalizations regarding urban patterns, rather than institutional dimensions of policy definition and reformulation.

REFERENCES

Andersson A. E., Philipov D., 1980, *Economic models of migration.* Paper presented at the Conference on Theoretical and Practical Aspects of Regional Development Modeling, IIASA, Laxenburg, Austria, March 18–21, 1980.

Berg van den L., Drewett R., Klaassen L. H., Rossi A., Vijverberg C. H. T., 1982, *Urban Europe: A study of growth and decline*, Pergamon Press, Oxford – New York.

Bergman L., Ohlsson L., 1981, *Changes in comparative advantages and paths of structural adjustments and growth in Sweden, 1975–2000.* RR-81-13, IIASA, Laxenburg, Austria.

Berry B. J. L., 1973, *Growth centers in the American urban systems*, vols. 1–2, Ballinger, Cambridge, Mass.

Bradbury K. S., Downs A., Small K. A., 1982, *Urban decline and the future of American cities*, The Brookings Institution, Washington, D.C.

Buhr W., Friedrich P., eds., 1981, *Regional development under stagnation*, Nomos Verlagsgesellschaft, Baden – Baden.

Eriplan: European Research Institute for Urban and Regional Planning, 1979, *Location of economic activities, final report*, Brussels.

Gordon P., 1978, *Deconcentration without a clean break.* RM-78-39, IIASA, Laxenburg, Austria.

Goron P., Ledent J., 1980, Modeling the dynamics of a system of metropolitan areas: A demoeconomic approach, *Environment and Planning A*, 10, 125–133.

Hall P., et al., 1973, *The containment of urban England*, vols. 1–2, George Allen and Unwin, London.

Hall P., Hansen N., Swain H., 1975, *Status and future directions of the comparative urban region study: A summary of workshop conclusions.* RM-75-59, IIASA, Laxenburg, Austria.

Hall P., Hay D., 1980, *Growth centers in the European urban system*, Heinemann Educational Books, London.

Hall P., Metcalf D., 1978, The declining metropolis: Patterns, problems and policies in Britain and mainland Europe, in: C. L. Leven, ed., *The mature metropolis*, D. C. Heath, Lexington, Mass.

Hansen N. M., 1976, *Systems approaches to human settlement.* RM-76-36, IIASA, Laxenburg, Austria.

Hansen N. M., ed., 1978, Human settlement systems. International perspective on structure, change and public policy, Ballinger, Cambridge, Mass.

Kawashima T., Korcelli P., eds., 1982, *Human settlement systems: Spatial patterns and trends.* CP-82-S1, IIASA, Laxenburg, Austria.

Klaassen L. H., 1981, *Regional dynamics*, Netherlands Economic Institute, Series: Foundations of Empirical Economic Research, 1.

Klaassen L. H., Paelinck J. H. P., 1979, The future of large towns, *Environment and Planning A*, 11, 1095–1104.

Korcelli P., 1980a, *Urban change: An overview of research and planning issues.* WP-80-30, IIASA, Laxenburg, Austria.

Korcelli P., 1980b, *Urban change and spatial interaction.* WP-80-161, IIASA, Laxenburg, Austria.

Korcelli P., 1981, *Migration and urban change.* WP-81-140, IIASA, Laxenburg, Austria.

Korcelli P., ed., 1983, *Urban systems modeling*, RR-83-21, IIASA, Laxenburg, Austria, Reprinted from *Sistemi Urbani*, 4, 1982.

Korcelli P., 1983, *The turnaround of urbanization in developed countries.* Paper prepared for Expert Group on Population Distribution, Migration and Development, International Conference on Population, 1984, Hammamet, Tunesia, 21–25 March, 1983.

Ledent J., 1980, *Calibrating Alonso's general theory of movement: The case of interprovincial migration flows in Canada.* WP-80-41, IIASA, Laxenburg, Austria.

Ledent J., 1981, *Statistical analysis of regional growth: Consistent modeling of employment,*

population, labor force participation, and unemployment. WP-81-128, IIASA, Laxenburg, Austria.

Leven C. L., 1978, Growth and nongrowth in metropolitan areas and the emergence of polycentric metropolitan form, *Papers of the Regional Science Association*, 51, 101–112.

Long L. H., Frey W. H., 1982, *Migration and settlement: 14. United States.* RR-82-15, IIASA, Laxenburg, Austria.

Nijkamp P., 1980, *Perspectives for urban analysis and policies.* CP-80-31, IIASA, Laxenburg, Austria.

Nijkamp P., Rietveld P., eds., 1981, *Cities in transition. Problems and policies*, Sijthoff and Noordhoff, Alphen an den Rijn.

Ohlsson L., 1979a, *Components of urban industrial employment change in a small open economy.* WP-79-32, IIASA, Laxenburg, Austria.

Ohlsson L., 1979b, *Tracing regional patterns of industrial specialization trends in Sweden.* WP-79-33, IIASA, Laxenburg, Austria.

Ohlsson L., 1979c, A conceptual framework for an assessment of Swedish regional policy. WP-79-34, IIASA, Laxenburg, Austria.

Richardson H. W., 1978, 'Basic' economic activities in metropolis, in: C. L. Leven, ed., *The mature metropolis*, D. C. Heath, Lexington, Mass.

Rees J., et al., 1983, *Technology and regional development in the American context.* CP-83-39, IIASA, Laxenburg, Austria.

Rogers A., 1975, *Introduction to multiregional mathematical demography*, J. Wiley, New York.

Rogers A., Castro L. J., 1981, *Model migration schedules.* RR-81-30, IIASA, Laxenburg, Austria.

Rogers A., Willekens F., 1984, *Migration and settlement: A multiregional comparative study*, J. Wiley, New York.

Scherbov S., Usbeck U., 1983, *Simulation of multiregional population change: An application to the German Democratic Republic.* WP-83-6, IIASA, Laxenburg, Austria.

Schönebeck C., 1982, *Sectoral change and interregional mobility: A simulation model of regional demoeconomic development in North Rhine-Westphalia.* CP-82-10, IIASA, Laxenburg, Austria.

Sheppard E., 1980, *Spatial interaction in dynamic urban systems.* WP-80-103, IIASA, Laxenburg, Austria.

Sheppard E., 1982, *City-size distribution and spatial economic change*, WP-82-31, IIASA, Laxenburg, Austria.

Shmulyian B., 1980, *Spatial modeling of urban systems: An entropy approach.* CP-80-13, IIASA, Laxenburg, Austria.

Termote M., 1980, *Migration and commuting. A theoretical framework.* WP-80-69, IIASA, Laxenburg, Austria.

Thomas M., 1981, *Growth and change in innovative manufacturing industries and firms.* CP-81-5, IIASA, Laxenburg, Austria.

Thompson W. R., 1968, Internal and external factors in the development of urban economies, in: *Issues in urban economics*, H. S. Perloff, L. Wingo, eds., Johns Hopkins University Press, Baltimore, Maryland.

United Nations, 1980, *Patterns of urban and rural population growth*, Population Studies, 68, Department of International Economic and Social Affairs, New York.

daVanzo J., 1980, *Repeat migration in the United States: Who moves back and who moves on?* WP-80-158, IIASA, Laxenburg, Austria.

Vining D., Kontuly T., 1978, Population dispersal from major metropolitan regions: An international comparison, *International Regional Science Review*, 3, 49–73.

Wegener M., 1982, *Aspects of urban decline: Experiments with a multilevel economic-demographic model for the Dortmund Region.* WP-82-17, IIASA, Laxenburg, Austria.

Willekens F., Rogers A., 1978, *Spatial population analysis: methods and computer programs.* RR-78-18, IIASA, Laxenburg, Austria.

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THE DYNAMICS OF INDUSTRIAL CHANGE IN URBAN AREAS: A REVIEW OF RECENT RESEARCH IN THE UK, 1978–1983

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Important changes are taking place in the industrial geography of the United Kingdom: changes which began in the 1960s but which accelerated considerably in the 1970s. Between 1971 and 1981, for example, manufacturing employment declined by 25 per cent while service employment increased by 15 per cent with important consequences for urban and regional change. Loss of employment in the manufacturing sector has been accompanied by a spatial decentralization of manufacturing employment from the conurbations to the non-metropolitan and rural areas (Fothergill and Gudgin, 1982). At the regional level employment growth is focused in those areas which contain no major industrial agglomeration – primarily the East Midlands, East Anglia and South West.

These changes occur at a time when research in industrial geography itself is at a crossroads. The debate over the usefulness of neo-classical and behavioural theories as opposed to Marxist approaches to understanding industrial change has taken on a fresh urgency as de-industrialisation, recession and the effects of monetarist economic policies sweep through the nation. This debate has created a great deal of uncertainty for the adoption of research methodologies particularly since British industrial geography, as Wood (1982) has noted, has been pre-occupied with serving government policy needs. Sayer (1982a), in particular, has argued for a more critical approach to the nature of the links between methodology and policy, castigating an eclecticism in industrial geography which has tended to combine different philosophical approaches 'and which serves to confuse the debate further by burying the distinctions between doctrines'.

In what follows, a brief attempt is made to review in outline the broad features of the methodology – policy debate, particularly as it impinges upon research into the dynamics of manufacturing change in urban areas. Since the bulk of the more empirical research on industrial decline and inner city unemployment up to the late 1970s has already been comprehensively reviewed by Thrift (1979), Kennett (1980) and Elias and Keogh (1982) among others, we have restricted this review to literature drawn chiefly from the 1978–1983 period. The first part of the paper presents a brief outline of the major features of UK urban industrial change as they are currently perceived and critically reviews those techniques commonly used in industrial geography to disaggregate urban employment change into its component elements. The second part of the paper then focuses upon the three main theoretical approaches applied to the explanation of urban industrial change and returns to outline current debates on methodology and policy.

URBAN AND REGIONAL TRENDS IN THE UNITED KINGDOM: THE BACKGROUND TO RECENT EVENTS

Metropolitan areas in Britain, as in the USA and other western capitalist nations, are currently losing both population and employment (Sterlieb and Hughes, 1975; Keeble, 1976; Kirwan, 1980). This decentralisation from the cores of the 19th century industrial cities is by no means a new phenomenon. The same issue drew the attention of 19th century commentators (Weber, 1889) just as it continued to do throughout the 20th century (Thompson 1933; Woodbury 1953; Kitegawa and Bogue 1955; Hall et al., 1973). What has attracted attention, however, is the scale of current decentralisation. In the late 1970s employment decentralisation was investigated by Warnes (1977), Kennett and Spence (1979), Kennett (1980), and Fothergill and Gudgin (1982), while Kennett and Hall (1981) provide a summary of post-war trends illustrating the acceleration of the process during the 1960s and 1970s. While, during the 1950s, Britain's urban cores marginally increased their employment, a relative shift of employment to the outer rings became a feature of change during the 1960s. Danson et al. (1980) in a study of the inner city problem from 1952–1976 compared the economic performance of the inner and outer areas of the six conurbations and showed that the period 1968–1973 led to an even greater acceleration in the rate of inner city decline and with growing rates of job loss from inner city areas in the mid 1970s. From 1973 onwards a marginal rate of loss was also being experienced in the outer metropolitan areas (Table 1).

TABLE 1. Inner and outer city employment change, 1952–1976 (% change per annum)

	1952–1963	1963–1968	1968–1973	1973–1976	Total employment change
Inner cities	+0.97	−0.92	−2.60	−3.15	−1,159,756
Outer cities	+1,88	+0.76	+1.66	−0.44	+556,569

Source: Lever, 1981.

Fothergill and Gudgin (1982), a in a sub-regional analysis of employment change over the 1959–1975 period identified the strong urban-rural contrasts which were occuring in total employment change. They also emphasised what they saw as the slowness with which these new trends were being picked up, criticising the

> 'sluggishness of geographers, economists and planners in identifying what is going on. Many researchers are only now beginning to recognise that the shift from urban to rural areas is the major trend in industrial location in Britain, even though the shift has been taking place for at least twenty years. It is a tribute to the strength of prevailing ideologies and perceptions — in particular, the 'north versus south' view of Britain — that the urban — rural shift has taken so long to gain the prominence it deserves.' (p. 24).

Fothergill and Gudgin's sub-regional analyses indicated that the larger and more industrial a settlement was, the poorer was its prospect for employment growth. Their research served to confirm that such net manufacturing employment growth as there was in the period took place primarily in Britain's county towns and rural areas (Table 2). They also emphasized the concentration of employment decline in those regions containing major conurbations as compared with the relative growth experienced in East Anglia, the East Midlands and the South West which contain no major industrial agglomerations. The more recent work of Champion et al. (1982) supports this analysis of employment trends and, on the basis of the recently

TABLE 2. Employment change by type of area, 1959–1975

	Total employment change %	Manufacturing employment change %
London	−11.4	−37.8
Conurbations	−4.7	−15.9
Free standing cities	+12.5	+4.8
Industrial towns	+22.0	+16.3
County towns	+18.0	+28.8
Rural areas	+14.3	+77.2
Great Britain	+5.1	−5.2

Source: Fothergill and Gudgin, 1982.

released 1981 Census of Employment, it is now possible to see how, at regional level in the period 1971–1981, the three Southern regions are the only ones to experience employment growth, whilst, with the onset of the 1979 recession, the West Midlands and the North West region have suffered the most serious relative losses (Table 3).

TABLE 3a. Employees in employment, 1971–1981 – Great Britain

	1971	1978	1981	Percentage Change 1971–1978	1978–1981	1971–1981
Manufacturing industry	7,886	7,117	5,924	−9.8	−16.8	−24.9
Service industry	11,358	12,858	13,091	+13.2	+1.8	+15.3
All industries	21,648	22,154	21,148	+2.8	−5.0	−2.3

Source: Department of Employment Gazette: August, 1973; March 1981; February, 1983.

From an analysis undertaken at the *county level*, Champion et al. (1982) showed that the country's fastest growing areas tend to be those which are most distant from the conurbations and the traditional industrial and mining areas, but they also suggest that

> 'Labour force growth in these (prosperous) areas has taken place despite a universal decline in male participation rates and has been promoted chiefly by the increase in female activity rates and through the effects of net inmigration.' (p. 31).

Until more detailed evidence from the 1981 Censuses of Population and of Employment becomes available, comparable national data on conurbation employment change for the late 1970s remain limited. Reviewing the evidence for 1951–1976, Gudgin et al. (1982) do, however, demonstrate that the inner city areas, with the exception of Tyneside and Birmingham, lost between a fifth and a quarter of their total employment and confirm that employment was rising in small towns and rural areas, in free-standing towns and outer cities (Table 4).

Since suitable disaggregated data at sub-regional or urban level have not been available, much of the empirical research analysing the impact of employment change in the more recent past has been forced to make spatial assessments at the regional level. In particular, whilst analysing the impact of the recession on the regions using

redundancy data, both Townsend (1982) and Martin (1982) have confirmed, using shift-share analysis, that high rates of manufacturing job loss in the older industrial regions cannot be explained simply by factors related to industrial composition. The structural or compositional explanation has also had little power in interpreting employment decline in the inner city areas. Danson et al. (1980) used shift-share

Table 3b. Employees in employment: regional change, 1971–1981

	1971 000's	1978 000's	1981 000's	1971–78 %	1978–81 %	1971–81 %
North	1,207	1,242	1,127	+2.9	−9.3	−6.6
Yorkshire & Humberside	1,918	1,987	1,829	+3.6	−8.0	−4.6
East Midlands	1,411	1,535	1,458	+8.8	−5.0	+3.3
East Anglia	607	683	676	+12.5	−1.0	+11.4
South East	7,247	7,292	7,168	+0.6	−1.7	−1.1
South West	1,429	1,566	1,525	+9.6	−2.6	+6.7
West Midlands	2,207	2,215	1,998	+0.4	−9.8	−9.5
North West	2,657	2,651	2,465	−0.2	−7.0	−7.2
Wales	962	1,016	932	+5.6	−8.3	−3.1
Scotland	2,003	2,067	1,970	+3.2	−4.7	−1.6
Great Britain	21,648	22,154	21,148	+2.8	−5.0	−2.3
Northern Ireland	473	503	n.a.	+6.3	n.a.	n.a.
United Kingdom	22,121	22,657	n.a.	+2.9	n.a.	n.a.

Source: Adapted from Champion et al., 1982. 1981 data is based on 1981 Census of Employment data published in *Department of Employment Gazette*, February, 1983. This excludes data for Northern Ireland which is not yet available

Table 4a. Population, employment and commuting in inner cities, free-standing cities and smaller towns, 1951–1976[a]

	Inner cities					Outer cities				
	1951 base 000's	1951	1961	1971	1976	1951 base 000's	1951	1961	1971	1976
		Indices, 1951 = 100					Indices, 1951 = 100			
Population of working age[b]	4,982	100	95	79	72	6,511	100	94	90	68
Employment	4,826	100	101	86	79	3,597	100	107	109	108
Net inward commuting	997	100	123	126	128	−765	100	97	82	71
Employment minus net commuting	3,829	100	96	76	67	4,362	100	105	107	101
	Free-standing cities					Small towns and rural areas				
	Indices, 1951 = 100					Indices, 1951 = 100				
Population of working age[b]	3,198	100	98	97	98	16,555	100	108	117	120
Employment	2,536	100	106	103	109	11,176	100	111	116	122
Net inward commuting	189	100	173	206	224	−421	100	181	243	274
Employment minus net commuting	2,347	100	100	97	100	11,597	100	118	120	128

Sources: Census of Population 1951, 1961, 1971; Department of Employment unpublished figures for 1971–1976.

[a] Figures other than the base year figures are indices based on 1951 = 100.

[b] Males aged 15–64, Females aged 15–59. After Gudgin et al., 1982.

Table 4b. Changes in employment, population and commuting in the inner areas of each of the six main conurbations of Great Britain, 1961–1976, in %

	London	Birmingham	Manchester	Liverpool	Tyneside	Clydeside
Population of working age	−28	−19	−32	−30	−33	−30
Employment	−20	−16	−26	−25	−7	−21
Net inward commuting	4	125	50	85	125	351
Employment minus commuting	−32	−29	−38	−40	−35	−34

Sources: Census of Population and Department of Employment unpublished figures. After Gudgin et al., 1982.

techniques and together with Gudgin et al. (1982), concluded that the industrial composition of each of the inner city areas has not been specially unfavourable to employment growth suggesting that reasons for the strong decline in inner city employment lie in performance rather than structural variables.

Together with shift-share, geographers have used the components of change analyses as a means of disaggregating employment trends within the conurbations in the search for process explanations. Establishment-based data banks have been set up to examine the components of employment change – births, deaths, transfers and *in situ* employment changes at plant or firm level. These have been used to isolate the role of new firm formation, industrial movement and plant closures in producing employment decline. Establishment data banks in the UK are primarily based on metropolitan areas (although, more recently, Mason (1981) has created one for South Hampshire). Research utilizing plant data banks has been conducted for individual conurbations by Lloyd (1979), Dicken and Lloyd (1978) and Lloyd and Mason (1979) for Manchester and Merseyside; by Gudgin and Fothergill (1979) and Gudgin (1978) for the East Midlands; and by Dennis (1978) and Gripaios (1977) for London. Components of change approaches have been particularly important in pointing to differences in the process of inner city industrial change between cities. However, as Firn and Swales (1978) note in their study of the Central Clydeside and West Midlands conurbations during the 1963–1972 period, the wide range of definitions, sectors, sources and time periods used by different studies has often meant that sophisticated comparative analysis has been impossible.

EXPLAINING THE DYNAMICS OF URBAN AND REGIONAL CHANGE

A great deal of debate currently surrounds issues of explanation in industrial as in all branches of human geography. In particular, empiricist and positivist approaches have increasingly been subject to challenge by humanistic and structuralist approaches (Johnston, 1983). Within industrial geography itself, explanations for locational trends were, until the mid-1970s, predominantly based on neo-classical or systems theories.

NEO-CLASSICAL APPROACHES

Neo-classical theories founded originally on Weberian transport cost analysis (Weber, 1909) were developed through the attention given to those basic *locational factors* which served to influence site choices: industrial linkages, the minimisation of transportation costs, relative land prices, agglomeration economies, labour costs. The inadequacies of these approaches were roundly criticised throughout the 1970s by two groups. The first sought to replace static equilibrium neo-classical ideas by

dynamic systems analyses focused on a more sophisticated view of the form. In the UK, this was commonly identified with those who adopted what became known as the 'geography of enterprise' approach (Keeble and McDermott, 1978; Hamilton, 1978; Wood, 1978; Watts, 1978; Goddard and Smith 1978; Dicken and Lloyd, 1978). A second group rejected both neo-classical and behavioural approaches in favour of a Marxist approach which, by placing industrial location in the context of the capitalist mode of production, did not support the development of a separate, autonomous body of theory concerned with industrial location *per se* (Massey, 1977; Scott, 1982; Storper, 1981; Miles, 1982).

Both groups criticised neo-classical theories for their high degree of abstraction from the real world and for their simplistic assumptions both about the nature of production and about business organizations in capitalist societies. Theories based on the concept of perfect competition and upon single independent plants making locational decisions primarily through a drive to minimise transport costs clearly could no longer provide adequate explanations of manufacturing location in economies dominated by large multi-plant, multi-locational enterprises under conditions where the costs of communications and transport links are no longer as crucial as they once were (Scott, 1982).

The urban dimension of Weberian location theory in the post-war period focused upon further investigation of agglomeration economies (Isard, 1956). Scale economies at the firm or sector level and external economies at the urban level (access to a common labour market, population and consumer markets, personal contacts) were investigated as major determinants of urbanisation processes. Constraints on the operation of agglomeration economies were invoked to explain urban industrial decline as competition for land and labour produced high rents, city living generated high wage rates, frictions in the urban labour market produced labour shortages and ageing capital led to strains on infrastructure provision.

Today, many researchers still see the root of the decentralization process in the breakdown of those traditional advantages associated with urban core locations with locational shifts determined by the balance of external economies and diseconomies (Richardson, 1971). Typically, the decentralization process is now attributed to the arrival of agglomeration diseconomies in large industrial centres and the availability of economies of deglomeration in those emerging unindustrialized areas lying outside the conurbations. Reduced accessibility, traffic congestion, inadequate premises and sites, land and labour shortages and planning restrictions are often advanced as favoured reasons for industrial decentralization over the last decade (Keeble, 1976; Dennis, 1978; Lloyd and Mason, 1979). By contrast, non-metropolitan areas outside conurbations offer lower cost space for green field industrial expansion and an 'amenity rich' pleasant environment. Fothergill and Gudgin (1982) are among the most ardent advocates of the approach which focuses upon one particular aspect of agglomeration diseconomies:

> 'The main causes of decline in large cities seems to be that too many firms find themselves in constrained locations, operating with inadequate premises and sites, hemmed in by existing urban development, and with no room for expansion.' (p. 184)

This explanation of employment decline is supported by research such as that of McIntosh and Keddie (1979) who surveyed directors and senior company managers in a sample of 501 manufacturing, distribution and office establishments in conurbations. They concluded that the most important factors in inner city re-location were those related to employers' premises, especially those limiting the possibility of expansion and undertaking new activities. This study also found that the quality of the environment and the problems of traffic congestion appeared to give inner city employers particular cause for concern.

One of the difficulties with this type of focus on agglomeration diseconomies, however, is the way in which this leads on to form a basis for policy prescriptions in the drive to arrest urban decline. For the most part, these set as their prime objective a need to *slow the urban-rural shift*, usually seeking to do so by *raising rates of new firm formation* (or slowing closures) in declining areas by means of those policy initiatives dedicated to making the inner city an *attractive industrial environment* once again. Actual policies for revival in Britain are commonly concerned with improving the stock of industrial *premises* and offering *rent and rate subsidies* to new and existing firms.

However, an explanation of urban employment decline based on locational constraints provides only a partial explanation for the urban-rural manufacturing shift and is far too simplistic an explanation of a complex phenomenon. Fothergill and Gudgin fail, for example, to penetrate those deeper causes of employment change which may be conflated with locational constraints. Changes in corporate organization and the impact of new product and process technologies together with issues of wages and labour organization are largely ignored, through the primarily 'locational' fix of the geographer. In more general terms, both Fothergill and Gudgin (1982) and McIntosh and Keddie (1979) can also be criticised for providing explanations of urban industrial change which are dominated by generalisations arising from observations under conditions where the observations themselves are assumed to be unproblematic (Sayer, 1982a, b).

BEHAVIOURAL APPROACHES

Systems approaches adopted by geographers in the 1960s as an aid to the understanding of urban and regional locational shifts received their impetus from two sources. On the one hand the adoption of theories of 'goal seeking open systems' supplemented the more mechanistic post-war theories of operations research to become the disciplinary core of the newly emerging science of business management. On the other, largely flowing from the work of Berry (1964) and Pred (1967), regional and city systems were themselves conceptualised as 'elements standing in interaction' with their 'external' environments in a variety of studies which sought to explore the processes of change in a real world context. Stemming from the first of these sources industrial location studies in the UK have been increasingly cast in what Keeble and McDermott (1978a) characterise as the *geography of enterprise* approach. This examines firm development and organisational structure and investigates the spatial implications of observed organisational processes seen through such corporate attributes as ownership and size in addition to product markets. For the most part systems approaches are cast in a mould which examines organizational behaviour and as the more self-conscious application of systems theories has declined, has become more appropriately identified with an emerging school adopting behavioral approaches to industrial geography (Krumme, 1969; Steed 1971). The systems heritage remains strong, however, in a continuing concern with the firms internal as opposed to external environment and with general goal seeking behaviour.

Studies examining corporations and their control status utilizing behavioural theories emerged in the late 1970s as the components of change approach was adapted in order to establish the organizational characteristics of establishments (Lloyd and Dicken, 1982, 1983). In particular, the corporate identity of firms (foreign, domestically controlled) and the headquarters location of parent firms have been used to examine the process of foreign manufacturing employment change and the role of mergers and acquisitions. In the North West region, for example, Dicken and Lloyd (1978) were able to examine the major differences existing between Inner Manchester and Inner Merseyside identifying the latter as a branch plant economy with 70.4 per cent

of manual manufacturing employment externally controlled in 1975. By contrast, Inner City Manchester saw 38 per cent of its manual jobs externally controlled and with local indigenous enterprises playing a stronger role. Adaptation of the components of change approach in this way led inevitably to research focused on the desirability of external ownership in terms of employment stability, quality and the impact of external control of linkages in the local economy. Watts (1981) provides an authoritative review of the structure and problems of branch plant economies and asserts that 'the externally-owned economy will tend to be deficient in white collar jobs and that externally-owned plants tend to rely less on the local region for business services.'

From a concern with the existence and relative benefits of external and local control, research has moved on to examine the role of large corporations in urban and regional economies. Townsend (1982) in particular has examined the pattern of UK redundancies from this perspective, whilst Lloyd and Reeve (1982) have drawn attention to the high degree of manufacturing employment which tends to be controlled by a small number of large corporations in regions like the North West – pointing out that the corporate decisions of the 13 companies which directly employed more than 25 per cent of the North West workforce in 1975 are clearly crucial to the future of that region. Subsequent research has concentrated on analysing corporate decision-making and financial strategy and its impact on regional employment change.

Another line of research which follows logically from a situation in which external control is often seen as being disadvantageous to particular economies is that which seeks to identify the properties of the now favoured locally-controlled or indigenous firm. One such study was that of Lloyd and Dicken (1982) which examined 460 small firms in the Manchester and Merseyside conurbations. This was sponsored by a government anxious to assess the contribution that small firms can make to job generation in depressed inner cities. The survey concentrated on examining the nature of entrepreneurship in local firms and their degree of attachment to the local market and assessing the ways in which these feed back to influence capital and loan finance. Criticising the view that locational constraints are primarily responsible for the observed shift in industrial activity away from older urban areas, this study concludes

> 'what seems to be lacking in the primarily environmental view and in those policies which stem from it is a clear picture of the *real* firm typical of the urban area and of the complex implications of environmental factors with all those other 'external' issues which condition the success or otherwise of the business venture.'

A concept which has its origins in the literature on the growth and behaviour of the firms is the product life cycle theory. This notion examines firm behaviour as it is associated with the incubation and development to maturity of a particular product line. It is also closely associated with the spatial theories of the diffusion of innovations. In the particularly urban context, product life cycle theory underpins many of the more simplistic notions which see urban enterprises as originating in the 'seedbed' of the specialised industrial quarter but subsequently decentralising to suburban sites as the firm and product mature and as capital is substituted for labour in the outward movement to the greenfield mechanised suburban plant (Norton and Rees, 1979). The cruder forms of product life cycle theory thus imply that it is the process of firm growth and the drive toward product maturity that underpins the decentralisation process. In particular, Scott (1982) has been critical of such approaches since he suggests they fail adequately to theorise the motivating forces of technical change within corporate organisations.

Again, a particular conceptual approach to analysis can be seen to flow directly through to policy conclusions and in a number of British cases to operational

policy initiatives. Hall (1982a) has, for example, played a major role in the development of enterprise zone policy in the UK which has become a major plank in current urban economic policy. Enterprise zones were to

> 'encourage enterprise, in the Schumpeterian sense of that word, innovation. Starting perhaps with relatively low-level developments involving little technical skill, they would progressively sophisticate to become independent centres of technical innovation.' (Hall, 1982a).

In this way Hall hoped to create the environment of Hong Kong in inner Liverpool or inner London.

Again linked to behaviourist frameworks local policy initiatives have emerged which proceed from the basis that the inner city problem can be cured by combatting the drive to external control of industry in cities. It is argued that large firm dominance reduces entrepreneurial talent and restricts the development of locally-owned new firms. Policy responses thus focus on developing the indigenous potential again by offering a myriad of subsidies to small firms channelled via local government and private agencies.

Policies such as these rest however, on assumptions that external and local control are sufficiently developed categories with which to understand manufacturing change and organisation. Behavioural theories, it must be recognised, only provide partial insights into the processes producing the pattern of change in industrial areas because the agents of change which drive firm organisation are still dimly perceived. Gough et al. (1979) identify two main types of weakness in the analysis. Too much autonomy is granted to the firm itself with no clear analysis of how far firm structures relate to the large units of the economy, national, sectoral or local.

MARXIST APPROACHES

The distinctive feature of *Marxist* approaches to industrial geography lies in the fact that those outcomes identified as locational shifts in industry and employment are identified not discretely as an area of study in their own right but as part and parcel of broader social processes deriving from the drive to accumulate capital and of the social relations which attach to it in the historical process of change within the capitalist mode of production. Against such a framework, the Community Development Project (CDP, 1977) developed the model of the 'making and breaking' of industrial areas shown in Table 5. CDP saw the decentralisation process as part of capitalism's normal development and arguing against simplistic notions that unemployment and urban deprivation could be cured by self-help, the CDP put forward the view that

> 'the explanation of persisting poverty, unemployment and all other features of 'deprivation' in our areas is to be found in the nature of capitalist economic development itself; its need constantly to restructure, to find new outlets and locations and to keep down its labour costs throughout a variety of changing market and competitive circumstances. The development, stability and prosperity of expanding industries and areas implies and depends on the progressive under-development of other areas.'

Within industrial geography itself, Marxist approaches have generated theoretically informed empirical studies examining the process of industrial change in different sectors, industries and local economies. In seeking to understand locational patterns such as decentralization, these approaches have focused attention on the way in which patterns of spatial inequality are reproduced as a result of changes in the requirements of the production process itself. The literature appears to contain three main elements: a focus on the process of industrial restructuring in industries and sectors; a concern to analyse the development within the labour process and draw the

Table 5. The making and breaking of industrial areas – a model

The first chapter divides the history of the five areas into three broad phases – growth, maturity and decline. To some extent this division is arbitrary and inevitably it over-simplifies the complex historical reality of industrial and social change. Nevertheless it does help to explain the processes underlying these changes, in particular the interaction of industrial and population change over time. Each area is specific in its details, the timing of events and phases vary, and external factors, like land values or state intervention, play different roles in each case. No model can do justice to the complexity and variety of the real situations, but it can point up the important and far-reaching implications of industrial development and decline for the lives of people and their communities. To this end we set out here a simple version, an ideal-typical model of what happens in the creation and decline of area like Batley, Benwell, Canning Town, North Shields and Saltley.

	Industry	*Community*
Growth	Firms locate in the area on green field sites. (The capital to set this up comes from profits made elsewhere, therefore contributing to the decline of some older working class area) The industry expands and employment grows. All the available land is filled up.	A new population moves into the area. The new housing is partly financed by investors with a stake also in the new industry and so in ensuring that there is an adequate supply of labour available locally. Many of the new population have come from other areas of the country, where industry/agriculture is in decline.
Maturity	Local firms remain profitable. Few firms leave the area and new growth slows. (Meanwhile, a new generation of industrial investment is being laid down elsewhere on green fields, partly financed by the profits from local industry).	Employment remains at a fairly stable level. The local population is well-established and settled. There is little turnover of population, as local employment and housing opportunities are still relatively good.
Decline	Local industry begins to decline. There is little new investment in existing plant. Employment is cut. The traditional manufacturing sector continues to decline, providing fewer and fewer jobs – especially skilled jobs. Several firms close altogether, leaving vacant sites. Vacant sites remain derelict or are developed for warehousing, distribution or offices – for which the area is attractive because of its relatively central location. No new manufacturing enterprises comparable to the traditional industries are attracted to these sites as they are relatively expensive to buy, rent and develop, and also because there is now relatively little skilled labour available locally. But the availability of cheap, old premises, together with a pool of low income workers, does attract an inflow of small-scale, low wage, low productivity industry.	The housing stock is beginning to deteriorate and many of the better paid and more skilled workers move out to newer working class areas. The reduction in job opportunities locally is an additional factor encouraging out-migration. More lower paid and less skilled workers move in from older working class areas. Rate of out-migration increases. Workers who lose their jobs in local industry cannot find equivalent jobs as local manufacturing employment continues to decline; they remain unemployed or find jobs outside the area. The housing stock is in a poor condition. The continued shift to a lower income population means that the deterioration of the housing accelerates, as the residents are less able to afford improvements of the rent necessary to attract investment in improvement. The emigration of younger, more skilled workers continues, leaving behind an increasingly unskilled, badly paid, insecurely employed or unemployed, and badly housed population.

Source: Community Development Project, 1977.

implications for industrial location and a more recent concern to grasp the role of class relations in industrial location and to analyse the impact of industrial restructuring on the class structure.

The first approach arises in particular from the work of Massey (1979), who argues that the economy of any area must be perceived as the product of successive rounds of investment and as:

> 'a combination of its (the area's) succession of roles within the series of wider, national and international, spatial divisions of labour'.

Massey argues that, in the UK, a new form of the spatial division of labour is in the making as the continuing centralisation and concentration of capital leads to production hierarchies based on the separation of control, research and development activities, production and assembly. Parallel with this, increasing competition between firms to lower labour costs and increase productivity produces a de-skilling process which allows the mass production and assembly stages of production to be located in areas where semi-skilled workers are more readily available but where wages are low and where there is little tradition of workers' organization and militancy. The search for female labour not previously involved in waged work which arises from changing production requirements thus emerges as an explanatory variable in the decentralization of industry from traditional manufacturing areas in the older conurbations.

Massey's analysis was informed by research on the spatial effects of the restructuring of the UK electrical engineering sector under the auspices of the government-backed Industrial Re-organization Corporation (Massey and Meegan, 1979). This study focused attention on the fact that job loss and employment growth originated from a range of different process not discernable from aggregate analyses of employment trends. Subsequently, Massey and Meegan (1982) developed their ideas further in analysing the causes of employment decline across a number of industries from 1968 to 1973. In the event, they produced a threefold classification relating employment change to forms of production reorganization as follows:

Intensyfication: production is reorganized with no loss of capacity but with no new capital investment either. The rate of exploitation is increased as individual workers produce more output through labour process changes involving shopfloor speed-ups, minor mechanisations and increased flexibility between trades.

Investment and technical change: where job loss occurs through major investment and production reorganization involving both process and product changes.

Rationalization: this produces the largest job losses as a result of disinvestment. Rationalization involves complete or partial plant closure, the scrapping of capital equipment and cutbacks in the labour force. No major reinvestment in plant and machinery, or new factory premises is undertaken.

Massey and Meegan pointed out that it is necessary to understand these production mechanisms in order to understand the processes underlying shifts in the geography of employment. Under rationalization, capacity will be concentrated on a limited number of previously occupied sites and not at new locations. Intensification, on the other hand, produces very little 'mobile' employment, reflecting itself in *in situ* shifts. The bulk of 'mobile' employment is to be expected as a product of new investment with this embodying technical change.

The focus on production mechanisms through *sectoral* analysis becomes problematic when industrial case studies are probed further, as Massey and Meegan acknowledge. A single form of production reorganization does not, of course, account for all the employment change in a particular sector and the aim of the study was to identify the *dominant* mechanism only. A key dimension missing from this approach to identifying forms of production reorganization through sectoral analysis at the individual nation level is that, within the large capitalist enterprises production is planned on a world-

scale. Thus, the international connectivity of events in the capitalist world economy must not be overlooked (Lloyd and Shutt, 1983) for while UK rationalization may not appear to involve 'mobile' employment in that particular nation state, the new investment to which such rationalization is often contingent may be in other countries and those other sectors to which corporate capital is drawn.

Since the time of Massey and Meegan's study, the UK economy has been plunged into deepening recession. Industrial restructuring has become more important than ever, as capital has tried to maintain and restore profitability and re-establish control over labour. Attempts to study the national industrial restructuring process for specific sectors have since been made for steel (Morgan, 1982) and chemicals (Hudson, 1982).

A second thread in the literature involving Marxist approaches to industrial location derives from the works of Dunford (1977a, b; 1979), Dunford et al., (1981), and Perrons (1981). These writers have sought specifically to relate regional spatial inequalities to a framework based on *regimes of accumulation*, defined by reference to historical changes in the form of labour process. Starting from the early 19th century, three phases in the capitalist labour process are identified, all of which are seen to have implications for the organization of capital and the geographical distribution of plants. These forms are described as Machinofacture, Manufacture, Scientific Management and Fordism and Neo-Fordism and are based on research on the US economy by the French Marxist, Aglietta (1979). Neo-Fordism in particular is seen to offer new capabilities for capitalist firms to structure their production throughout the world, serving to accelerate the creation of a new international division of labour (Frobel et al., 1980). In the particular case of the UK this is seen to be associated with the external control of manufacturing industry, the de-skilling of the traditional labour force and, as Dunford et al. (1981) further maintain

> 'a reduction in the coherence and integration of its production complexes, as regional plants become increasingly called upon to produce only parts of products or to perform part of the assembly process' – a process which generates few intra-regional industrial linkages.

The most persuasive analysis adopting this 'regimes of accumulation' approach has been Perron's study of the role of Ireland in the new international division of labour. This examines the decentralization of manual production by foreign branch plants which has served to incorporate Ireland more than ever before into the world economy. Perrons (1981), together with Lloyd and Shutt (1983), emphasizes that the industrial structure of urban and regional economies can only now be fully understood in a context which acknowledges the importance of the international dimension in interpreting locally observed corporate behaviour.

Both the industrial restructuring and labour process approaches have led to a growing literature within which there continue to exist large areas of debate. One criticism of the 'regimes of accumulation' approach is, for example, that it is too bold and simplistic to reduce changes in the labour processes to specific time periods and 'tendencies'. Massey and Meegan (1983) attempt to bridge the gap by arguing that, when analysing employment change, it is 'important to steer a path which encompasses both a recognition that actual causes often take place through detailed and specific social mechanisms and an appreciation of how this detail relates to the wider context of production in a capitalist society.'

In a third strand of literature, Marxist approaches have also drawn more attention to ideological issues and political *ideology* as factors underlying UK job losses after 1979. Recent events have led them to the view that job loss in particular industries and localities is by no means simply the result of purely economic forces. Thus, Morgan (1982), in a study of the British Steel Corporation and the British steel industry articulates the view that

'the advent, in 1979, of the Thatcher government inaugurated a more symbiotic

> relationship between state and capital: at no time in the post-war period has the British state assumed a more transparent role in the articulation and imposition of dominant class interests in an attempt to maximize the *politically conceived* conditions considered optimal for private capitalist accumulation.

This approach is supported by Hudson and Sadler (1982) in a recent study of the politics of steel closures in the European Community.

Large scale factory closures in the UK, combinated with large scale industrial restructuring by UK and foreign-owned firms have raised a number of additional issues for Marxist analysis over the last three years. First, there has been a concern with the *impact of the industrial restructuring process on class composition*. In this context, a seminal paper by Massey (1983) points out that

> 'industrial restructuring is a process of class restructuring; it is one of the mechanisms by which the social structure is re-shaped, social relations changed and the basis for political action broken down or reconstructed.'

Parallel with this, there has been growing attention given to the way in which *the relations between classes* are themselves important in determining the process of urban and regional industrial development. Cooke (1981), for example, shows the importance of *labour organization* by analysing the development of unionization in South Wales and the motor industry in Southern England, whilst Hudson and Sadler (1982) focus in on a concern for analyzing *attachment to locality* from a Marxist perspective in contrast to the humanistic geography approach of others (Pocock, 1981).

Most of the Marxist literature is then concerned with examining the dynamics of industrial change at national and regional levels because the focus is on the process of change rather than on location itself. As Johnston (1983) notes, 'most of the research to date has been developed as part of a critique of existing geographical approaches and is part of the wider revival in Marxist urban and regional research elsewhere in Europe and the United States.'

From a Marxist perspective, therefore, the solution to that decentralization process which is accelerating the decline of inner city areas cannot be found in policy initiative which focus on the stimulation of small firm private capitalist development in the conurbations. It is suggested that, so long as capitalist social relations exist, then uneven development will persist. Forrest et al. (1978) have argued that,

> 'What constitutes the inner city debate must be set within a wide economic context. That is, amidst a context of Britain as a declining economic power with an important imperial heritage, with obsolete branches of the imperial economy; where there is increased concentration and centralization of capital on a world scale with capital intensive multi-nationals seeking peripheral locations and labour intensive industries seeking cheap labour; Britain with high unemployment cuts in state social expenditure and sectoral decay. Part of the inner city issue revolves around the fact that the focus of production is now elsewhere both nationally and internationally.'

Adherents to Marxist approaches seek to set their work within this wider context. For them, solutions to the inner city problem cannot even begin to be found without state intervention in order to take control of production for profit (see, for example, Cochrane and Dicker, 1981).

CONCLUSIONS

Urban industrial geographers in the UK have, therefore, been confronted during the past decade with a growing uncertainty about the effectiveness of traditional methodology in confronting new and apparently revolutionary changes in urban form and function. Models based upon 19th century conceptualizations of the city as a source

of industrial labour, an expanding market for the products of manufacturing and as a rich source of external economies have been becoming increasingly inappropriate to the modern world.

The decentralization of population and employment which occurred in the 1960s and 1970s not only hinted at the breakdown of the city's historical 19th century role as a locus of manufacturing, it served cumulatively to accentuate that breakdown itself. As Fothergill and Gudgin (1982) showed, a new tendency emerged for manufacturing (and to a lesser extent service) employment growth to become *negatively* associated with urban rank size.

These shifts in the location of industry parallelled crucial changes in the forms of those corporate organizations whose decisions promoted locational events – rendering previous conceptualizations of the firm increasingly inappropriate. New forms of conceptualization thus emerged, adapting systems theoretic approaches to the study of organizational behaviour in the multi-plant firm and exploring corporate enterprises as the prime *agents* for locational change.

Over time, a growing requirement to specify the necessary conditions within whose constraints the corporate agencies exercised their span of decision-making control revived an interest in structuralist approaches and in Marxist formulations. At the present time, both Marxist approaches and those primarily concerned with the nature of organizational behaviour dominate the debate about urban industrial change in the UK, interacting together to produce a literature which emphasizes both the behaviour of the business enterprise and the characteristics of the capitalist mode of production.

A particular feature of the UK debate on urban industrial change which we have sought to emphasize in this paper has been its strong tendency to be drawn directly into the policy-making arena. What we have attempted to show is that policy has closely mirrored methodology. Prescriptions for change have been couched in terms which derive from the protagonists' conceptualization of process. With the translation of policy into action at the state level, new forms of urban industrial development such as Enterprise Zones, the promotion of indigenous small firms or attempts to ameliorate the degree of 'external control' have provided a real world reflection of particular perspectives on the nature of urban problems and processes.

REFERENCES

Aglietta M., 1979, *A theory of capitalist regulation*, New Left Books, London.

Berry B. J. L., 1964, Cities as systems within system of cities, *Papers and Proceedings of the Regional Science Association*, 13, 147–163.

Champion A. G., Gillespie A. E., Owen D. W., 1982, *Population and the labour market with special reference to growth areas in the UK*, British Society for Population Studies Conference, Durham.

Cochrane A., Dicker R., 1981, Renewing the inner city? Government priorities in practice in Birmingham, in: A. Cochrane et al., eds., *City economy and society*, Harper and Row, London.

Community Development Project, 1977, *The costs of industrial change*, Inter-project Report, London.

Cooke P., 1981, *Interregional class relations and the redevelopment process*, UWIST Papers in Planning Research, UWIST, Cardiff.

Danson M. W., Lever W. F., Malcolm J. F., 1980, The inner city employment problem in Great Britain, 1952–76: a shift share approach, *Urban Studies*, 17, 193–210.

Dennis R., 1978, The decline of manufacturing employment in Greater London, 1966–1974, *Urban Studies*, 15, 68.

Department of Employment Gazette (various), Department of Employment, London.

Dicken P., Lloyd P. E., 1978, Inner metropolitan industrial change, enterprise structures and policy issues: case studies of Manchester and Merseyside, *Regional Studies*, 12, 181–197.

Dunford M., 1977a, Regional policy and the restructuring of capital, *Urban and Regional Studies Working Paper*, 4, University of Sussex.

Dunford M., 1977b, The restructuring of industrial space, *International Journal of Urban and Regional Research*, 1, 510–520.

Dunford M., 1979, *Capital accumulation and regional development in France*, University of Sussex Working Paper, Brighton.

Dunford M., Geddes M., Perrons O., 1981, Regional policy and the crisis in the UK: a long-run perspective, *International Journal of Urban and Regional Research*, 5, 377–410.

Elias P., Keogh G., 1982, Industrial decline and unemployment in the inner city areas of Great Britain: a review of the evidence, *Urban Studies*, 19, 1–15.

Firn J. R., Swales J. K., 1978, The formation of new manufacturing establishments in the central Clydeside and West Midlands conurbations, 1963–1972: a comparative analysis, *Regional Studies*, 12, 199–213.

Forrest R., et al., 1978, The inner city: in search of the problem, *Centre for Urban and Regional Studies Working Paper No. 64*, Birmingham University.

Fothergill S., Gudgin G., 1982, *Urban and regional employment change in the UK*, Heinemann, London.

Frobel F., Heinrichs J., Kreye O., 1980, *The new international division of labour*, Cambridge University Press, Cambridge.

Goddard J., Smith I. J., 1978, Changes in corporate control in the British urban system, 1972–1977, *Environment and Planning A*, 10, 1073–1084.

Gough J., Escott K., Leigh R., North E., 1979, A conceptual framework and methodology for analysing industrial change, *Occasional Paper No. 2*, London Industry and Employment Research Group, Middlesex.

Gripaios R., 1977, The closure of firms in the inner city: the South East London case, 1970–1975, *Regional Studies*, 11, 1–6.

Gudgin G., 1978, Industrial location processes and regional employment growth, Saxon House, Farnborough.

Gudgin G., Fothergill S., 1979, *The East Midlands industrial databank: a guide to sources, methods and definitions*, Centre for Environmental Studies, Working Note 559, CES, London.

Gudgin G., Moore B., Rhodes J., 1982, Employment problems in the cities and regions of the UK: prospects for the 1980s, *Cambridge Economic Policy Review*, 8.

Hall P., 1982a, Enterprise zones: a justification, *International Journal of Urban and Regional Research*, 6.

Hall P., ed., 1982b., *The inner city in contex*, Heinemann, London.

Hall P., et al., 1973, *The containment of urban England*, George Allen and Unwin, London.

Hamilton F. E. I., 1978, Aspects of industrial mobility in the British economy, *Regional Studies*, 12, 153–165.

Hudson R., 1982, Accumulation, spatial policies and the production of regional labour reserves: a study of Washington New Town, *Environment and Planning A*, 14, 665–680.

Hudson R., Sadler D., 1982, *Region, class and the politics of steel closures in the European Community*, Department of Geography, University of Durham.

Isard W., 1956, *Location and the space economy*, MIT Press, Cambridge Mass.

Johnston R. J., 1983, *Philosophy and human geography*, Edward Arnold, London.

Keeble D. E., 1976, *Industrial location and planning in the United Kingdom*, Methuen, London.

Keeble D., McDermott P., 1978a, Organisation and industrial location in the United Kingdom, *Regional Studies*, 12, 139–141.

Keeble D., McDermott P., 1978b, Manufacturing organisation and regional employment change, *Regional Studies*, 12, 247–266.

Kennett S., 1980, *The inner city in the context of the urban system*, Social Science Research Council, London.

Kennett S., Hall P., 1981, The inner city in spatial perspective, in: P. Hall, ed., *The inner city in context*. The Final Report of the SSRC Inner Cities Working Party, Heinemann.

Kennett S., Spence N., 1979, British population trends in the 1970s', *Town and Country Planning*, 48, 221–223.

Kirwan R., 1980, *The inner city in the United States*, Social Science Research Council, London.

Kitegawa E., Bogue D. J., 1955, *Suburbanisation of manufacturing activities in the standard metropolitan areas*, Miami.

Krumme G., 1969, Toward a geography of enterprise, *Economic Geography*, 45, 30–40.

Lever W. F., 1981, The inner city employment problem in Great Britain since 1952: a shift-share approach, in: J. Rees et al., *Industrial location and regional systems*, Bergin, New York.

Lloyd P. E., 1979, The components of industrial change for Merseyside inner area: 1966–1975, *Urban Studies*, 16, 45–60.

Lloyd P. E., Dicken P., 1982, *Local manufacturing firms in the older urban environment: perspectives for Greater Manchester and Merseyside*, Inner Cities Research Programme No. 6, Department of the Environment, London.

Lloyd P. E., Dicken P., 1983, The components of change in metropolitan areas, events in their corporate context, in: J. B. Goddard, A. G. Champion, eds., *The urban and regional transformation of Britain*, Methuen.

Lloyd P. E., Mason C. M., 1979, Industrial movement in North West England, *Environment and Planning A*, 11, 1367–1385.

Lloyd P. E., Reeve D. E., 1982, North West England 1971–1977: a study in industrial decline and economic re-structuring, *Regional Studies*, 16, 345–359.

Lloyd P. E., Shutt J., 1983, *Recession and restructuring in the North West Region*, North West Industry Research Unit Working Paper 13, School of Geography, University of Manchester, Manchester.

McIntosh A., Keddie V., 1979, *Industry and employment in the inner city*, Department of Environment, London.

Martin R. L., 1982, Job loss and the regional incidence of redundancies in the current recession, *Cambridge Journal of Economics*, 16, 375–395.

Mason C. M., 1981, *The creation of an establishment-based databank for South Hampshire*, SSRC, Grant HR 6796 Final Report, Department of Geography, University Southampton.

Massey D., 1977, Towards a critique of industrial location theory, in: R. Peet, ed., *Radical geography*, Methuen, London.

Massey D., 1979, In what sense a regional problem?, *Regional Studies*, 13, 233–243.

Massey D., 1983, Industrial restructuring as class restructuring: production decentralisation and local uniqueness, *Regional Studies*, 17, 73–89.

Massey D., Meegan R., 1979, The geography of industrial reorganization, *Progress in Planning*, 10, 155–234.

Massey D., Meegan R. A., 1982, *The anatomy of job loss*, Methuen, London.

Massey D., Meegan R., 1983, *Profits and job loss*, Paper presented to the SSRC Industrial Location Seminar in February, Open University, Milton Keynes.

Miles N., 1982, *The spatial decentralisation of manufacturing growth and the restructuring of the labour process*, Department of Geography, London School of Economics, London.

Morgan K., 1982, *Restructuring steel: the crisis of labour and locality in Britain*, mimeo., University of Sussex.

Norton R., Rees J., 1979, The product life cycle and the spatial decentralisation of American manufacturing, *Regional Studies*, 13, 81–100.

Perrons E., 1981, The role of Ireland in the new international division of labour: a proposed framework for regional analysis, *Regional Studies*, 15, 81–100.

Pocock D., ed., 1981, *Humanistic geography and literature*, Croom Helm, London.

Pred A., 1967, Behavior and location, part 1, *Lund Studies in Geography* B, 27.
Richardson H. W., 1971, *Urban economics*, Penguin, London.
Sayer A., 1982a, Explanation in human geography, *Progress in Human Geography*, 6, 68–88.
Sayer A., 1982b, Explaining manufacturing shift: a reply to Keeble, *Environment and Planning A*, 14, 119–125.
Scott A. J., 1982, Locational patterns and dynamics of industrial activity in the modern metropolis, *Urban Studies*, 19, 111–142.
Steed G. P. F., 1971, Changing processes of corporate environmental relations, *Area*, 3, 207–212.
Sterlieb G., Hughes J., 1975, *Post-industrial America: metropolitan decline and inter-regional job shifts*, Centre for Urban Policy Research, New Brunswick, New Jersey.
Storper M., 1981, Towards a structuralist theory of industrial location, in: J. Rees et al., eds., *Industrial location and regional systems*, Bergin, New York.
Thompson T. E., 1933, *Location of manufacturers, 1899–1929*, Washington.
Thrift N., 1979, Unemployment in the inner city: urban problem of structural imperative? A review of the British experience, in: D. T. Herbert, R. J. Johnston, eds., *Geography and the urban environment*, vol. 2, Wiley, Chichester, 125–226.
Townsend A., 1982, *The impact of recession*, Croom Helm, London.
Warnes A. M., 1977, *The decentralisation of employment from the large English cities*, Department of Geography Occasional Paper No. 5, King's College, University of London.
Watts H. D., 1978, Inter-organisational relations and the location of industry, *Regional Studies*, 12, 215–225.
Watts H. D., 1981, *The branch-plant economy: a study of external control*, Longmans, London.
Weber A. F., 1889, *The growth of cities in the nineteenth century*, Cornell (reprinted in 1963).
Weber A. F., 1909, *Über den Standort der Industrie: reine Theorie des Standorts*, J. C. B. Mohr, Tübingen.
Wood P. A., 1978, Industrial organisation, location and planning, *Regional Studies*, 12, 143–152.
Wood P. A., 1982, Industrial geography, *Progress in Human Geography*, 6, 576–583.
Woodbury C., 1953, *The future of cities and urban redevelopment*, Chicago.

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INDUSTRIAL SYSTEMS AND REGIONAL ECONOMIES: BRITISH RESEARCH IN AN INTERNATIONAL PERSPECTIVE

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STRONG EMPIRICAL AND EMPIRICIST TRADITIONS IN BRITAIN

'The regional concept' has commanded neither the same degree of prominence nor the same level of controversy in the study of industrial activity as it has done generally in modern geography. An exception might be the debates in the Soviet Union about the identification of, and interrelationships between industrial and territorial-production complexes, energy-production cycles and economic regions. Yet 'the region' has provided an extremely valuable spatial framework, particularly in a more advanced economy such as the United Kingdom (UK), for two types of analysis.

First, publication between 1900 and 1970 of more than 200 studies of industrial development and change in single regions of the British Isles, and many by UK geographers working in the Commonwealth (Hamilton, 1969), built up powerful traditions in historical and empirical investigations of regional industrial trends and problems. Most provided mainly descriptive time-space analyses of the birth, growth, development, stagnation, decline – even death – of single industries or of several industries in the economic 'sequent occupance' of an area. Apart from studies of industrial change in Merseyside (Smith, 1941), London (Wise, 1956; Hall, 1962; Martin, 1966), West Midlands (Wise, 1950; Beesley, 1955), and Estall's (1966) analysis of industrial adjustment in New England, few have rivalled Kenyon's research into the sequential effects of product cycles on the industrial structure, economy, and importance of the Paterson – Passaic district of New York (Kenyon, 1960).

Second, many researchers (Hamilton, 1969, 55–83, 97–111) set out to define the functional and structural cohesiveness of regional industrial economies against a broad shift of interest and method from formal coalfield or 'depressed area' studies to the analysis of functionally integrated regions. Some applied indices of specialization and diversification, and the location quotient, to available regional and urban Minimum List Heading statistics (e.g. Martin, 1966); others began to use empirical surveys to examine intra-and inter-organizational production and management linkages as a method of defining regional industrial cohesion and change (e.g. Luttrell, 1962; Brown, 1967). In contrast to American work, few theoretical or quantitative analyses were

cast in the 'regional science' mould, partly because data deficiencies restricted the use of input-output techniques in the UK, though Britton's (1967) Bristol region study is an exception to this.

THE CONTEMPORARY PURPOSES OF REGIONAL INDUSTRIAL STUDY

Until the late 1960s research was primarily focused on industry and industrial location for their own sake. Major exceptions in Britain were studies of planning and employment issues. Concern for jobs, not matched in other countries, dated from the first economic depression of the 1930s. It stimulated studies then of diverse regional patterns of unemployment, strikes, the search for work, labour markets and the journey to work (Thomas, 1934, 1938; Champernowne, 1938–1939; Singer, 1939–1940; Daly and Atkinson, 1940). The region in the UK became:

(1) a useful analytical tool for identifying industrial structure, process and stage and their employment implications;

(2) a policy framework for decision involving resource allocation with job creation as a significant objective; and

(3) a convenient way of generalizing real world complexity for didactic purposes.

The past 15 years have seen far less debate over what is or what is not a region partly because government has broadly accepted the regional concept for statistical, policy and administrative purposes. Economic, technological and organizational forces have also combined to 'collapse' physical distance for most material industrial functions. This has to some extent weakened the *raison d'etre* of the region both as a 'real geographic' and as an analytical framework for very cohesive, integrated, industrial operations, although less true for those functions requiring significant face-to-face contact, teamwork and intensive information exchange (e.g. research and development, high-technology innovative industries, and business services linked to management).

The need for regional study of industry today resides far less in the definition, description and analysis of internally 'formal' and 'functional' production regions and far more in other considerations, including:

(a) the appreciation of the consequence of changing quantitative and qualitative relationships between

(i) increasingly footloose 'export'-orientated, production and service units managed in multi-locational organizations (often externally controlled as far as most regions are concerned) and

(ii) the more inert regional factors and conditions notably the locally-orientated businesses, people, public consumption functions, and infrastructure embedded in the settlement system;

(b) the role of industry and industry-related functions in the economic health, social well-being and development of the region;

(c) the ways in which regional environments might be improved, and by whom (private enterprise, local or central government, or public corporations), to stimulate structural change and adjustment (whether involving industry or not) which would yield sustained economic vitality and high social victualling;

(d) interregional relationships and changes within and across national frontiers, leading to a better understanding of, and capability to monitor, provide, contain, and make arrangements for dealing with the international transmission of industrially and environmentally-induced economic and social impacts; and

(e) offering a statistically manageable laboratory for the study and testing of the interactions between organizations, national and international forces on the one hand, and local milieu on the other. The latter point is fundamentally important. It

underlines the utility of city and region as vehicles for the integration of macro-scale and micro-level analyses which hitherto has proved to be a major stumbling block in economic research.

INDUSTRIAL SYSTEMS IN CONCEPTUAL AND THEORETICAL PERSPECTIVE

Since the early 20th c. British industrial analysts have been influenced by a succession, at shortening intervals, of dominant paradigms: the classical/neo-classical Weberian (e.g. Chisholm, 1910, 1914), the behavioural-organizational (Hamilton, 1974; Townroe, 1972), and the (rediscovery of the) Marxist (e.g. Massey, 1973). While UK industrial geographers had largely accepted neo-classical analysis 'passively' until the 1960s, they became increasingly active innovators in the Western world regarding the behavioural-organizational approaches (initiated by Rawstron, 1958) and the recognition and use of Marxist analysis (Hamilton, 1967; Massey, 1973). Strict adherence by some to 'their' paradigm tended in the 1970s to segment the explanation and prediction of processes which are essentially unitary. Each paradigm *per se* has led into a conceptual, methodological or factual *cul-de-sac* because its proponents have perceived 'their' paradigm as providing the *exclusive* explanation of the *whole* industrial problem and *all the time*. And this encouraged mutual criticism or rejection of each other's paradigms on grounds of 'mono-causality' (such as minimum cost, maximum profit, product cycles, entrepreneurial behaviour or the class struggle under capitalism). Extreme abstraction, such as the assumption of economic rationality by the neoclassicists, has been as much a disservice to progress towards theory and concepts revealing the truth and relevance of industrial distributions and location as have empiricist behavioural studies or preoccupation by some 'structuralists' with the deterministic omnipotence of economic structures.

Work was initiated in 1976 on an industrial systems approach (Hamilton, 1979) within the framework of the International Geographical Union Commission on Industrial Systems. It must be emphasized that this approach from the outset.

(1) places industry in a total production system context and thus defines 'industrial system' as comprising:

(a) manufacturing activities;

(b) related non-manufacturing (e.g. extractive, financial, business service, managerial, research) functions; and the

(c) industrial environment (e.g. exogenous factors, other organizations, government, etc.);

(2) provides an analytical framework for understanding *and linking* the character and dynamics of industrial systems at macro-, meso- and micro-scales; *and also*

(3) permits work towards an integration of the different paradigms, theories and concepts that can help to explain industrial systems and their dynamics. Discussion of some alternative views is given in Hamilton and Linge (forthcoming).

Given adequate methodologies, a holistic systems approach is a major advance in helping to bridge the paradigm gaps and in bringing better understanding to the complexities of industrial and production systems and their dynamics in space. Such an approach should not simply use the 'best' of each paradigm. Rather it should get to grips with:

(a) real world industrial systems which are complex and are shaped by many interacting processes and forces; and

(b) which may also be interpreted from various angles such as those of entrepreneurs, workers, governments, investors, consumers and foreign or minority ethnic groups.

Generally the world's non-socialist industrial and production systems are shaped by:

(1) capitalist structural parameters or constraints which form the macro-environment of the national governments, regions and organizations situated in the First and much of the Third Worlds;

(2) the decision-makers performing strategic control functions in organizations who, within this macro-environment, operate at the meso-scale (large and small private or state organizations) to set in train commonly a-spatial actions – innovations, investments, disinvestments or takeovers – with implicit or explicit spatial attributes. In so doing, they generate variety in organizational and entrepreneurial responses, sub-processes and behaviour for a wide range of economic, ethnic, historical, national, organizational, personal, political, social and temporal reasons;

(3) micro-level solution of each specific problem or choice of project alternatives which involves use of the neo-classical types of economic and social evaluation of production conditions and comparative advantages (with deliberate or derived assessment of place-specific advantages and disadvantages) but always within the constraints of the structural and behavioural parameters.

Future theoretical and empirical research is required to substantiate this 'nesting' of paradigms.

REGIONAL INDUSTRIAL SYSTEMS

The regional (i.e. sub-national or urban-centred) level of world industrial systems forms the focus of this paper for four reasons. *First*, much recent British empirical research either has continued to analyze regional and urban industrial changes or, out of sheer necessity, has had to use aggregated UK Standard Region data. *Second*, British governments have attempted for decades to improve the welfare of selected regions by policies to stimulate the location or movement of manufacturing and office functions. *Third*, the close interaction between industrial change and labour-market processes means that the social relevance of industrial systems is more overt at regional level; and this level may be city-dominated or fairly easily disaggregated into various local urban and rural components. *Fourth*, there is still inadequate conceptualization and understanding of the real connections between the life of 'the region' on the one hand and the corporate, 'national' and international production systems on the other hand.

The production system of any region is shaped through time by:

(1) the 'population' of organizations and their units functioning in the region; and

(2) the blend of processes and conditions operating broadly at three distinct levels of the environment to influence the behaviour and functioning of those units, namely:

(i) local and regional conditions (resources, infrastructure, social structure);

(ii) the national environment provided or shaped by government and by organizations located elsewhere in the national space; and

(iii) international forces.

Of course, decision-makers respond to the forces operating in these various environments either as 'objectively existing' and 'scientifically proven' forces or as their 'perceived images' of the components in those environments. A recent example of local and regional moment is provided by Burgess' (1982) study of the 'market' of local government area attractions for business in the UK. Focus here, therefore, is on research into organizations; the ability of the state to regulate change in the regional interest; and the impacts of international processes on the urban and regional industrial economy.

THE IMPORTANCE OF ORGANIZATIONS

A regional industrial system comprises a 'population' of industrial and industry-related facilities with diverse functions, scales and performances (Dicken and Lloyd, 1978; Hamilton and Linge, 1979) usually made up of:

(1) facilities which are significantly or dominantly linked directly (or 'associated') within the region through decision, information, production and service flows and financial transactions, and

(2) facilities which are largely or wholly unconnected with others located in the region (i.e. are 'coincident') but have most transactions with units outside the region (and/or country) even though these may be within the same organization.

UK researchers have generally recognized the shift in structure from a dominance of the region by the former to a prevalence (if not a dominance) of the latter type of facility in the growing volume of work since 1970 on multi-locational and multinational firms. The importance of such organizations has increased markedly, bringing greater proportions of industry and industry-related functions in British cities and regions into dependency on 'external control', i.e. on strategic decision-making and management functions performed at a locus outside the city and its region (and often outside the UK). Although they are essentially different geographical scales of the same processes and phenomena, four types of organizations, are in varying ways, sources of external control in at least some of the UK regions in which they operate.

'National' private and state corporations

First, many private British firms and, *second*, the nationalized industries (coal, electricity, gas, steel) have developed interregional production systems confined to UK space. Work published by Heal (1974), in Keeble and McDermott (1978), by Leigh and North (1978) and by Watts (1981), for example, stresses the increase in the period of growth to 1974 of the interregionalization of British corporate organization through the spatial divisibility and separation of functions, branch-facility construction, and plant movement; and of reorganization through acquisitions and mergers. Production in most UK regions became more dependent on control and decision functions localized in London and Southeastern England. Bargaining between 'national' organizations (e.g. British Steel Corporation) and local administrative authorities may be no less significant especially for communities which are highly dependent for their livelihood and health on a single industry.

Foreign-owned multi-national firms

Third, foreign-owned transnational and multinational corporations (for a definition see: Linge and Hamilton, 1981) with facilities in the UK have been the subject of several recent studies (Law, 1980; Watts, 1980a; and Lloyd and Reeve, 1982). Their work in part builds on earlier research by Blackbourn (1974), Hamilton (1976) and Young and Hood (1976) regarding United States' direct investment in new industrial construction in Western Europe. Increasing concern has been expressed for the local impacts of the in-movement, expansion or closure of facilities belonging to these corporations on changes in population, jobs, skills, incomes and public finance. A series of issues has been raised and, in varying degrees, investigated. Key amongst them are the complicated and diversified bargaining relationships between "the state" (or 'the nation') and the multinational corporations that concentrate increasing control over international flows of capital, cash, commodities and information.

British research findings regarding the processes and consequences of the growth of multilocational organizations have their parallels elsewhere. Recent debates over the redistribution of manufacturing in the USA from the "snowbelt" to the 'sunbelt' states (Bluestone and Harrison, 1981) are examples, while Britton and Gilmour (1978) and Hayter (1983) essentially view the Canadian industrial system as a 'branch plant colony' of the US economy comprising 'truncated' regional industrial sub-systems. There is much agreement that external control through branches has both positive and negative effects, the balance of which may change significantly from the short term to the long term in any locality or region. Yet most authors hint of the gravity of the future for the regional economy and society of the rising levels of uncertainty, vulnerability, dependency and de-stabilization engendered by significant or growing trends towards external control. By contrast, Erickson (1981) is more cautiously optimistic on this issue in the context of the US economy.

This difference of opinion suggests that more research is required into the understanding of: the type and the quality of external control, the activities being controlled, and the character of the regional or national environment. External control by national or foreign organizations may be less problematic in more highly dynamic industrialized economies and regions such as the USA, West Germany, Switzerland or Japan than in countries like the UK with poor performance and in countries typified by segmentation, fragmentation and truncation of their regional and national industrial systems as a result of overseas dependency. It may also depend on the 'balance' of home and foreign owned facilities; and on the relationship of the 'life cycles' of multinational facilities to each other and to the regional economy. Another critical factor, however, may be the positive local role of city or regional or State banks in industrialized federal economies such as the USA or West Germany in channelling locally accumulated capital into local enterprise; in the UK significant regional capital accumulation is in large measure first 'drained' to London by the highly centralized system of national banks and then, second, effectively exported by the internationally-orientated banks in The City.

British transnational firms

Fourth, transnational and multinational corporations based or headquartered in Britain are still important in several UK regions (e.g. ICI in the North East). Nevertheless the analysis of the impacts on the local and regional components of the 'home' national economy which result from overseas expansion, transfer, or reorganization of functions by such corporations is still a neglected field. Pioneering work by Owens, a young Irish geographer, examined the feedback effects on UK areas of investments by British firms in Eire (Owens, 1980). Research has also been undertaken on this issue in France (Savey, 1981); and in the Laboratoria di Geografia Economica, Universita di Torino, where the organizational and inter-organizational consequences in the Turin region of Fiat's overseas and local restructuring are a major research focus. Clearly there is much future scope for this problem's analysis to be cast in the mould of the capital-restructuring ('rounds of investment') framework first elaborated by Massey and Meagan (1982).

Neglect of the feedback effects on the home economy of corporate offshore expansion, it could be argued, is more apparent than real. The focus of international research has remained strongly on the impacts of multinational firms in *host* regions abroad. Several explanations may be offered. *First*, outside the most advanced economies, all regions depend primarily on foreign investment for their industrialization. *Second*, such investment in the Third World invites controversy in interpretations and analysis (see Linge and Hamilton, 1981). *Third*, the Harvard Business School's extensive 1960s and 1970s research into multinational corporate expansion was largely supported

by Vernon's product-cycle theory which stimulated the 'diffusionist' view of world industrialization. *Fourth*, under the conditions of global growth until the mid-1970s overseas expansion of primarily US and UK firms appeared not to create 'home' problems. Extensions of their activities overseas involved *either* penetration of other developed-country markets *or* procurement of raw and semi-processed materials and energy from less developed countries for home manufacture. Neither process appeared to 'export' jobs. Rather both maintained and even augmented home employment in the production of finished goods and capital equipment for overseas facilities and of business technologies. These changes in production contributed often to the overall restructuring of core-regional economies from labour-intensive through more capital-intensive to more information- and technology-intensive industries.

Only since the mid-1970s has significant export of jobs occurred from industrialized countries, notably by multinationals operating in durable consumer goods sectors. These have sought locations offering far lower labour costs to maintain competitiveness in selected labour-intensive production and assembly stages during the world recession. Some transfer of capacities and jobs has resulted from regions in developed to regions in some developing and newly industrializing countries, occasionally also to regions in Eastern Europe. While this problem has attracted attention in the UK as part of that country's apparently critical de-industrialization experience (of which there are many *other* causes), the continued high rate of inflow of foreign direct investment in new plant and facilities into the USA (Breuer, 1983; McConnell, 1983) and the more vigorous West European economies has dampened the real effects in some regions of those countries of job export by home multinationals. Certain West European governments have partly 'mitigated' the problem by repatriating *Gastarbeiter* to their own (and less developed) countries such as Greece or Turkey. Yet indications are that some current technological innovations will stimulate new waves of industrialization, modernization or reindustrialization of selected regions in the multinationals' home countries, too.

Regional Process

Most of the foregoing studies, are cast essentially in neo-classical or behavioural-organizational frameworks. Research by Dunford (1977, 1979), Holland (1976, 1980), Lewis, Hudson and Carney (1980), Massey (1983), Perrons (1981) and Sayer (1983) stand in stark contrast. Drawing often on wider continental European experience, these authors focus on the significance for regional patterns and impacts of selected capitalistic processes, particularly the influences on investors' decision of profit rates and capital accumulation opportunities, capital restructuring, rounds of investment and the labour process. These approaches have revealed in greater depth the consequences for jobs, participation rates, skills and incomes at regional and local level of the performance, productive restructuring, and organizational trends in industrial enterprises and local and regional industrial changes in general. They have thus shifted attention from the processes themselves to the social and economic impacts in space of various capitalistic processes and have imbued industrial research with a more 'radical' perspective.

The processes that operate in the capitalist arena are filtered (or imported) into regions by organizations. Their birth, in-migration (or entry), growth, development, successful survival, and adaptation to changing international, national and regional environments generate jobs, improve skills, raise incomes and increase wealth. All these positive changes – even just to maintain the *status quo* – depend in varying degrees on a range of innovations and on restructuring. Some organizations – or selected units within them – may also yield stagnation and decline in the regional economy as a result of inertia, the lack of sufficient innovation or adaptation, contraction,

closure or out-migration. Any city or region contains some combination of 'leading' (lead) or 'lagging' (lag) organizations or their branches and a population made up of 'innovator', 'adopter', 'follower' or 'spectator' units. The aggregate balance of these 'locates' each regional economy on the continuum from 'very strong', 'healthy' and 'active' – in which there is a high ratio of lead and innovative organizations creating substantial capital accumulation and wealth (currently highest in the information industry) – to the 'very weak', 'pathological' or 'passive' regional economy which is suffering from a predominance of stagnating and declining organizations and sectors.

Thus increased attention has been paid recently – despite the very high research inputs required – to the more detailed investigation of firms' business performance, innovation potential, and adaptability to changing environmental conditions. UK research in this field (e.g. based in London, Manchester and Newcastle) has its parallels in North America, especially Canada (e.g. Science Council of Canada, 1982) and in Western Europe. Although much of this work has focused latterly on technological innovations and their diffusion, its wider significance lies in the substantial refinement that it can provide to the understanding of general relationships between organizational size, sector, performance, entrepreneurial behaviour, innovation and location.

Past research often concerned the sectoral structure of the regional economy. While this still provides a guide to dynamic, stagnant and declining conditions in regions, the stronger focus on organizations is essential because under capitalism

(a) diversification often takes place *within* organizations, e.g. the movement of US oil and petrochemical firms like Exxon into the manufacture of business machinery and office equipment and into related business services, a trend which involves their restructuring and affects their performance overall as well as that (and the very existence) of specific facilities within the organization, and

(b) there has been a shift in social status and economic importance in the division of labour from that between industrial sectors (although this still remains important) to that between management, information-processing, research and services on the one hand and production on the other hand within industrial sectors.

This is why the increased sectoral diversification of industries located in most regions of the UK between 1960 and 1978 in particular has been accompanied by a sharpened division of the country between (a) those peripheral, northern and central regions remaining specialized on lower-order factory and with low (or increasingly negative) rates of profit, and (b) Southern England which has become more specialized on chains of management, information-processing, high technology, research and business applications – with the emergence of related clusters of industries (e.g. along the London-Bristol axis) with very high rates of profit. Indeed, southern Britain provides an attractive environment combining the advantages of metropolis, corporate headquarters, the seat of government, high infrastructure provision (including international aiports) and pleasant countryside to stimulate the incubation and growth of local, and in-movement of foreign organizations to create new clusters of linked high technology and business service functions. This region is thus characterised by the formation of new industrial systems which, though 'looser' in a spatial sense (i.e. dispersed regionally and between cities) and different in type, appear to replicate the linked chains of producers of goods and services that historically typified for example the Lancashire textile and clothing, Birmingham engineering, and inner London furniture trades.

STATE, NATION AND REGION

Implicitly underpinning much of the past UK geographers' research have been the assumptions that

(1) the economies of the UK regions are dominantly shaped by interregional interaction within the national economy; and that

(2) the UK government could hold predominant sway over the destinies of those regional economies.

Adequate attention to the international context helps to reveal clearly that 'the nation' is an intermediary – however important – between globe and region, and vice-versa. The structure, health and dynamics of regional economies depend to a very considerable extent on *both* the willingness *and* the ability of the state of which they are part to

(1) create infrastructural and organizational conditions which would provide regions with enhanced or specific advantages over regions in other countries;

(2) filter international processes, conditions and events (e.g. price inflation, detente) which might shape national and regional comperative advantages in various positive or negative ways; and

(3) protect them from particularly 'harmful' international processes (e.g. excessive or 'unfair' competition for regionally-localized industries like textiles, shoes, other consumer products, or steel).

In reality the world's nations range from the very few in which the state has substantial ability to the majority (including the UK) with restricted capability of controlling or filtering international forces. For some years now UK researchers should have taken more heed of the work of investigators in developing countries who emphasize the problems of overseas dependency of urban and regional economies there. Except insofar as local government authorities wield power to local production systems (Burgess, 1982), or insofar as regional separatist movements have used charges of internal colonialism to sway UK government decisions in their favour (see Hamilton and Linge, forthcoming), UK regions are essentially passive recipients of some nationally-directed nationalized industry and infrastructure, some nationally-steered activities (e.g. through IDC industrial and office policy) and much nationally-uncontrolled industrial and industry-related changes. The comparatively high degree of international integration and openness of the UK economy limit and segment inter-regional inter-dependencies within UK space and widely expose all regional economics to international conditions.

Thus the very substantial efforts of UK governments during the five decades since 1934 to improve structurally-maladjusted peripheral-regional economies have been undone in less than five years, despite more successful attempts to attract new technology to South Wales and Scotland. True, regions like Southeast England with a preponderance of active sectors and organizations contribute to national growth through earnings from interregional and international sales of goods and services, while peripheral regions dominated by passive and lagging sectors and organizations need national assistance to enable them to engage more effectively in production or to share benefits more equally. Yet the UK illustrates well how governments miscalculated

(a) the continued industrial growth (and hence interregionally redistributive) capacities of the London and West Midlands regions as a solution to the employment problems of northern and western Britain, especially as the former experienced sharpening international competition; and

(b) its own ability to redistribute economic growth and development in a mixed economy and in situations of substantially uncoordinated state ministerial policies.

Nevertheless, government is a key 'meso-level' operator and, as such, must be reckoned as a behavioural component which interacts with other organizations within constraints set by the capitalist macro-level system dynamic. Too few geographers have realized the very significant national environmental role that national fiscal, currency-exchange rate tariff, taxation, public expenditure and other sectoral policies have played *both* in the international competitiveness or uncompetitiveness of UK organizations *and* in assisting, neutralizing or retarding the effects of the specifically

'regional' policies that have commanded so much of their research attention. No less important, the success of 'regional' policies has been circumscribed by the failure of UK governments and researchers alike to view UK space (and hence the UK production system) as a whole and as comprising a set of regions with inter-dependent activities being shaped by the actions and interactions of both governmental and non-governmental organizations.

IMPACTS OF THE INTERNATIONAL ECONOMY

Geographers have neglected international forces in their research until very recently. This is not only a British problem, nor is it specific to industrial geography. Rather it has resulted from preoccupations by geographers in most countries – for a variety of reasons – with 'national' issues and policies. Yet continued underestimation by British industrial geographers of the importance of international conditions is surprising because

(1) the UK was the 'workshop of the world' until a century ago;

(2) industrialization everywhere abroad since the 1860s has actually displaced British manufactures from overseas markets and has slowed UK industrial growth;

(3) the UK remained until the late 1970s at least, after the USA, the largest source of foreign direct capital investment in world development and, this 'exported' some national growth; and

(4) British government industrial, regional and other policies since the 1950s have been regularly constrained by Treasury concern for UK balance of payments problems (Hudson, forthcoming).

The earlier discussion of UK research on corporations suggests that British industrial geographers

either did not perceive the export-orientated growth by British firms in UK and overseas locations and losses of export markets by them as significant factors in the regional economy

or have perceived them to be far less important 'international' processes than the employment effects of the location of foreign firms in UK regions or of the penetration of UK manufactures markets in the UK by foreign-based firms.

Indeed, the sudden rise of interest in international impacts appears to be closely related to the 'spectre' of 'de-industrialization' and its regional consequences (Martin, 1981). The more readily identifiable 'international' forces that seem to have accelerated the severe contraction of industry in the UK since 1974 are:

First, the internationalization of operations by capitalist firms has had various direct impacts on the regions. Transfer of production abroad by some British firms, the acquisition of other UK firms by corporations based in other EEC countries to eliminate competition, the closure of older branches located in the UK by foreign (especially US) multinationals have all led to serious job losses. Displacement of British firms from home markets by foreign (mainly Japanese) entrants, however, may have partly preserved some jobs, though usually not in the same regions where the British firms closed. These processes have brought more regions and cities directly into competition with each other across national frontiers, continents and oceans both via competing organizations and via locational substitution *within the same organization*.

Second, these trends have weakened the ability of the state to adopt policies to counteract job losses because internationalization of corporate operations:

challenges the concept of national sovereignty over economic development and change;

makes regional economies and populations more remote from, and less able to influence the executives in, centres of decision making and capital control;

and increasingly sets national states and their governments unwittingly or intentionally in competition with each other. There is now a 'thriving' international 'market place' of governmental national and regional economic and social policies and incentives and of national political, legal and bureaucratic systems giving multinational firms ample scope for 'shopping around' and driving hard bargains. As the world recession has coincided with a major technological revolution, competition for a dwindling 'supply' of new industrial capacities and jobs is fiercer. Regional economies are thus more frequently being caught up in the international politics of recession, protectionism, dumping, surplus capacity and labour unity (or disunity) and in 'backwash' effects of various national political and economic crises or international tensions.

Third, more indirectly, world recession has combined with an inflated (1980–1982, i.e. 'Dutch disease') or unstable (1982–1983) £ sterling related to oil and gas prices to weaken UK competitiveness at home and abroad. Yet competition for UK firms in overseas markets or import penetration of the domestic market – a fundamental process of the market economy which has continued to shape British regional economies for the past century – has received undeservedly little attention. Considerable data limitations are partly to blame. Attempts to overcome these have not been assisted by preoccupations of UK researchers with their national governments', industrial, regional and urban policies which have tended to 'blinker' them to the operation of international processes. Despite pioneering (and largely unpublished) economics work by Woodward, and Gibbs' study of the Manchester clothing industry (Gibbs, forthcoming), there is still much scope for research on this issue. Benefit could be derived from using methods of analysis applied in Sweden by Ohlsson (Ohlsson, 1980; 1983). Nevertheless, as Gibbs implies for one of Britain's oldest industries in which job loss has been continuous and unabated, import penetration may not be the major – or even a significant – cause of decline. Rather it may often be a sympton of organizational, financial, technological, product-design, social and other weaknesses which pervade British industry or British environments locally or nationally.

Fourth, with the profits to be earned by international bankers (partly based in London) from lending to newly – industrializing and some developing countries, there is an additional powerful force to stimulate the displacement and substitution on world markets of a widening range of intermediate and finished goods from producers in older industrial regions by manufacturers in emerging industrial areas, centres and countries.

Although the downward spiralling multiplier effects are as yet hardly understood, let alone documented (but see Townsend, 1982), the broad impacts on regional industrial systems are clear:

(1) substantial contraction or disappearance of once vertically-integrated production chains;

(2) selective 'stranding' of both footloose and locally-linked firms which must restructure to survive;

(3) disappearance of labour-intensive firms and functions unless firms can adopt or innovate labour-replacing automated processes; and

(4) lateral effects of unemployment, falling incomes and social pathologies to 'despoil' the regional and urban business environment.

ISSUES AND CHALLENGES

Relationships between industry and region are multivariate and changeable. Regional populations of active and passive functions, lead and lag organizations, and changing cohorts of units yield an economic mosaic expressed in segmented

regional labour markets. That mosaic challenges the notions of simplistic regional aggregate structures and division of the nation into core, semi-peripheral and peripheral regions. Internationalization of corporate activities also brings into doubt the reality of region-nation interdependencies; both region and nation become highly segmented sub-systems or 'entrepots' (or 'conveyor belts') of multinational corporate production systems. Workers become more 'remotely' controlled or competitive. Shrinkage and segmentation of labour markets following industrial decline and reorganization have also been seriously eroding the one-time national, regional or urban solidarity of workers performing like jobs in the same sector in large-scale enterprises. Labour bargaining power with capital has been seriously weakened.

Preoccupation with economic growth after 1950 largely made governments and researchers alike ill-prepared to cope with the current industrial recession. The coincidence of the energy-cost induced inflation after 1973 with the introduction of job-replacing technologies in the 'trough' between Kondriatiew waves has greatly aggravated structural and social tensions and disturbed change in the industrialized countries and their regions. Contemporary British research is beginning to illuminate the processes, problems and issues involved in de-industrialization which now permeates all UK regions. Widespread decline now, however, should not be allowed to obscure the industrial and business restructuring proceeding, particularly in the London-Telford-Swansea triangle; but this must be harnessed for the benefit of all regions. Nor should it be naively assumed that some future revival of world economic growth will solve unemployment – especially in northern, central and western Britain – comprising millions of workers made redundant in the prime of life, thousands of school-leavers yet to find their first jobs, and women who will soon be displaced from full-time work in metropolitan areas like London by the impending office automation revolution.

The present technological revolution in industrialized nations and sustained growth in newly industrializing countries mean that Britain's industry will require a very significantly smaller labour force in 1990 than today even if it acquires equal or superior competitiveness. Industry will assume a very different form. The greatest challenges to the British government of today are to take a positive lead in harnessing new technologies for the benefit of the people and to find constructive ways for the people of all regions as their human right to share in nationally satisfying gainful and useful employment. To meet these challenges requires that government, business, labour unions and people in general, not only in Britain but everywhere, co-operate to answer the questions 'what is industry for?', 'what is the place of industry in the future economy?', 'who is industry for?' and 'how should work in society as a whole be organized and allocated?'. A holistic production systems approach with human welfare goals should be usefully invoked to help to provide objective answers to these questions.

REFERENCES

Beesley M., 1955, The birth and death of industrial establishments: experience in the West Midlands conurbation, *Journal of Industrial Economics*, 4, 45–61.

Blackbourn A., 1974, The spatial behaviour of American firms in Western Europe, in: F. E. I. Hamilton, ed., *Spatial perspectives on industrial organization and decision making*, Wiley, London – New York.

Bluestone B., Harrison B., 1982, The *deindustrialization of America*, Basic Books, New York.

Breuer H., 1983, Deutsche Industrieansiedlungen in den USA, *Geographische Rundschau*, 4, 174–181.

Britton J. N. H., 1967, *Regional analysis and economic geography: a case study of manufacturing in the Bristol Region*, Bell, London.

Britton J. N. H., Gilmour J. M., 1978, *The weakest link: a technological perspective on Canadian industrial underdevelopment*, Ottawa Science Council of Canada Background Study, 43, Ottawa.

Brown A. J., 1967, What is the Leeds region?, in: M. W. Beresford, G. R. J. Jones, eds., *Leeds and its region*, British Association for the Advancement of Science.

Burgess J., 1982, Selling places: environmental images for the executive, *Regional Studies*, 16, 1–17.

Champernowne D. G., 1938–39, The uneven distribution of employment in the United Kingdom, *Review of Economic Studies*, 6, 111–126.

Chisholm G. G., 1910, Geographical relation of market to seats of industry, *Scottish Geographical Magazine*, 26, 169–182.

Chisholm G. G., 1914, The development of industries of Edinburgh and Edinburgh district, *Scottish Geographical Magazine*, 30, 312–321.

Daysh G. H. J., 1935, A distressed industrial region – Tyneside, *Economic Geography*, 2, 159–166.

Dicken P., Lloyd P. E., 1978, Inner metropolitan industrial change, enterprise structures and policy issues: case studies of Manchester and Merseyside, *Regional Studies*, 12, 181–198.

Dunford M., 1977, Regional policy and the restructuring of capital, *Urban and Regional Studies Working Paper, University of Sussex*, 4.

Dunford M., 1979, Capital accumulation and regional development in France, *Urban and Regional Studies Working Paper, University of Sussex*, 12.

Estall R. C., 1966, *New England: a study in industrial adjustment*, Bell, London.

Erickson R. A., 1981, Corporations, branch plants and employment stability in non-metropolitan areas, in: J. Rees, G. J. D. Hewings, H. A. Stafford, eds., *Industrial location and regional systems*, Bergin/Croom Helm, New York – London.

Gibbs D., 1983, The effect of international and national developments on the clothing industry of the Manchester conurbation, in: F. E. I. Hamilton, G. J. R. Linge, eds., *Spatial analysis, industry and the industrial environment*, vol. 3: *Regional economies and industrial systems*, Wiley, Chichester – New York.

Hall P., 1962, *The industries of London since 1861*, Hutchinson, London.

Hamilton F. E. I., 1967, Models of industrial location, in: R. J. Chorley, P. Haggett, eds., *Models in geography*, Methuen, London.

Hamilton F. E. I., 1969, *Regional economic analysis in Britain and the Commonwealth: a bibliographic guide*, Weidenfeld and Nicolson/Schocken, London – New York.

Hamilton F. E. I., ed., 1974, *Spatial perspectives on industrial organization and decision-making*, Wiley, London – New York.

Hamilton F. E. I., 1976, Multinational enterprise and the EEC, *Tijdschrift voor Economische en Sociale Geografie*, 67, 258–278.

Hamilton F. E. I., 1979, The definition and character of industrial systems, in: F. E. I. Hamilton, B. Kortus, eds., The spatial structure of industrial systems, *Zeszyty Naukowe UJ, Prace Geograficzne* (Special issue), 48, 9–20.

Hamilton F. E. I., Linge G. J. R., forthcoming, Industrial systems and regional economies, chapter 1, in: F. E. I. Hamilton, G. J. R. Linge, eds., *Spatial analysis, industry and the industrial environment*, vol. 3: *Regional economies and industrial systems*, Wiley, Chchester – New York.

Hayter R., 1982, Truncation, the international firm and regional policy, *Area*, 14, 277–282.

Heal D. W., 1974, Ownership, control and location decisions: the case of the British steel industry since 1945, in: F. E. I. Hamilton, ed., *Spatial perspectives on industrial organization and decision-making*, Wiley, London – New York.

Holland S., 1976, *The regional problem*, Harvester, Brighton.

Holland S., 1980, *The uncommon market*, Harvester, Brighton.

Keeble D., McDermott P., eds., 1978, Organization and industrial location in the United Kingdom, *Regional Studies*, Special Issue, October.

Kenyon J. B., 1960, *Industrial localization and metropolitan growth: the Peterson-Passaic District*, University of Chicago, Dept. of Geography Research Paper, 67.

Law C. M., 1980, The foreign company's locational investment decision and its role in British regional development, *Tijdschrift voor Economische en Sociale Geografie*, 71, 3–14.

Leigh R., North D., 1978. Acquisitions in British industries: implications for regional development, in: F. E. I. Hamilton, ed., *Contemporary industrialization*, Longman, London.

Lewis J., Hudson R., Carney J., 1980, *Regions in crisis*, Arnold, London.

Linge G. J. R., Hamilton F. E. L, 1981, International industrial systems, in: F. E. I. Hamilton, G. J. R. Linge, eds., *Spatial analysis, industry and the industrial environment*, vol. 2.: *International industrial systems*, Wiley, Chichester – New York, 1–117.

Lloyd P. E., Reeve D. E., 1982, North West England 1971–1977: a study in industrial decline and economic re-structuring, *Regional Studies*, 16, 345–359.

Luttrell W., 1962, *Factory movement and industrial location*, 2 vols., London.

McConnell J. E., 1983, The international location of manufacturing investments: recent behaviour of foreign-owned corporations in the United States, in: F. E. I. Hamilton, G. J. R. Linge, eds., *Regional economies and industrial systems*, vol. 3: *Spatial analysis, industry and the industrial environment*, Wiley, Chichester – New York.

Martin J. E., 1966, *Greater London: an industrial geography*, Bell, London.

Martin J. E., 1981, La desindustrialisation de la Grande Bretagne, *Revue d'Economie Regionale et Urbaine*, 3, 283–289.

Massey D., 1973, Towards a critique of industrial location, *CES Working Paper*.

Massey D., Meegan R., 1979, The geography of industrial reorganization, *Progress in Planning*, 10, 155–237.

Massey D., 1983, *Industrial location and the economy: considerations on space and class*, Macmillan, London.

Ohlsson L., 1980, Industrial structure and possible industrial futures of Malmohus county, *IIASA Working Paper*, IIASA, Laxenburg.

Ohlsson L., 1983, Structural adaptability of regions during Swedish industrial adjustment 1965–1975, in: F. E. I. Hamilton, G. J. R. Linge, eds., vol. 3, *op. cit.*

Owens P., 1980, Direct foreign investment – some spatial implications for the source economy, *Tijdschrift voor Economische en Sociale Geografie*, 71, 50–62.

Perrons D., 1981, The role of Ireland in the new international division of labour, *Regional Studies*, 15, 81–100.

Rawstron E. M., 1958, Three principles of industrial location, *Transactions and Papers, IBG*, 25, 132–142.

Savey S., 1981, Pechiney-Ugine Kuhlmann: a French multinational company, in: F. E. I. Hamilton, G. J. R. Linge, eds., *op. cit.*

Sayer A., forthcoming, Theoretical problems in the analysis of technological change and regional development, chapter in: F. E. Hamilton, G. J. R. Linge, eds., *op. cit.*

Science Council of Canada, 1982, *Choosing Winners*, Science Council of Canada, Ottawa.

Singer H. W., 1939–40, Regional labour markets and the process of unemployment, *Review of Economics and Statistics*, 7, 42–58.

Smith W., 1941, *Distribution of population and the location of industry on Merseyside*, Liverpool University Press, Liverpool.

Thomas B., 1934, The movement of labour into South-East England, *Economica*, 1, 220–241.

Thomas B., 1938, The influx of labour into the Midlands, 1920–1937, *Economica*, 5, 410–434.

Townroe P., 1972, Some behavioural considerations in the industrial location decision, *Regional Studies*, 6, 261–272.

Townsend A., 1982, *The impact of recession: on industry, employment and the regions 1976–1981*, Croom Helm, London.

Watts H. D., 1980a, The location of European direct investment in the United Kingdom, *Tijdschrift voor Economische en Sociale Geografie*, 71, 3–14.

Watts H. D., 1980b, *The large industrial enterprise*, Croom Helm, London.

Watts H. D., 1981, *The branch plant economy: a study of external control*, Longmans, London.

Wise M. J., 1950, *Birmingham and its region*, British Association for the Advancement of Science.

Wise M. J., 1956, The role of London in the industrial geography of Great Britain, *Geography*, 41, 219–232.

Young S., Hood N., 1976, The geographical expansion of U.S. firms in Western Europe: some survey evidence, *Journal of Common Market Studies*, 14, 223–239.

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THE ECONOMIC DEVELOPMENT OF OLDER INDUSTRIAL AREAS: THE CASE OF THE NORTHERN REGION OF ENGLAND

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The purpose of this paper is to provide a broad overview of economic development in the Northern Region of England. The paper draws on a variety of studies of industrial location trends and relates these to the development of the region. In particular the paper examines the inter-action of general forces that have been shaping the British economy in the post-war period – such as industrial concentration, the shift to white collar workers and the pressure for industrial innovation – with the specific conditions in the North arising from its history of development. The paper attempts to synthesize quantitative studies of the location of economic activities with a more qualitative appreciation of local conditions.

THE NORTHERN REGION: CURRENT SITUATION

The Northern Region is one of the eight English economic planning regions. The term 'economic planning region' is currently something of a misnomer since in 1979 all formal regional economic planning in the UK was abandoned. The region has a current population of around 3 million and on a wide range of indicators is one of the most deprived regions of England. This point is graphically illustrated by Table 1 which compares 'the life chances' of one 1,000 children born in the region and in the South East Region at various stages of the life cycle. Perhaps the most significant contrasts from the point of view of this paper are in the proportions staying on at school beyond the minimum school leaving age, taking advance school qualifications and going on to full time higher education. Wide ranging social and economic implications follow from the subsequent differentiation of the population into blue and white collar groups, a differentiation largely based on educational attainment. Thus 19 per cent of the North's employees work in office occupations, compared with 32 per cent of the working population in the South East Region. A further contrast highlighted by Table 1 is that of employment opportunities. The unemployment rate in the North is currently the highest in England and Wales with one in five men out of work. However, within the region, there are significant variations about this average ranging from over 30 per cent in Consett (a steel closure area) to 9 per cent in Hexham (a market town 20 miles from Newcastle and only 10 miles from Consett); there are equally strong contrasts in social conditions. To talk of 'the Region' as a coherent whole is therefore misleading. Rather, the area is composed of a number of labour markets with different economic

Table 1. The fortunes of 1,000 children: Northern Region and South East Region

	North	South East
Still births per 1,000 live births	8	7
Live Births	1,000	1,000
Deaths within one month	8	7
Staying on at school at age 16	270	413
School leavers one or more A levels	124	180
School leavers, no graded results	743	693
School leavers going to University	68	82
School leavers going to other full-time education	84	148
Unemployed, age 20	144	79
Unemployed, age 35	74	41
Economically active, age 35	801	752
Unemployed, age 50	65	37
Economically active, age 50	700	700
Survivors, age 70	618	689

Source: The State of the Region Report, 1982, North of England County Councils Associations.

and social structures. These include a number of dominant centres (Newcastle and Teeside), sub-dominant centres in their hinterland and existence of free standing towns and a significant number of rural areas outside the commuting influence of the urban centres.[1]

HISTORICAL ANTECEDENTS

The North has not always been an economically depressed area. Up until the 1880s, parts of the area prospered as a result of natural resource endowment (coal, iron ore, chemicals), endowments which were exploited largely by local capitalists who ultimately built up heavy engineering industries on Tyneside, Wearside and Teesside. Many significant innovations of the industrial revolution sprang from Tyneside and Teesside. A well developed institutional infra-structure linked together industry, commerce and education. For example, the structure of the departments of the precursor of the University of Newcastle closely reflected the needs of industry on Tyneside.

Although it is difficult to identify precise turning points, it is generally agreed that during the last decades of the 19th century much of this initial dynamism began to be dissipated. Many leading enterprises failed to invest in new products and processes (e.g. in the manufacturing of chemicals and steel), innovations that were forced on competitors in countries like Germany which lacked a secure empire market. This failure was concealed by the rearmament boom prior to the First World War; by supplying the state directly or indirectly many firms avoiding selling in competitive market places. In the 1920s and early 1930s the poor performance

[1] M. G. Coombes, J. S. Dixon, J. B. Goddard, S. Openshaw, P. J. Taylor. Functional regions for the population census of Great Britain, in: *Geography and the urban environment. Progress in research and applications*, vol. 5, D. T. Herbert, R. J. Johnston, eds., John Wiley & Sons Ltd, 1982, 63–112.

of many Northern firms was attributed to the world wide recession and not to any structural weaknesses. Once again, rearmament before the Second World War and then the subsequent boom which arose in order to equip the devasted economies of Germany, France and Japan concealed the basic problem. It was not until the late 1950s with oil replacing coal as a major fuel and the coming on stream of the modernised economies of Europe and Japan that the full impact of the underlying structural weaknesses in the North's traditional industries became apparent. In the next fifteen years massive job losses occurred in these industries – for example 117,000 jobs disappeared in mining, 25,000 in shipbuilding, 13,000 in metal manufacturing between 1958 and 1973.

PAST POLICY RESPONSES TO THE REGION'S PROBLEMS

The public policy response to these job losses was to attempt to reduce the dependence of the region on its traditional industries by diversifying the structure of the economy in aggregate through the introduction of new industry from outside. This was achieved by a mixture of controls on industrial expansion in the prosperous South East and West Midlands regions and financial incentives for investment in the North (and other similar areas in Scotland, Wales, Merseyside and Northern Ireland). These policies were highly successful in plugging the employment gap created by job losses in the traditional industries. Between 1958 and 1973, in spite of the massive declines noted above, total employment in the Northern Region had fallen by only 4,000 jobs. A wide range of new industrial sectors came to be represented in the region, chiefly in the branches of national and international companies. The Northern Region Strategy Team estimated that 50,000 manufacturing jobs were created in the post-war period as a result of regional policies.[2] They estimated that out of 450,000 manufacturing jobs in the region in 1972, 70,000 were in firms established after 1952. However, these achievements were made at considerable cost; at its peak in 1975/76 regional industrial assistance in the UK as a whole was running at the order of £ 900M gross (or £ 400M net after having allowed for benefits arising from reduced unemployment, increased taxes, etc.). Approximately one third of this expenditure occurred in the North.[3] These policies undoubtedly prevented a potentially difficult situation becoming worse than it might otherwise have been. However, as Table 2 indicates the rate of job loss in the manufacturing sector has accelerated again during the 1970s particularly in the period since 1976. With a heavy dependence on export orientated manufacturing the region has been particularly affected by the over-valued 'petro-pound'. Moreover the earlier growth of jobs in the service sector has now disappeared particularly because so much of service employment in the region is in the public sector and this has been particularly affected by constraints on public expenditure. While much of this loss of jobs can be attributed to the national economic situation there can be little doubt that state assistance to the region in the past has failed to create a strong economy that can withstand international pressures. The remainder of the paper will probe deeper into this failure and also discuss future policy options.

For ease of presentation the discussion will be divided into two parts – one concerned with indigenous or locally owned industry and the other with the externally owned sector. Before proceeding some comment on the relative size of each sector is appropriate.

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[2] *Strategic plan for the Northern Region*, HMSO, London 1977.

[3] J. Marquand, *Measuring the effectiveness of regional policy*, Government Economic Service, Working Paper, Department of Industry, London.

TABLE 2. Employment change by industry: Northern Region, 1966–1976 and 1976–1981 (thousands)

INDUSTRY	1966	1976	Change 1966–76	1981	Change 1976–81
Agriculture, forestry, fishing	23	16	−7	14	−2
Mining and quarrying	107	50	−57	45	−5
PRIMARY	130	66	−64	59	−7
Food, drink, tobacco	31	32	+1	28	−4
Chemicals, etc	60	54	−6	50	−4
Metal manufacture	62	47	−15	26	−21
Engineering	113	118	+5		
Shipbuilding	58	48	−10	149	−43
Vehicles, metal goods n.e.s.	24	26	+2		
Textiles, leather, clothing	56	53	−3	35	−18
Other manufacturing	59	61	+2	54	−7
MANUFACTURING	463	439	−24	342	−97
CONSTRUCTION	105	96	−9	80	−16
Gas, electricity, water	24	20	−4	20	−
Transport and communications	85	66	−19	65	−1
Distributive trades	152	144	−8	133	−11
Insurance, banking, finance	23	31	+8		
Professional and scientific services	130	180	+50	345	+11
Miscellaneous services	97	123	+26		
Public administration and defence	71	91	+20	87	−4
SERVICES	582	655	+73	650	−5
TOTAL*	1277	1255	−22	1130	−125

* Note: Industry figures rounded to nearest thousand so do not exactly sum to total; 1981 figures are provisional estimates (for June).

Source: Department of Employment.

In 1963 approximately 48 per cent of manufacturing employment in the region was in locally owned industrial establishments. By 1973 this proportion had fallen to 22 per cent. The growth of external ownership during this period has arisen not only though the increasing share of employment accounted for by branch plants established in the region with the aid of government assistance. It can also be attributed to the acquisition of indigenous companies by firms headquartered outside the region. Thus by 1973 31 per cent of all manufacturing employment was in previously indigenous firms acquired by non-regional companies. The significance of this high level of external ownership will be discussed at several points in the remainder of the paper.[4]

THE NATURE OF INDIGENOUS INDUSTRY[5]

The indigenous sector of Northern industry is dominated by a limited number of large engineering companies some of which (e.g. shipbuilding) are now state owned.

[4] I. J. Smith, The effect of external takeovers on manufacturing employment change in the North, *Regional Studies*, 13, 1979.

[5] See N. Segal, The limits and means of 'self-reliant' regional economic growth, in: D. Maclennan, J. B. Parr, eds., *Regional policy: Past experiences and new directions*, Martin Robertson, Oxford 1979.

The companies tend to be product rather than market orientated, selling 'one off' goods to specific customers often in the UK public sector. The companies generally support a limited range of modern management functions like market intelligence. At the same time a number of smaller satellite suppliers can be identified who have become increasingly dependent on the shrinking market these large companies offer. For example, a study of small firms supplying the shipbuilding industry has revealed that many locally owned suppliers have steadily become more dependent on this industry – in order to maintain a larger share of a declining market.[6] The similarity to Glasgow where the shipbuilding industry has also cast a shadow over the rest of industry in the city is striking.[7]

Even in those parts of the indigenous industrial sector operating in generally dynamic markets the orientation to change in the form of new and improved products would appear to be well below the national average. Thus a survey of product innovation in three nationally innovative sectors (electronic components, industrial and scientific instruments, and metal working machine tools) has revealed that only 44 per cent of independent firms in the North introduced a new and improved product in the five year period ending in 1977 compared to 77 per cent of similar firms in the South East. This lack of innovation would appear to be associated with a lack of commitment to R & D and contacts with sources of technological information outside the region.[8]

There are of course exceptions to this general picture of a dependent and non-innovative indigenous sector. However, the experience of the 1960s and early 1970s would suggest that many of the more successful of the Region's companies have been acquired by firms based outside. Subsequent to acquisition local employment growth appears to have slowed down, pointing to a removal of managerial functions which have been centralised on the acquiring company's headquarters. More significantly the rate of closures of acquired plants would appear to be four times the regional average for all closures with approximately 10,000 jobs lost in acquired plant closures between 1963 and 1973, largely as a result of post-merger rationalisation to eliminate excess capacity.[9]

THE NATURE OF NEW INDUSTRY

The expectation was implicit that the introduction of new plants to the region through government financial assistance would overcome the problem inherent in indigenous industry. New firms would not only bring in employment but new production and managerial techniques would be transferred to other firms in the area. This would occur either directly through the purchase of components manufactured to high specification standards or indirectly through these firms, contribution to the local labour market and social milieu. Reality proved to be much different.

In the first place most of the new industries consisted of production only branch plants locked into patterns of intra-corporate trading with local management

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[6] G. Rabey, Contraction poles: an explanatory study of traditional industry decline within a regional industrial complex, *CURDS Discussion Paper Number 3*, University of Newcastle upon Tyne, 1977.

[7] See S. Checkland, *The Upas tree*, Longman, London, for a discussion of the recent economic history of Glasgow.

[8] A. T. Thwaites, R. Oakey, P. Nash, *Industrial innovation and regional economic development.* Final Report to the Department of the Environment, Centre for Urban and Regional Development Studies, University of Newcastle upon Tyne, 1981.

[9] I. J. Smith, *op. cit.*

having little autonomy over purchasing or investment decisions. While these firms did contain on average a higher proportion of white collar workers to total employment than indigenous firms (36 per cent as compared with 28 per cent of total employment), most of these staff were in production management and few in research and development activities or other functions.[10] When compared with similar status branches and subsidiaries elsewhere in the UK, those in the North are revealed to have had a smaller representation of non-production workers.[11] Services like accounting, are provided by company headquarters and not purchased from local business service firms: survey results suggest that only 22 per cent of the service requirements of branch plants in the North are met within the region compared with 77 per cent in the case of locally owned firms.[12]

When set alongside the facts on the loss of local firms through acquisition these findings on purchasing have important implications for Newcastle as the regional capital. At the turn of the century Newcastle was the focal point a regionally organized economy providing business and financial services to a wide area. In the post-war period it has retained and even strengthened its position as a retail service centre but virtually ceased to function as a significant business service and financial centre. In an institutional sense also the leading personnel of the new industries have not been integrated into the social fabric of the city or the region.[13] Most production managers are locked into a corporate career path and spend only a few years in the region. As the older industries have passed into state ownership and transferred their headquarters out of the region, positions of influence in the area have returned (if they ever left) to the landed rural interest many of whom had financed the original industrialisation. In industrial terms there can be little doubt that new firms succeeded in diversifying the structure of the region in terms of the range of sectors represented. But when one looks below the sector level to individual products it is apparent that although in modern industries like electronics, many firms were manufacturing goods that were highly standardised and at the end of their product life cycle (e.g. electro-mechanical telephone exchanges) and therefore vulnerable to the introduction of new technologies elsewhere. Moreover, such standardised products were particularly susceptible to competition from low labour cost countries overseas. The experience of the North in relation to the textile industry which was introduced to the area largely as a result of government regional assistance clearly illustrates most of these points.

THE TEXTILE INDUSTRY IN THE NORTH[14]

In 1945 the manufacturing of textiles in the North was of minor significance. However in the immediate post-war period the dispersal of the industry from its traditional centre in West Yorkshire was encouraged by the Board of Trade in order to overcome shortages of labour, especially female labour, in that area. For example, one of the largest and longest established enterprises in the industry, Patons and

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[10] J. N. Marshall, Corporate organisation and regional office employment, *Environment and Planning A*, 11, 1979, 553–563.

[11] R. E. Crum, G. Gudgin, *Non-production activities in UK manufacturing industry*, Regional Policy Series No. 3, Commission of the European Communities, Brussels 1978.

[12] J. N. Marshall, Ownership, organisation and industrial linkages, *Regional Studies*, 13, 1979.

[13] N. Segal, *op. cit.*

[14] See I. Hardill, Wool textiles in the North: an ephemeral industry, *Northern Economic Review*, 5, 1982, 28–33.

Baldwins replaced five worsted plants in Leeds by a single operation in Darlington in 1945. In the following year Lister and Co. established a branch to manufacture yarn and cloth at Barrow-in-Furness. A second round of transfers occurred in the 1960s and coincided with major restructuring in the industry. Courtaulds, a manufacturer of synthetic fibres, sought a secure market for its products and therefore acquired textile manufacturers with branches in the North. It also established its fibre production outside the traditional wool textile areas, for example with a major branch located in Spennymoor. During the same period a major manufacturer of cotton yarns, J. and P. Coates pursued a diversification strategy into wool textiles, merging with Patons and Baldwins: this meant that branches in the North changed ownership.

TABLE 3. Coats Patons comparative labour costs April 21, 1981

Country	Single shift		Double shift		Treble shift	
	Total cost £ HR	Index	Total cost £ HR	Index	Total cost £ HR	Index
UK	2.678	100	3.186	100	3.481	100
Italy	3.259	122	3.499	110	4.943	121
W. Germany	3.561	133	3.696	116	3.913	115
Canada	3.596	134	3.564	112	3.613	109
US	3.134	117	3.134	98	3.157	96
Portugal	1.076	40	1.177	37	1.799	42
Colombia	0.958	36	1.121	35	1.304	36
Brazil	0.840	31	1.009	32	1.065	31
Peru	0.611	23	0.620	19	0.637	19
India	0.342	13	0.345	11	0.416	11
Philippines	0.276	10	0.276	9	0.282	8
Indonesia	0.166	6	0.169	5	0.168	5

Source: Financial Times, 26.6.81.

These structural transformations were followed by a decline in demand for wool and synthetic textiles arising from changes in fashion and increased international competition. Companies had to remove excess capacity to remain profitable. In this process many of the branches in the North were closed. Thus the number of textile plants fell from 18 to 6 between 1971 and 1982 with 2,600 jobs lost. In the remaining plants a similar number of jobs were lost through *in situ* contractions. The international dimension to this closure is of particular importance. Although demand for wool textiles in the UK was declining, world demand was still expanding. The leading UK companies like Coats Patons sought to serve this demand from overseas branches where labour costs were lower. By 1980 67 per cent of Coats Patons' workforce were based overseas and Table 3 indicates that comparative labour costs have been a major factor in this shift. Thus during the 1970s the company established plants in Spain, Portugal, Malaysia, Hong Kong, Brazil, Thailand and the Phillipines. In contrast, Listers, a company which has remained in the UK has closed plants in West Yorkshire and one of its plants in the Northern Region (Darlington) and concentrated its production in the other (Barrow-in-Furness). In this way the company was able to take advantage of regional assistance (Regional Development Grants) and in addition sectoral aid to the industry for restructuring.

Another feature of the wool textile industry that deserves special mention is its preference for female labour, a preference which appears to go back to the days of the

domestic system. The North characteristically had low female activity rates associated to some degree with the constraint imposed on the household by the shift work system traditionally employed in industries like coal mining. The decline of mining and the introduction of more regularized patterns of work made it possible for more women to enter the labour-force. More importantly this female labour was often non-unionised; this was in marked contrast to the traditional core area of the industry in West Yorkshire where a wide range of restrictive practices associated with the numerous craft skills remain, in spite of the fact that new technologies had made many craft demarcations irrelevant.

THE CHANGING GEOGRAPHY OF ECONOMIC ACTIVITY WITHIN THE NORTH

The movement of industry to the North in the post-war period is inseparable from its changing distribution within the region. Like all of the UK regions, the North has experienced a net shift of employment from the major urban centres to the surrounding areas. This rate of decentralisation was lower than in more prosperous regions and proportionally more influenced by state intervention, particularly in the form of New Towns. Initially New Towns like Peterlee and Cramlington were not intended for overspill purposes *or* for attracting mobile industry but rather for restructuring dispersed settlement patterns on the Durham and Northumberland coalfields.[15] Mining was to be the monopoly employer of men and manufacturing jobs of women were to be encouraged. With the subsequent run-down of mining Peterlee had to attract mobile industry. However, in this process there was considerable competition between it and Washington New Town, more conveniently located on the edge of the Newcastle conurbation.

Apart from the role of New Towns there has been much discussion of the cause of the net shift of employment from large urban centres to smaller towns and rural areas. Although there has been some re-location of firms the main difference has been in differential rates of employment expansion. One explanation is that of 'space constraint'.[16] The suggestion is that firms in urban areas occupy most of their sites and are not able to expand *in situ* in order to accommodate increasingly space extensive forms of production. In contrast in smaller towns in rural areas no such constraint exist.

There appears to be little evidence of the relevance of this general explanation in the North. On Tyneside much of manufacturing activity is concentrated in government factory estates within the built up area while Teesside has vast petro chemical complexes on extensive sites within the urban area. It is true that the shipbuilding industry on the Tyne and on the Wear does operate from difficult sites but this could hardly be a major explanation for its decline. Similar strictures apply to the Vickers Engineering Works on the Tyne; its run-down was associated with reinvestment outside the Region but when conditions were right a new factory was built on an adjacent and equally restricted site. Nevertheless it is reputed to be the longest factory in the country.

Other explanations of the growth of employment outside the city stress the more favourable position of capital in relation to labour in less urbanised areas.[17] Many

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[15] F. Robinson, State planning of spatial change: compromise and contradiction in Peterlee New Town, in: *Redundant space*, R. Hudson, J. Lewis, eds., Academic Press, London 1983.

[16] G. Gudgin, S. Fothergill, *Unequal growth: urban and regional employment change in the UK*, Heinemann, London 1982.

[17] D. B. Massey, In what sense a regional problem? *Regional Studies*, 13, 1979.

of the small towns and rural areas were characterised by single dominant employers of which the historic example was the Coal Mining Industry in numerous small settlements in West Durham but also the Iron and Steel industry in Consett. In many places coal mining was replaced by a new single industry (e.g. battery manufacturing in Stanley, Co. Durham); in other instances new industries went to rural market towns previously lacking a manufacturing base (e.g. pharmaceuticals in Bernard Castle) to become the dominant employer in these towns. But dominance is equally characteristic of some of the urban centres with highly localized labour markets around each shipyard on the Tyne.

These contrasts suggest that one cannot derive explanations of the cause of shifts of industry from urban to non-urban areas in the North by examining the pattern of change itself. A simple urban/rural classification oversimplifies the processes of change that are at work. Rather one has to consider the changes in terms of the successive rounds of investment and disinvestment by capital in the context of the specific conditions prevailing in each locality at the time, with these conditions being inherited from all previous rounds of investment.[18] The so called 'urban – rural shift' and dispersal of manufacturing activity to the peripheral regions of Britain is a consequence of a process which has produced very different results in different places. Moreover, the characteristics of places such as the lack of a previous industrial base have also influenced the process of restructuring itself.

FUTURE POLICY OPTIONS

MOBILE INDUSTRY

The prospects of the North attracting new industry to replace the jobs lost in the Region's traditional sectors and in the new branches recently closed are extremely limited. In the long term perspective the high levels of industrial mobility which characterised the period up until 1966 are likely to be regarded as unique. Up until that date output growth and employment growth in manufacturing were closely linked. Demand for labour was increasing and firms could be attracted to areas of relatively high unemployment. From 1966 to 1973 increases in output ceased to provide additional jobs; from 1973 the relationship became negative with output increases leading to employment decreases.[19] These findings correspond with evidence of the declining effectiveness of regional incentives to attract industry to Britain's Assisted Areas which show that the rate of net job creation associated with regional policy declined through the 1970s.[20] The growth of unemployment in areas like the West Midlands has led to the removal of the disincentive element to regional policy; conversely regional incentives has been concentrated on the most deprived parts of the region. These developments all suggest that the direct role of the state in bringing new industry to the area must decline.

However, all of these negative factors should not be taken to imply that *no* new industry will come to the region. The example of textiles indicates that industry is continuously restructuring in order to remain profitable and in this context there will

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[18] D. B. Massey, Industrial restructuring as class restructuring: production decentralisation and local consequences, *Regional Studies*, 17, 1983.

[19] R. Rothwell, W. Zegveld, *Industrial innovation and public policy: preparing for the 1980s and the 1990s*, Frances Printer (Publishers) Ltd, London 1981.

[20] J. Marquand, *op. cit.*

always be potentially mobile jobs.[21] Listers Textiles now is the second largest employer in Barrow-in-Furness after shipbuilding although this position has arisen at the expense of West Yorkshire. As has already been mentioned, after shutting its Scotswood factory in Newcastle, Vickers have opened a new factory in the adjacent Enterprise Zone, taking advantage of the government's desire to attract new industry into the Inner City. So in certain circumstances the North will have comparative advantages but the nature of these will change from time to time. The assessment of these comparative advantages will be difficult. For example, it has been suggested that the lack of union militancy was one factor attracting the textiles industry to the North; declining union power because of the recession and government legislation could reduce that advantage. On the other hand, the shift of industry to non-unionised areas (or the threat of such a shift) could be used to accelerate the national trend towards de-unionisation.

INDIGENOUS DEVELOPMENT

Because of the decline in mobility of industry increasing attention is being focussed on indigenous development. This term embraces a wide range of policy initiatives such as stimulating the birth of totally new enterprises, either of a capitalist or co-operative nature; the development of locally owned small and medium sized enterprise particularly through the stimulation of technological innovation; the retention of jobs in the externally owned sector, again through technological renewal and finally increasing the level of indigenous ownership through de-mergers or management buy-outs. All these initiatives have limits and contradictions.

NEW AND SMALL FIRMS

The attraction of new and small firms arises from their perceived contribution to job generation and the fact that unlike branch plants, control rests within the community. However, the evidence on new and small firms in relation to job generation is not clear cut.[22] Although their share of total employment is increasing in Britain this is largely due to the more rapid decline of employment in large firms where scale economies of new technologies can be reaped. While new firms make a significant contribution to *gross* job generation, when account is taken of job losses through closure of established businesses, possibly because of the entry of new firms, the *net* gains are not so great.

Notwithstanding these and numerous other caveats, the stimulation of new and small businesses receives wide support from central and local government of both political pursuasions. But as a solution to the North's employment problems major obstacles become apparent. On a large number of counts the local economy and social environment is hostile to new firm formation. Even if there was a dramatic increase in the rate of new firm formation in the UK as a whole, the North would not benefit to the same degree as regions like the South East[23] (Table 4). New and small firms usually sell in a local area but the Northern economy is the least buoyant of all the English regions. Because market demand is static or declining new firms are likely to displace the business of existing local enterprises. Local marketing opportunities are also limited because so much of manufacturing industry is run by

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[21] D. B. Massey, R. Meegan, *The anatomy of job loss: the how, why and where of employment decline*. Methuen. London 1982.

[22] D. J. Storey, Small firms and economic recovery, *Northern Economic Review*, 2, 1982.

[23] D. J. Storey, *Entrepreneurship and the small firm*, Croom Helm, London 1982.

branch factory managers who have little autonomy to make purchasing decisions. Individuals also tend to set up new business in the sector of their previous employment but the North is dominated by sectors like steel, shipbuilding and chemicals where the barriers to entry are high. Moreover, these sectors are characterised by large plants where the likelihood of a potential founder having direct contact with management is low. Last but not least the North has an under-representation of employers in managerial occupations in both the indigenous and externally owned sector, and it is from these occupations that most successful entrepreneurs are drawn.

TABLE 4. Indicators of barriers to entrepreneurship, Northern Region and South East (regional rankings)

	Northern Region	South East
1. % of total manufacturing employment in small plants	9	1
2. % of total manufacturing employment in large plants	11	4
3. % of school leavers taking degree course	9	3
4. % school leavers without qualifications	4	2
5. % economically active in managerial and professional classes	7	1
6. % economically active in manual occupations	9	1
7. Savings per capita	3	4
8. % householders who are in owner-occupied property	11	7
9. Average dwelling price	6	1
10. % employment in metals, shipbuilding and chemicals (high barrier to entry industries)	11	2
11. Disposable income per capita	6	1
Total Rank	11	1

Source: D. J. Storey: *Entrepreneurship and the small firm*, Croom Helm, 1982.

In the light of these considerations it is not surprising why that the North has the third lowest birth rate of new business foundation in Britain and the second highest death rate relative to births. Moreover, the scale of net job generation is small relative to the magnitude of the jobs lost in the branches of large companies in the region. Thus in the relatively prosperous period 1965–1978 only 12,000 new jobs were created in wholly new firms compared with a loss of 40,000 jobs in complete closures of large plants in the four years 1978–1982. Most new firms start small and if they do not close remain small; in the North about one in every two hundred small firms set up in the period 1965–1978 had more than a hundred employees ten years later.[24]

TECHNOLOGICAL INNOVATION

Technological innovation in existing firms is seen by many as a way of retaining the competitive position of Northern industry. If firms in the region fail to introduce new and

[24] D. J. Storey, *op. cit.*

improved products they are likely to be superseded by competitors elsewhere in the country or in the world economy. Policies to stimulate innovation in the region's industries therefore have an obvious attraction.[25]

However such policies face considerable difficulties. Perhaps the most immediate of these is the lack of research capability within companies in the region as compared with elsewhere. The study of the metal working machine tools, electronic components and scientific instruments industries referred to earlier in the paper has revealed that on-site R & D capability is an important influence on the likelihood of product innovation, even in branch factories.[26] Yet the commitment to R & D in the North is much less than in the South – an average of 13.7 workers per factory site compared with 34.1 in the South East with the maximum numbers ranging from 60 in the North to 300 in the South East.

In addition to more on-site R & D, factories in the South East have ready access to detached research laboratories in both the public and private sectors. Most of these can be found in semi-rural locations in a ring around London. The correlation between innovation and R & D capability on the factory site suggest that a more even distribution of R & D might bring considerable national economic benefits. British industry has been characterised by over ambitious technological leaps and insufficient commitment to incremental improvement of existing products. The concentration of research in the detached laboratories almost certainly encourages this approach.

Against this point of view it could be argued that a more dispersed pattern of R & D would produce serious damage to effective face to face communications between scientists concentrated in the South East. However, improvements in air and rail transport between the North East and London (now a three hour journey) would suggest that this is not a serious constraint. Scientists function quite adequately in British Universities which are well dispersed throughout the country. Moreover, improvements in telecommunications could further reduce this problem. Since most of the dispersal would be a re-allocation between different sites of large companies, communications would remain within the corporation. Studies of inter-regional business travel from the North and London suggest that it is this type of communications that is most readily substitutable by new technologies.[27]

So if there are economic benefits and few communication obstacles, why does the North have such an under-representation of research activities? The answer probably lies in social rather than economic factors.[28] The highly skilled technologists and scientists placed in the South are the elite of the new industrial order and therefore in a strong bargaining position. The South East outside London offers numerous residential advantages – climatic, environmental and above all, an institutional situation which is supportive of the needs of such an elite (Clubs, Private Schools, strong land use planning controls preserving residential amenities etc). The high density of employment opportunities means that individuals can change jobs (e.g. between private and public laboratories and between companies in different sectors) without changing home and in the process transfer valuable technical information from one employer to another. There is little possibility of the North reproducing such an environment.

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[25] A. T. Thwaites, Some evidence of regional variations in the introduction and diffusion of industrial products and processes within British manufacturing industry, *Regional Studies*, 16, 1983, 371–381.

[26] A. T. Thwaites, R. Oakey, P. Nash, *op. cit.*

[27] J. B. Goddard, Technology forecasting in a spatial contex, *Futures*, 1980.

[28] D. P. Massey, personal communication.

However, while the North cannot hope to rival the South East in terms of basic technological innovation there is much scope for improving the technological capability of Northern industry on a broad front by policies designed to stimulate best industrial practices in existing firms in the region. This implies a more active role on the part of government in 'delivering' this industrial policy.[29,30]

The principal difficulty with this 'local policy delivery strategy' is that local management in the North seldom has the autonomy to make investment decisions even if it has the necessary information. It has therefore been suggested that government should make efforts to increase the degree of indigenous ownership in the region by under-writing 'buy-outs' of brach plants by their local management.[31] A factory which is not viable in the context of a large corporation may be able to find a market niche as an independent company. One difficulty with such a strategy is that local management, because marketing, R & D and other functions do not exist, may not have the necessary capability to run a self-sufficient company and therefore the risk of failure is high. More fundamentally, management as opposed to workers' buy-outs would not change the relationship between capital and labour and thereby produce truly indigenous activity.

One further technological policy option deserves a final mention. In relation to R & D it has been already suggested that developments in telecommunications technology could reduce the remoteness of the North for communication intensive office functions which are now concentrated in the South East. This could facilitate some dispersal of white collar jobs in large organisations. Such dispersal has already occurred to some degree in the public sector. But the jobs dispersed have been low level clerical jobs (e.g. social security payments) which are particularly vulnerable to displacement by new office technology. Because higher level jobs still rely to a large degree on face to face communications, dispersal of these functions requires a greater degree of decentralisation of administrative responsibility in large organisations. New communications technologies could support such a decentralisation strategy. Equally however, improved communications could be used to accelerate the loss of autonomy in the Region. Existing evidence would suggest that, on balance, new communications technologies are facilitating greater centralisation of control within large organisations.[32] Moreover, the balance of advantage in terms of communications costs is tipping further towards large firms who are able to achieve scale economies by renting private lines and installing compatible equipment throughout the company.

There are other ways through which smaller enterprises in the North are likely to be disadvantaged by developments in New Information Technology. The 'privatisation' of British Telecommunications into a number of separate regional companies which have to invest in new facilities from retained profits will mean that the cross subsidisation of telecommunications infrastructure and services from rich to poor

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[29] As befits a country where agriculture has an influence out of all proportion to its employment size much more effort has gone in to farming as opposed to industrial advisory services. Just as agricultural policy is delivered to the farm gate so industrial policy needs to be delivered to the factory where most technology is implemented. As British industry has become more and more concentrated the channels of communication have been longer between board and factory level. At the same time government policy has been targetted at the board level in London and not at the sharp end of production where it really matters.

[30] A. T. Thwaites, *Regional technology change centres.* Working Note, Centre for Urban and Regional Development Studies, University of Newcastle upon Tyne, 1983.

[31] D. J. Storey, Management buyout, *Regional Studies*, forthcoming.

[32] J. B. Goddard, *op. cit.*

regions is likely to cease. The introduction of new facilities in the South East may favour companies providing 'value added network services' which can be delivered to the North to the detriment of companies at present sheltering behind the barriers of distance and dependent on a small local market base. So rather than reducing regional equalities by lowering the barriers to communications, new information technologies may have the reverse effect.[33]

REGIONAL DEVELOPMENT VERSUS URBAN DEVELOPMENT

Some of Britain's most pressing problems of social deprivation can be found in the centres of the largest cities such as Liverpool, Birmingham and London. While this is true to some degree in the North there are also concentrations of deprivation outside Newcastle (e.g. Hartlepool, Workington, Consett). The newly emerging set of problems has created considerable difficulties for the State in assessing spatial priorities and these conflicts are clearly exemplified in the North.

Regional policy has traditionally been the responsibility of the Department of Industry. The intellectual justification of the policies in the 1960s was its contribution to national economic efficiency through reducing inflationary pressures generated in the congested South East. Industrial movement to the Assisted Areas was directed chiefly to ex-urban locations and therefore did not contribute to alleviating emerging problems in the Inner Areas of large cities in these regions. With increasing urban problems, including racial violence, much of the initiative for spatial policy has now switched to the Department of the Environment which is also the Ministry responsible for overseeing local government. As a result increasing emphasis is being placed on urban economic development initiatives run jointly by local authorities and the Department of the Environment. Many of these initiatives have taken the forms discussed above – attempts to attract mobile industry back into the city through the establishment of Enterprise Zones, attempts to stimulate new and small firms, attempts to bring about higher rates of technological innovation.

These diverse economic initiatives have been pursued in areas with very limited economic potential – indeed the areas have been identified on the basis of indicators

TABLE 5. Public sector employment in the Northern Region, 1978

	000s	% total
Coal mining	45	3.6
Shipbuilding	47	3.8
Steel	38	3.1
Gas, electricity, water	17	1.0
Public transport	36	2.9
Education	96	7.7
Medical	66	5.3
Local government	52	4.2
National government	38	3.1
Total public sector	435	35.1

[33] J. B. Goddard, A. T. Thwaites, A. E. Gillespie, I. J. Smith, J. N. Marshall, *New information technologies and the less-favoured regions of the community*. Interim Report to the EEC, Centre for Urban and Regional Development Studies, University of Newcastle upon Tyne, 1982.

of social deprivation. The initiatives have been very localised and their very diversity has created a mosaic of policy zones within each city. This highly localised spatial policy contrasts with the broader framework of traditional regional policy which had enabled industry to select locations within a wide area.

What this approach has overlooked is that the prosperity of the cities in the North is to some degree dependent on the prosperity of the regional economy as a whole. Notwithstanding the relative decline of business services mentioned earlier in the paper, Newcastle remains a major centre for personal services for a region extending North to the Scottish border, West to the Cumbrian Coast and South to North Yorkshire (73 per cent of employment in the city is in the service sector). Attempts to rejuvenate manufacturing activity within the urban area therefore appears to run contrary to the city's comparative advantage.

CONCLUSION

In this paper the economic development of the North has been analysed principally in terms of the evolution of the manufacturing sector. However through the discussion it should have been apparent that not only is the manufacturing sector of declining importance nationally and regionally but also that the conventional sectoral classification of economic activity is of little relevance conceptually. The older sectoral specialisation of the regions of the UK economy is breaking down: in terms of overall industrial structure the regions are becoming more alike. What is arising is a new division based not on the industries in which people work but the types of jobs they perform. The basic distinction now is one between a South dominated by higher level managerial jobs in manufacturing and services and the North dominated by manual and lower level clerical jobs. As a consequence there is a more clear cut social differentiation of the British space economy that has existed at any time in the past.

A further important division of the economy is that between the public and the private sector. The discussion in the paper and most of the analysis upon which it has been based has concentrated on the private sector and its restructuring. However, in the North the public sector is now a leading employer both in both manufacturing and services, particularly within the cities (Table 5). This sector encompasses nationalised industries, state corporations, the public utilities, the health and social services, central and local government. Apart from local government, decision making in the region in the public sector is largely outside immediate political control. Various attempts are being made to make the sector financially more accountable and in this process private sector motives are being introduced. In this process urban and regional considerations are increasingly taking a back seat.

THE RELATIONSHIPS BETWEEN THE LOCATION OF THE AGRICULTURAL PROCESSING INDUSTRY AND THE AGRICULTURAL PRODUCE BASE IN THE POZNAŃ REGION

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INTRODUCTION

The aim of the present paper is to analyse the factors determining the dimensions and spatial pattern of the relationships between the agricultural processing industry and the agricultural produce base. The analysis concerns three branches of the agricultural processing industry (the sugar, potato and spirit industries) and examines two main groups of problems: (a) the influence of the produce base (spatial availability, crop yields, and the sugar content of the beet crop) on the economic effectiveness of sugar refinery locations; (b) the influence of the system of land ownership and the organizational structure of agriculture, as well as competition for agricultural products, on raw material supplies to the agricultural processing industry.

The choice of the sugar, potato and spirit industries is justified by their close and direct spatial links with the agricultural produce base. This results from the decidedly raw material-oriented location of these industries, as reflected by high values of Weber's material indices and by the large contribution that raw material costs make to total production costs. The values of both indices, calculated for the Poznań voivodship factories, are shown in Table 1.

TABLE 1. Raw material costs and agricultural processing industries

Type of factory	Weber's raw material index	Contribution of raw material costs to total production costs (in %)
sugar refineries	8.68	59.2
the Potato Industry Works at Luboń	3.92	42.0
distilleries	5.98	70.3
potato flaking mills	4.33	71.5

Source: own calculations on the basis of data from factories (1975).

The choice of the Poznań region[1] as the research area was influenced by the following considerations: (a) the highly developed nature of its agricultural processing industry with a large number of factories of different sizes (including several small works whose location problems have not been analysed in detail so far); (b) the occurrence of various forms of agricultural production, land ownership and organizational structures; (c) the existence of the Poznań urban area which modifies the spatial structure of cultivation and the market for agricultural produce; (d) the long tradition of links between the agricultural processing industry and farming, with a simultaneous variability resulting from relatively frequent changes of political and economic conditions in business activity.

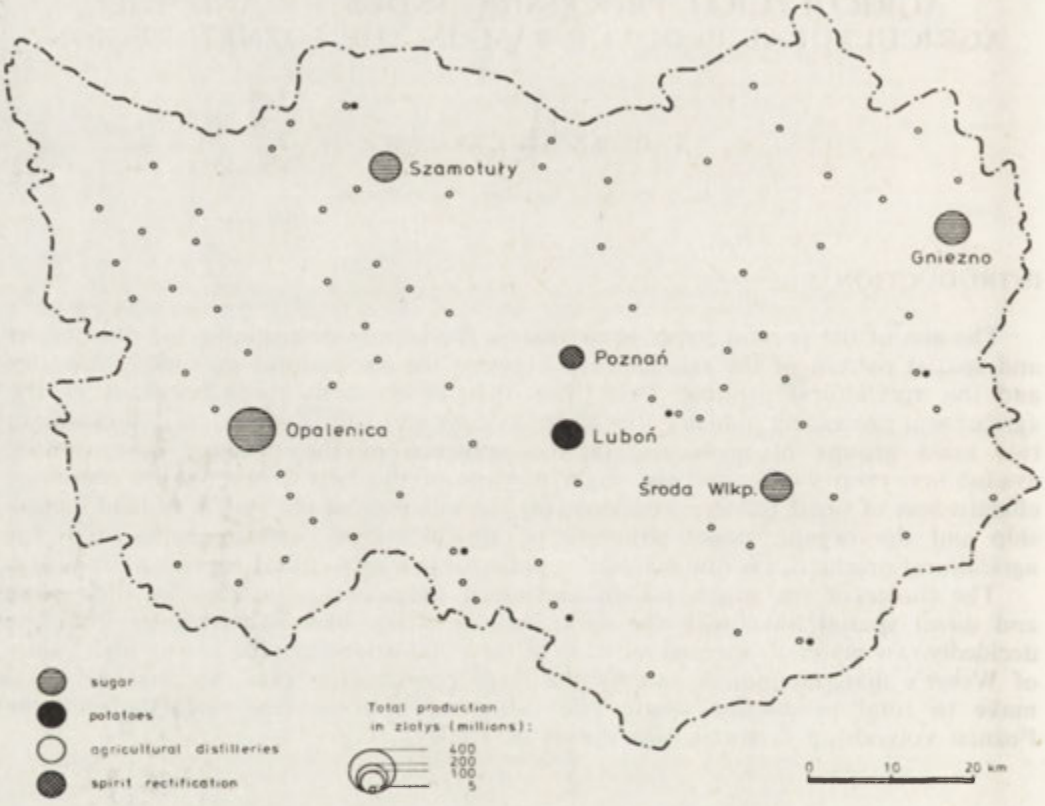

Fig. 1. The spatial structure of sugar, potato and spirit industries in the Poznań voivodship, 1979

The choice of a relatively small research area and a limited number of factories made it possible to collect most of the documentary material directly from individual factories and enterprises. All the data refer to 1979 unless otherwise stated.

The spatial structure of the sugar, potato and spirit industries is shown in Figure 1, and demonstrates a characteristic occurrence of two types of factory by size:

[1] The 'Poznań region' covers the territory of the Poznań voivodship as established on 1 June, 1975.

(a) five large plants, comprising four sugar refineries (from 289 to 494 employees[2]) and the Potato Industry Works at Luboń near Poznań (788 employees[3]);

(b) 83 small works (2–8 employees[4]) comprising 77 agricultural distilleries and six potato flaking mills. All these works are situated in villages with the exception of five distilleries. The spirit rectification and vodka plants located in Poznań deal with a further processing of the semi-finished product from distilleries (raw spirit), and so their relationship with agriculture is only indirect.

The spatial structure of the sugar, potato and spirit industries in the Poznań region was established in the 19th and at the beginning of the 20th centuries. The sugar refineries at Gniezno, Środa and Opalenica are about 100 years old, and the distillery at Owińska, built at the beginning of the 19th c. and still in use, has been recognized as a monument of industrial building.

THE INFLUENCE OF THE RESOURCE BASE ON THE ECONOMIC EFFECTIVENESS OF SUGAR REFINERY LOCATION

THE SPATIAL AVAILABILITY OF RAW MATERIALS

Despite the fact that the location of sugar refineries at the end of the 19th c. did not always take place in areas with optimum soil conditions for sugar beet cultivation, as shown in Figure 2, the spatial dependence between the resource base and the location of sugar processing works is the strongest of all the agricultural processing industries. For example, the correlation coefficient between the percentage of sugar beet to all crops (y) and the distance to the nearest sugar refinery (x) is $r_{xy} = -0.77$, and the regression equation $y = 9.2325 - 0.2146x$ shows that a 10 km increase in the distance from a refinery corresponds to an average 2.1 per cent drop in the proportion of sugar beet to all crops. In the case of individual sugar refineries, however, there is a clear mismatch between the size of the local raw material base and their current processing capacities. An indication of the discrepancy between supply and demand is provided by the transport of sugar beet from distant regions.

In order to determine the degree of raw material availability, a supply space potential model of the type developed by Isard (1960), Warntz (1959) and Chojnicki (1966) was formulated as follows

$$V_i = \sum_{j=1}^{n} \frac{P_j}{d_{ij}}$$

where V_i – the supply space potential for sugar beet of community i,
P_j – sugar beet crops in community j,
d_{ij} – the distance between i and j in km,
n – the number of communities ($n = 60$).

The values of the supply space potential are shown in Figure 3, and as in Figure 2, this shows that distinct 'supply zones' stand out around sugar refineries. Nonetheless, the greatest proportion of sugar beet to all crops and the highest values of the supply space potential are found around Września, in spite of the fact that the sugar refinery in this town existed only from 1882 to the Second World War. This demonstrates the long-standing influence that a previous location decision can have

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[2] This is average employment which fluctuates considerably during the year due to the seasonal character of production.

[3] Cf. footnote 2.

[4] Cf. footnote 2.

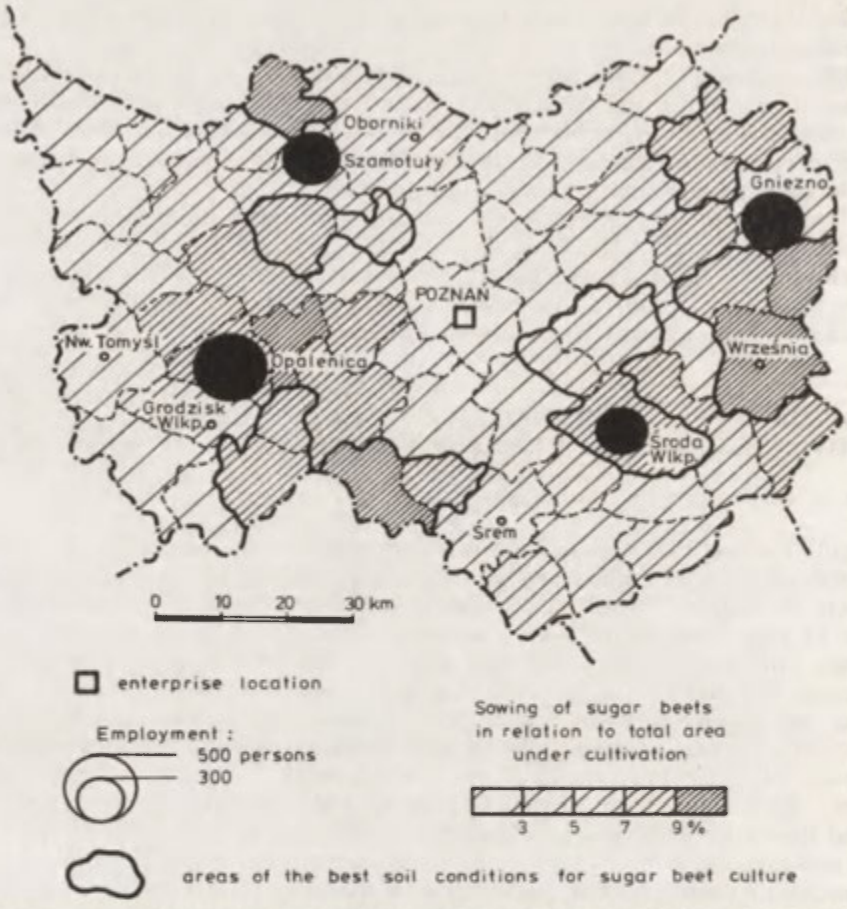

Fig. 2. Location of sugar refineries and sugar beet culture in the Poznań voivodship

on crop structures. In contrast, the peak area of the supply space potential around Środa indicates a high degree of adaptation by the local sugar refinery to the supply base and this is reflected in a small number of local beet purchasing centres and a lack of beet importation from other regions. In the case of the biggest sugar refinery at Opalenica, however, the movement of beet from the Konin and Sieradz voivodships, 150 to 200 km away, constitutes about 30 per cent of the total raw material supply.

The economic effect of adapting factory location to the resource base is reflected in the size and structure of unit costs of sugar production, primarily in the so-called raw material supply costs, which include, among others, contracting costs, organization of purchase, and transportation.[5] These are illustrated in Table 2 which averages out data for the period 1966–1972, which has been chosen since it was a period of comparative price and tariff stability. Table 2 shows that raw material supply costs can vary considerably; for example, the costs of the Środa sugar refinery amount to only 74 per cent of those in the refinery at Opalenica. A comparison of total costs per unit of production in the two works yields, however, a proportion of 93 per cent,

[5] Transport costs constitute, on average, about 60 per cent of raw material supply costs.

which indicates that the advantages of the larger scale of production at Opalenica only partially make up for the effects of the unfavourable location of this refinery. This finding differs from Fajferek's thesis that 'the absolute production cost decides in favour of big sugar refineries' (Fajferek, 1961, 117).

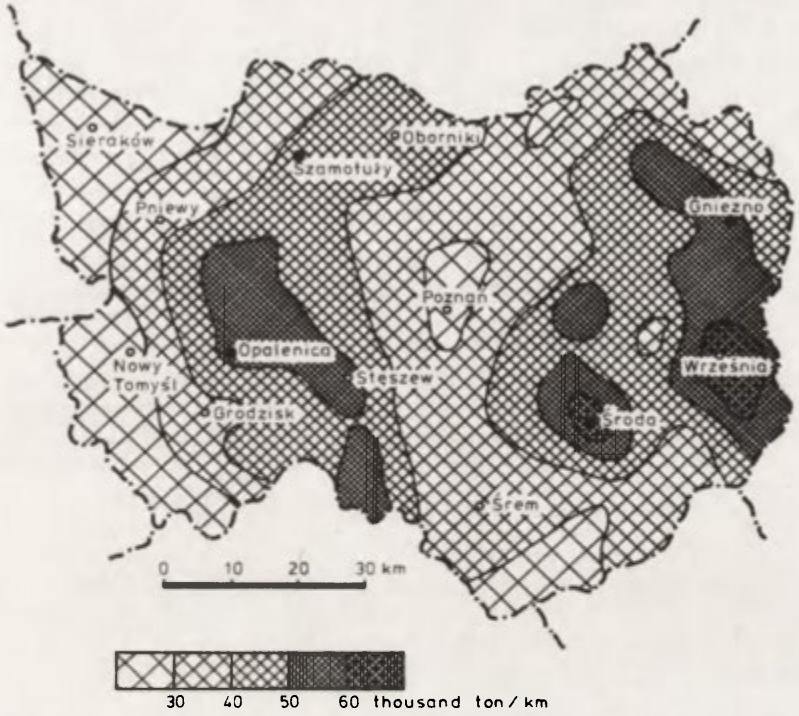

Fig. 3. Supply space potential for sugar beet in the Poznan voivodship

TABLE 2. Raw material supply costs in comparison with the production cost of 1 tonne of sugar in zlotys

Sugar refinery*	Material supply costs in zlotys per 1 tonne of sugar	Proportion of material supply costs in total production costs	Material supply costs in zlotys per 1 tonne of purchased beet	Production costs of 1 tonne of sugar in zlotys
Gniezno (2000 t/day)	1471.1	15.45	156.4	9535.0
Opalenica (3400 t/day)	1631.7	17.14	165.1	9514.9
Szamotuły (1400 t/day)	1375.0	14.65	146.9	9519.6
Sroda (1400 t/day)	1214.4	13.68	130.9	8871.0
mean	1423.0	15.23	149.8	9360.2

* The figures in parentheses indicate the capacities of the refineries expressed as the average volume of beet (in tonnes) processed per day.

Source: Hamrol (1976, 69–82) and own calculations.

THE YIELD OF SUGAR BEET CROPS AND THE SUGAR CONTENT OF BEET

An analysis of costs over a longer period of time allows further factors influencing the effectiveness of refinery location to be distinguished, in particular crop yields and the sugar content of beet. This analysis was carried out using elements of game theory. The theoretical foundations of game theory have been discussed by Sadowski (1958), Williams (1966), and Greń (1972), and the problems and examples of its geographical application by Stevens (1961), Gould (1963), Isard and Reiner (1962), Isard (1967), Abler, Adams and Gould (1972), and Webber (1972).

In the present paper, game theory is used as a method of cost analysis for different locational variants in conditions of uncertainty. Four game states were distinguished using crop yields of 350 quintals per hectare and a sugar percentage in beet of 15 per cent, to give the following states:

y_1 – beet crops of over 350 q/ha, sugar content over 15 per cent;
y_2 – beet crops of over 350 q/ha, sugar content below 15 per cent;
y_3 – beet crops below 350 q/ha, sugar content over 15 per cent;
y_4 – beet crops below 350 q/ha, sugar content below 15 per cent.

(Note: one quintal – 100 kg).

The elements of the pay-off matrix a_{ij} are average material costs per unit of production (t) (for the 1966–1972 period), together with material supply costs in zlotys, as shown in Table 3. Since these costs represent inputs, they receive the 'minus', sign, and in order to increase the level of interpretation, average values of costs are also given, as well as their coefficients of variation.

TABLE 3. The relation of material costs and material supply costs (in zlotys) per 1 tonne of sugar to the yield of crops and sugar percentage of beet

Sugar refinery	States of the resource base				$\min_i a_{ij}$	Variation coefficient*
	y_1	y_2	y_3	y_4		
1. Gniezno	−6544	−7495	−7590	−7441	−7590	6.69
2. Opalenica	−6824	−7908	−7097	−8219	−8219	8.77
3. Szamotuły	−6424	−7370	−7171	−7908	−7908	8.50
4. Sroda	−6722	−7168	−6571	−6794	−7168	3.72
$\max_i a_{ij}$	−6424	−7168	−6571	−6794		
$\bar{a}_{ij}$	−6629	−7485	−7107	−7591		
Variation coefficient*	2.69	4.17	5.10	8.16		

* The variation coefficient was calculated as the ratio of standard deviation to arithmetical mean and expressed in percentage.

Source: Hamrol (1976, 69–75) and own calculations.

An analysis of Table 3 by columns leads to the following conclusions:

(1) From the point of view of material cost minimization, at the regional scale, state y_1 is the most favourable (high-yield crops with a high percentage of sugar). This is a situation when location has the least influence, which is indicated by the lowest value of the variation coefficient. Also, low-yield crops are profitable if they have high sugar content (state y_3).

(2) High costs, on average, are connected with states y_2 and y_4, characterized by low sugar content.

The preceding observations allow the formulation of a thesis that the sugar

content of beet has the greater influence at the regional scale. On the other hand, coefficients of variation show that the spatial differentiation of costs, and hence the significance of location, manifests itself most strongly in the case of low-yield crops (states y_3 and y_4).

An analysis of Table 3 by rows allows the influence of each state on the economic effectiveness of particular works to be determined:

(1) The resource base has the strongest influence in the case of the refinery with the greatest capacity, namely Opalenica, and the weakest influence in the case of Środa, located in the area with both the most favourable soil conditions for sugar beet cultivation and the largest supply space potential.

(2) Refineries located outside the optimum area for raw materials have the lowest material costs for state y_1, i.e., in the cases of high-yield beet crops with a high sugar content. The refinery at Środa, however, with optimum location, is characterized by the greatest effectiveness in the case of relatively low-yield crops with a high sugar content. High-yield crops, and hence too much beet to be processed, cause an undue prolongation of the processing period and beet storage, which results in waste or transportation to other refineries, and this decreases the effectiveness of production.

Two methods were used in an attempt to evaluate location on the basis of game theory:

(a) Wald's principle of maximum-minimum costs (assuming prevalence of states least favourable for a factory):

$$v = \max_i \min_j a_{ij} = \min_j \max_i a_{ij}.$$

The matrix has a saddle point, so that a solution of the game exists for

$$v = -7168 \text{ zlotys}.$$

(b) Bayes' principle, with expected values of material costs calculated for the following *a posteriori* distribution of states of the resource base $P(y_1) = 0.1429$, $P(y_2) = P(y_3) = P(y_4) = 0.2857$;

$$E(a_{ij}) = \sum_{j=1}^{n} a_{ij} P(y_j) \quad \text{for } i = 1, \ldots, m \qquad \sum_{j=1}^{n} P(y_j) = 1,$$

$$E(a_{1j}) = (-6544)0.1429 + (-7495)0.2857 + (-7590)0.2857 + (-7441)0.2857 = -7370{,}82 \text{ zlotys},$$

$$E(a_{2j}) = (-6824)0.1429 + (-7908)0.2857 + (-7097)0.2857 + (-8219)0.2857 = -7610.25 \text{ zlotys},$$

$$E(a_{3j}) = (-6424)0.1429 + (-7370)0.2857 + (-7171)0.2857 + (-7908)0.2857 = -7331.67 \text{ zlotys},$$

$$E(a_{4j}) = (-6722)0.1429 + (-7168)0.2857 + (-6571)0.2857 + (-6794)0.2857 = -6826.85 \text{ zlotys}.$$

Both methods confirm the optimum location of the Środa refinery, shown earlier with the help of the supply space potential model. The expected values of material and raw material supply costs per unit of production are in inverse relation to the size of the works.

THE INFLUENCE OF LAND OWNERSHIP AND THE AGRICULTURAL STRUCTURE ON RAW MATERIAL SUPPLIES TO THE AGRICULTURAL PROCESSING INDUSTRY. MATERIAL COMPETITION AND SUBSTITUTION

A significant factor determining the supply of raw materials to the agricultural processing industry is the system of land ownership in agriculture. Initially, the agrarian base was composed of big landowners' estates, and these adapted their crop structure to provide raw materials for factories. This was so because landowners

were usually also closely involved with factories as either their proprietors or shareholders. In addition, the system of price setting related the price of raw materials to a factory's financial output. For example, in the interwar period, sugar refineries paid growers an advance only, and the final price was established only after the completion of sugar production. The effectiveness of this system is demonstrated by the fact that beet prices obtained by planters from the Poznań region were 9 to 15 per cent higher than those obtained in the central and eastern regions of Poland, where this system did not exist (Wykrętowicz 1962, 33).

After the Second World War, the close links between supply and demand were severed. Today, because of the great labour intensity of beet cultivation and the necessity to develop other branches of farm production, the state farms and collective farms of the Poznań region provide only about 40 per cent of the total production of sugar beet and only about 12 per cent of the potatoes used by distilleries. The remainder comes from private farms. In the case of distilleries, this leads to a paradoxical situation, since although most of them belong to the state farm system, their greatest potential source of raw materials comes from the more numerous private farms located in the area. Distilleries provide an example of how the advantage of location resulting from close links between supply and demand lost its significance after the change in the system of ownership. This unfavourable situation in the management of raw materials is aggravated by competition in potato contracting and purchasing.

Potato sales involve three groups of produce:

(a) industrial potatoes bought by potato industry works and distilleries.

(b) edible potatoes bought mainly by communal and gardening co-operatives,

(c) seed sets bought by the Central Seed Board.

There is no competition among potato processing works due to regional confinement and identical conditions of purchase. Regional confinement, however, does not concern edible potatoes. Hence, communal co-operatives encouraging farmers in potato production are the biggest competitor for potato works and distilleries, especially in periods of relatively low prices for industrial potatoes. There are often other elements involved in this competition for raw materials besides direct financial profit (e.g. a farmer looking for construction materials or fertilizers is inclined to sell his potatoes to a communal co-operative, and one using a state farm combine-harvester may agree to sell his potatoes to the state farm distillery, in spite of a lower price). Other reasons for which farmers sell their potatoes to distilleries are:

(a) a shortage of labour needed to sort out edible potatoes;

(b) the possibility of utilizing rotting potatoes, of lower value;

(c) obtaining a residue which is a valuable feed for cattle;

(d) tradition.

However, the above can hardly provide a basis for long-range raw materials management, especially since the farms selling potatoes to distilleries often belong to the group of farms in decline, and the proportion of potatoes in the cultivation area of private farms has been decreasing (from 17.4 per cent in 1975 to 15.5 per cent in 1981). Even greater difficulties with raw material procurement appear in the regions selected for the production of sets.

In the case of the Potato Industry Works at Luboń, the negative location effect of Poznań is clearly marked. Competition from the Poznań market and the typical crop structure of suburban zones result in a situation in which only 25 per cent of potatoes processed by the factory come from the Poznań voivodship.

The unfavourable situation in potato procurement outlined above has produced a number of different responses from the factories:

(a) in the case of the Potato Industry Works at Luboń, with a large scale of production – the source of raw materials was extended to about 400 km to the Siedlce

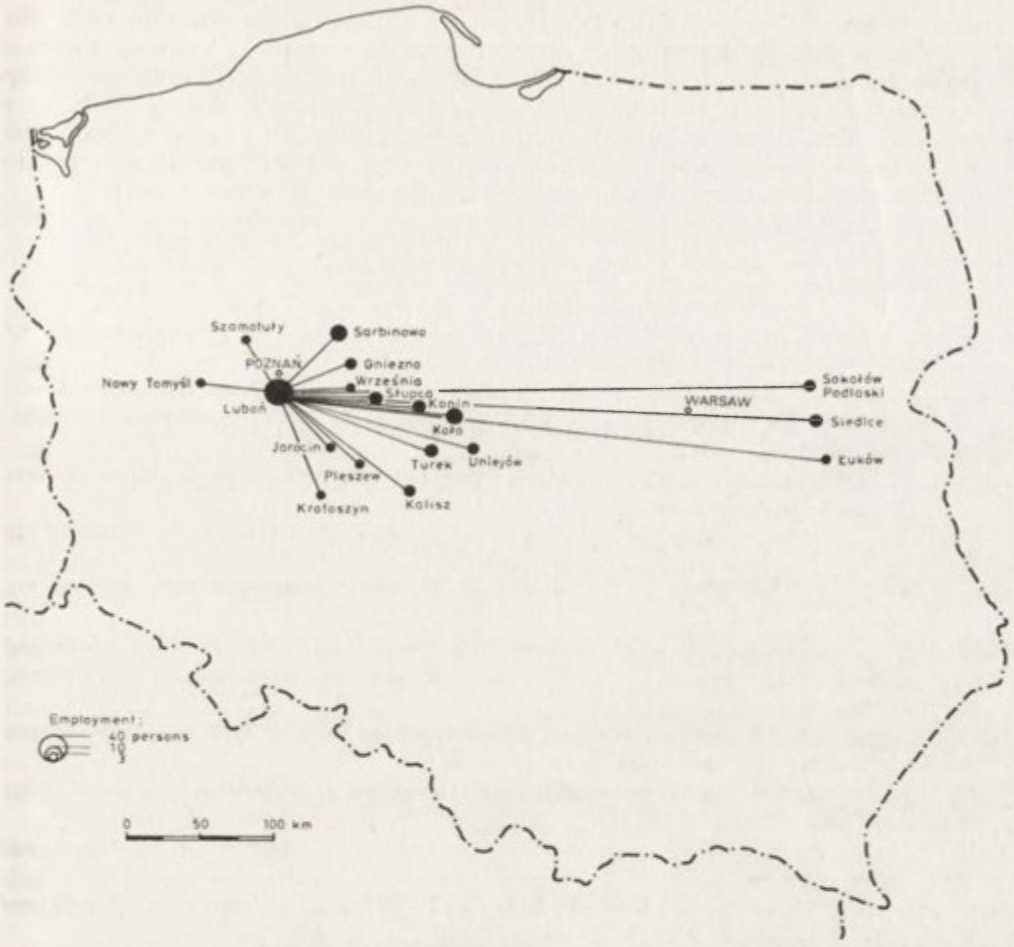

Fig. 4. Potato purchasing centres of the Potato Industry Plants at Luboń

and Biała Podlaska voivodships, which lack potato factories, although this was unjustified from the point of view of transport costs, as shown in Figure 4;

(b) material substitution in distilleries;

(c) closure of plants, or a change of the production pattern (starch and potato flaking mills).

The possibility of material substitution, as emphasized by Isard (1956), among others, has become the main factor ensuring distilleries their capacity utilization and production profitability. In 1924/25 the distilleries of the then Poznań voivodship produced 99.96 per cent of the total amount of spirit from potatoes but in 1975 this had fallen to 35 per cent. The remainder was made up from rye (47 per cent), molasses (15 per cent), and the remaining 3 per cent from corn, apples, and other produce. After 1975 the share of rye spirit decreased in favour of that produced from molasses and fruit, mainly apples. Due to the common use of molasses, the proximity of a sugar refinery has become a more and more significant factor in distillery location in the Poznań region. The advantage is mutual, since refineries can economize on having less molasses to transport to distant industrial distilleries.

Small, obsolete potato industry plants, having no possibilities of extending the

spatial range of their raw material sources or of material substitution (with the possibility of partial substitution of their produce), have shown a constant decrease in production, and even closure. In 1976 the last starch mill in the Poznań voivodship was closed down, and in 1975–1979 four out of ten potato flaking mills were closed. It seems, however, that there has now appeared a chance to stop this process, due to the considerable limitations on feed import, and though potato flakes are expensive, they are a valuable feed, at a time of scarce imports.

REFERENCES

Abler R., Adams J. S., Gould P. R., 1972, *Spatial organization: the geographer's view of the world*, Prentice-Hall, Englewood Cliffs, N. J.

Chojnicki Z., 1966, *Zastosowanie modeli grawitacji i potencjału w badaniach przestrzenno-ekonomicznych* (The application of gravity and potential models in spatial economic research), Studia KPZK PAN, 14.

Fajferek A., 1961, Niektóre problemy wielkości polskich cukrowni (Some problems of sizes of Polish sugar refineries), *Biuletyn KPZK PAN*, 3, 111–124.

Gould P. R., 1963, Man against his environment: a game theoretic framework, *Annals of the Association of American Geographers*, 53, 290–297.

Greń J., 1972, *Gry statystyczne i ich zastosowania* (Statistical games and their application), PWE, Warszawa.

Hamrol M., 1976, *Koszty własne i rentowność w przemyśle cukrowniczym* (Cost prices and profitability in sugar industry), Zeszyty Naukowe Akademii Ekonomicznej w Poznaniu, Seria II, 58.

Isard W., 1956, *Location and space economy*, The Technology Press of MIT – John Wiley and Sons – Chapman and Hall, New York – London.

Isard W., 1960, *Methods of regional analysis. An introduction to regional science*, John Wiley and Sons, New York.

Isard W., 1967, Game theory, location theory and industrial agglomeration, *Papers and Proceedings, RSA*, 18, 1–11.

Isard W., 1967, Game theory, location theory and industrial agglomeration, *Papers and Papers and Proceedings, RSA*, 9, 25–34.

Sadowski W., 1958, *Statystyczne funkcje decyzyjne i teoria gier* (Statistical decision functions and game theory), PWN, Warszawa.

Stevens B. H., 1961, An application of game theory to a problem in location strategy, *Papers and Proceedings, RSA*, 7, 143–157.

Warntz W., 1959, *Toward a geography of price*, University of Pennsylvania Press, Philadelphia.

Webber M. J., 1972, *Impact of uncertainty on location*, The MIT Press, Cambridge, Mass. – London.

Williams J. D., 1966, *The complete strategist*, McGraw-Hill, New York.

Wykrętowicz S., 1962, *Przemysł cukrowniczy w zachodniej Polsce w latach 1919–1939* (Sugar industry in western Poland, 1919–1939), PTPN, Badania z dziejów społecznych i gospodarczych, 44, Poznań.

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THE SPREAD OF INDUSTRY AS A CONSEQUENCE OF THE LOCATION OF NEW FACTORIES IN POLAND, 1945–1982

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Poland's post-World War Two industrialization pace was one of the quickest in the world. Therefore the country is a good case for studies of contemporary location trends and changes in the distribution of industry. This paper examines the spatial diffusion of industry as a consequence of location of new factories, 1945–1982. During these thirty-seven years Poland underwent vigorous industrialization, which was considered one of the main tasks of the state's economic policy. The largest investment inputs were given to industry, which provided the greatest number of new work-places. Employment in industry grew by more than 3.5 times – from 1.4 million persons in 1946 to over 5 million people in late 1981. The number of industrial plants grew during this period from 21,000 to 59,000 and the number of large establishments (over 1,000 employees) increased from 542 in 1960 to 774 in 1982.

Many of these large factories were actually founded during the period under investigation. Large factories change industry's spatial structure the most effectively – due both to their own scale and to the fact that they precede the establishment of smaller ones whose production complements their own.

Therefore, the study described in this paper concentrated on the location of larger new factories; a factory had to possess at least 100 million zlotys in fixed assets in 1970 (about 1.4 million pounds sterling according to contemporary exchange rates) to be included in the study. As regards factories built after 1970, the value was estimated on the basis of available information about the value of investment inputs; allowances were made for increasing building costs and depreciation of the Polish currency. The value of fixed assets seems to be the most accurate indicator of an industry's importance and its influence on economic structures and spatial organization.

In total, 797 factories were found to fulfil the adopted qualification. Some were not completely new, but were reconstructed from rubble or moved into specially adapted non-industrial premises. Fixed assets, particularly engines, in these factories were mostly new and production was often completely different from previous operations. Therefore, although buildings pre-existed on these sites, they may be considered as new locations.

Although all the new factories were treated in the same way in computations, an additional group of 133 largest factories was demarcated. These were factories where fixed assets in 1970 surpassed 1 billion zlotys, i.e. ten times the adopted minimum. Such factories give rise to towns or new industrial regions.

The sequence of factory construction was analysed; the period in question was

divided into seven parts, most of which coincided with five year economic plans. The date of starting production, and not the beginning of construction (which is harder to ascertain) counted as the beginning of a factory's existence. Dates of location decisions were also considered: such decisions are usually made three to six years before production was launched. This should be taken into account in studying spatial shifts.

New factories with the given value of fixed assets were built in all the 49 voivodships (provinces). Their numbers range from two in the Biała Podlaska voivodship to 99 in the Katowice voivodship. Average age of these post-war factories in 1982 was 16 years; approximately half were built before 1966 and the other half since. However, the distribution of the two groups of factories differs, as shown in Figs 1 and 2. The first map shows the location of factories built between 1945 and 1966 and the second those built between 1967 and 1982.

Comparison of the two maps shows particularly a stronger spatial dispersion in the later period, as well as the general trend of industrial shift towards the east and north. In the earlier period, concentration of new industrial plants was the highest in Warsaw and Upper Silesia, followed by Cracow and the regions of Częstochowa and Łódź, which are large cities and old industrial districts. This distribution was

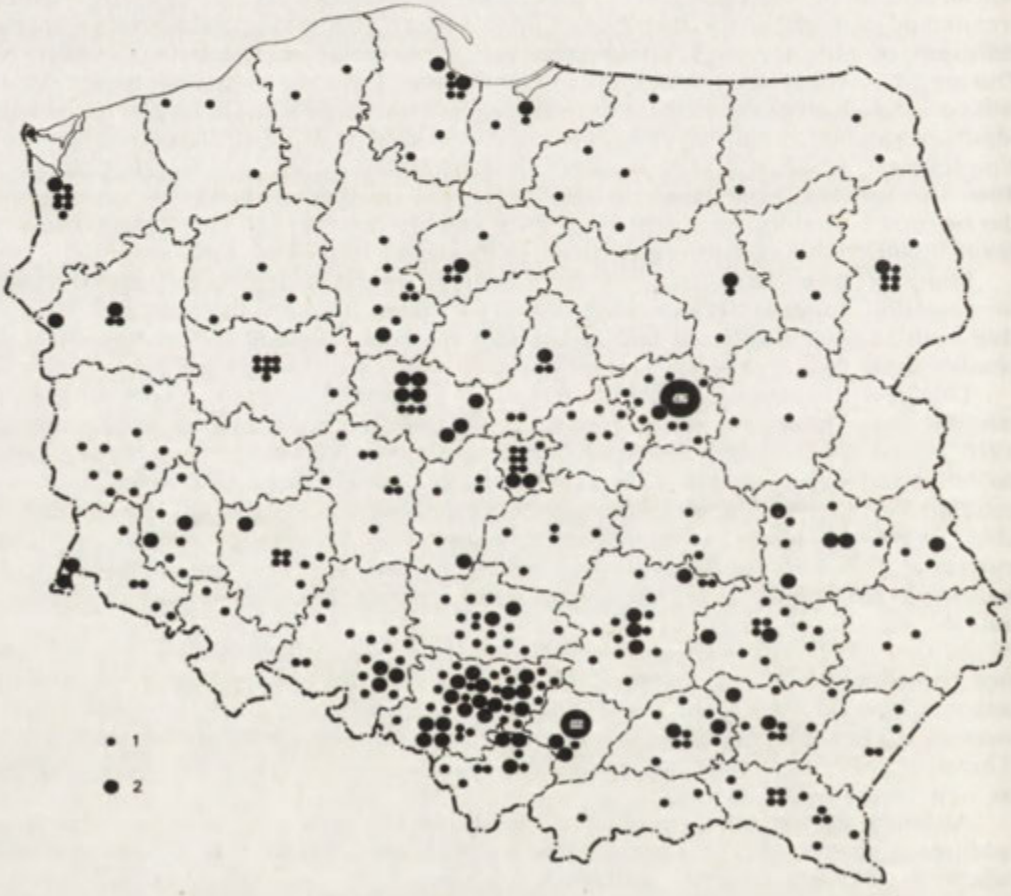

Fig. 1. Location of major industrial plants, 1945–1966. 1 – plants with fixed assets over 100 million zlotys, 2 – including over 1 billion zlotys (in 1970 prices)

due to the location of mineral and energy resources as well as of the old production potential, the priority of highly power-consuming heavy industry and the need to start up indispensable production as soon as possible and not spend too much money on infrastructure in economically backward regions. Some locations were an outcome of the existence of old buildings or equipment, which could be reconstructed and used again.

In the later period (Fig. 2), new factories were located much more evenly, which testifies to some deglomeration of old industrial regions and big cities (this

Fig. 2. Location of major industrial plants, 1967–1982. 1 – plants with fixed assets over 100 million zlotys, 2 – including over 1 billion zlotys (in 1970 prices)

was the policy pursued in the 1960s). The only places of concentration of new factories were some vigorously expanding mining districts (Upper Silesia, Rybnik, Lubin–Głogów) and the biggest cities, among which Łódź took the leading place owing to the reconstruction of its obsolescent textile industry. However, most new industrial establishments sprang up outside these regions. The rate of growth of industry was highest in poorly industrialized voivodships, which only after 1965, and especially after 1970, were given a chance for quicker economic development.

When examining the location of new industrial plants over time, certain trends are apparent which have led to an increasing spread of industry.

(a) *Spatial shift towards east and north.* Just after World War Two there was great inbalance in the distribution of industry in Poland. Industry was concentrated in the south, and the western area was more industrialized than the eastern. Industrial concentration in the south was an outcome of the region's geological structure and abundance of mineral resources (especially coal, zinc, lead, iron and copper ores, as well as most kinds of rock used in building). Concentration of industry in the region was related to concentration of population. The proportion of urban population was particularly high in Upper and Lower Silesia; the southern region had the highest density of rural population which, unable to make a living as farmers, had to look for extra jobs in industry.

Disproportion between the western and the eastern area was primarily due to the regions' history; until 1918 the western area belonged to the economically advanced German state, the eastern area, to Czarist Russia, and the south-eastern area was part of Austrian territory. In the former Russian sector industrial plants were concentrated in the small, but strongly industrialized regions of Łódź, Dąbrowa Górnicza, Warsaw and Białystok. The situation was similar in the area of the Austrian sector where nearly all the major factories were located on the outskirts of Upper Silesia. As regards the German sector, major factories were concentrated in Upper Silesia and in the Sudety region and smaller ones were fairly evenly distributed throughout the territory; all big cities were at the same time industrial centres.

Figure 3 illustrates the gradual spread of industry and its shift to the east and north. In the chronological sequence of dates when production was launched at larger factories, a median date was adopted as an indicator of the process. This date denotes the mid-point in a given region's industrialization. Spatial units are the present voivodships with the exception of the most industrialized Katowice voivodship, which was divided into three districts because of its considerable internal differentiation in industrialization periods.

Figure 3 shows that the following regions were the earliest industrialized (post-war industrialization only is considered):

(1) the Cracow region; the largest steel mill, together with subsidiary plants, was built there between 1949 and 1954;

(2) the Warsaw region; the city was annihilated in 1944 and all industrial plants had to be built from scratch; most factories, notably electronics, electrical engineering, precision and machine construction works, which are Warsaw's specialization, had launched production by 1960;

(3) the Częstochowa region; this was designed as the main iron ore mining region, and an iron works was constructed;

(4) the eastern part of Lower Silesia; Wroclaw's destroyed factories were rebuilt and old buildings in the Sudety region were adapted for new purposes.

Industrialization later spread to south-eastern voivodships, where a new sulphur mining complex sprang up around Tarnobrzeg and the engineering, metal and chemical industries were vigorously developed in the 1950s and 1960s. As a consequence of rebuilding and adaptation of ruined plants, south-western, western and some northern voivodships reached the mid-point of industrialization in the 1960s.

Subsequently industrialization spread to other voivodships in central, central-western and northern parts of the country. The process was encouraged by the industrial deglomeration policy in the 1960s and geological discoveries which resulted in the development of new mining complexes (lignite near Konin, and copper near Lubin and Głogów).

The central-eastern, eastern and north-eastern voivodships were industrialized last and to the smallest extent. Generally speaking, the investment boom did not reach them until the early 1970s. This group includes also the new mining regions of

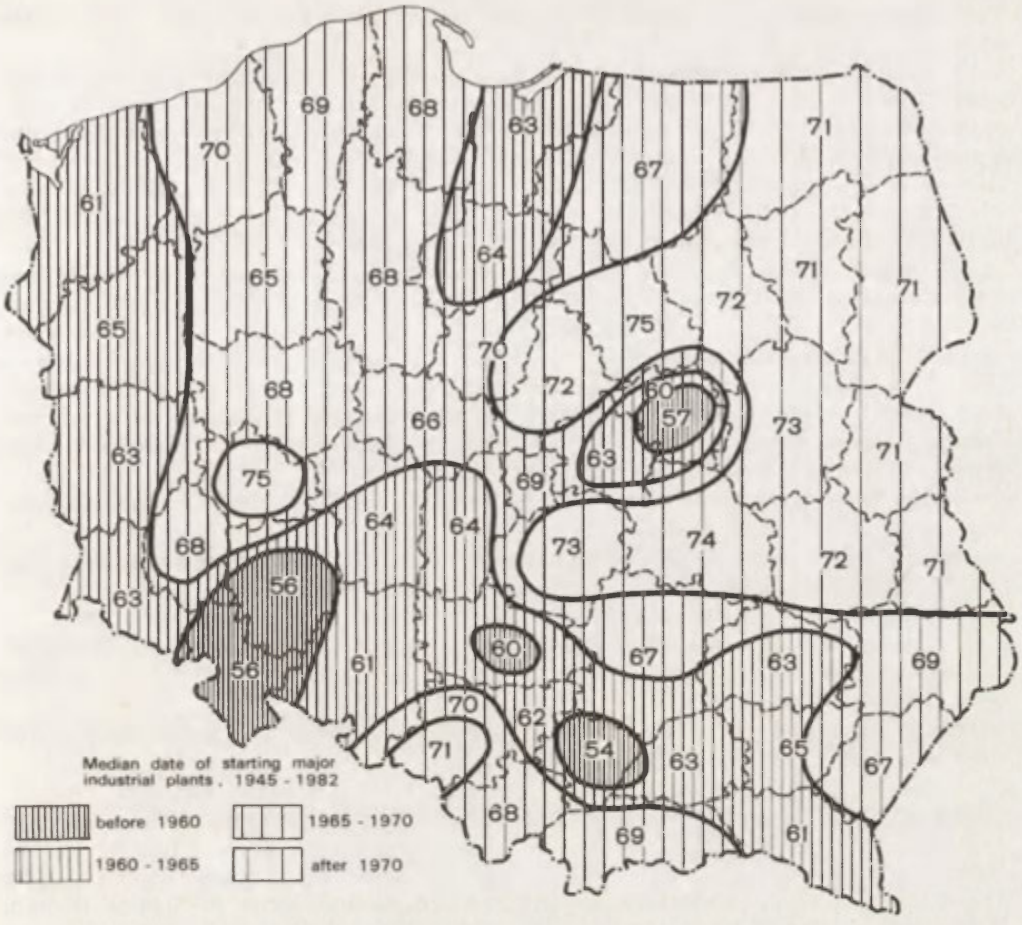

Fig. 3. Spread of industry in Poland, 1945–1982

Bełchatów (lignite) and of Lublin (hard coal) and even the older Rybnik coal region, in which most new collieries were launched after 1964.

The general trend was for new industrial ventures to shift from the south and west to the north and east. Naturally, there were exceptions, one of them being the industrialization of Warsaw, which largely outstripped the development of neighbouring voivodships. The most important old industrial regions (Upper Silesia and Łódź) and some old industrial cities (Poznań, Bydgoszcz, Gdańsk) witnessed a late upsurge of investment; their median dates of industrialization lay between 1968 and 1970. Investments in those localities often consisted of modernization or reconstruction of older factories.

(b) *Shift from big cities to small towns.* Alongside a macro-spatial shift to the east and north, within regions the industrial potential frequently shifted from big cities to towns. Although in absolute numbers big cities are still in the lead, the rate of their industrial growth is slowing down and the number of new locations in these cities decreases.

This tendency is clearly seen when one compares locations in the two post-war periods: until 1966, when a half of the investigated factories had been launched, and after

1966. In the earlier period the eleven biggest cities accounted for 24 per cent of new locations, whereas in the later for 17.5 per cent.

The same trend is observed when examining the 49 voivodships capitals. In the earlier period, 42 per cent of new factories were located in voivodship capitals, in the later 35 per cent. Although these proportions vary between voivodships, the appeal of the biggest cities, notably Warsaw and Cracow, which were 'overinvested' during the first post-war decade, faded the most quickly. On the other hand, the share of new factories located in smaller voivodship capitals, ones promoted to this rank in 1975, either remained the same or increased.

The share of new factories located in medium-sized cities, between 20,000 and 100,000 in population, has grown relatively the most rapidly. As these have attracted the greatest numbers of new industrial plants, they have been developing more rapidly than other cities. The majority of the 32 new voivodship capitals belong to this group. Some smaller towns actually sprang up in the wake of a new factory location. A statistical approach to these trends is hampered by changes of city boundaries, including mergers of smaller towns, and the inclusion of industrialized suburban regions or entire towns in neighbouring big cities.

The reasons why new factories are now more frequently located in smaller towns: may be summarized as follows:

(1) There is a disproportion between the number of inhabitants and the number of jobs available in big cities; this results in mass-scale commuting.

(2) Big cities suffer from a shortage of space and technical infrastructure.

(3) Cities suffer from air and water pollution, and some from water shortages.

(4) There is a demand to stimulate the development of non-industrial smaller towns, many of which have labour surpluses.

(5) There are demands for a more even distribution of industry, which is the main stimulus of economic development.

(6) Mineral resources have recently been discovered far from big cities.

(c) *Shift to new industrial regions and centres.* The above mentioned factors also cause industry to shift from old to new industrial regions. New industrial regions have mainly developed around mineral deposits discovered or freshly explored after the war. The most important new regions are mining areas of lignite (Konin, Bełchatów), hard coal (Rybnik, Lublin), sulphur (Tarnobrzeg) and copper (between Lubin and Głogów). Some plants have been located near deposits of salt and of rocks used in construction, espacially limestone.

Location of many new industrial centres was decided by water resources, especially the Vistula, which is the biggest river of Poland. This is particularly true of the chemical and pulp and paper plants, which consume large quantities of water. The old industrial regions have very unfavourable locations in this respect: the largest two, (Upper Silesia and Łódź), lie on the Vistula—Odra divide and suffer acute water shortages, and others (the Sudety, Bielsko and Częstochowa regions) lie on upper stretches of rivers with little flow. This is one of the reasons why industry is shifting north — down the rivers, toward lakes and the sea.

Finally, new industrial centres have also been established far from mining districts and big rivers. These are agricultural and food processing plants and centres of other manufacturing industries which allow flexibility in location (e.g. electrical-engineering, textile or clothing industries). Nearly all voivodships demanded that these branches of industry should be developed in their areas.

(d) *Reduced imbalances between voivodships.* The shift described above have resulted in a reduction in imbalances between voivodships. Shortly after World War Two four voivodships accounted for over a half of all employees in industry (all data have been re-calculated to suit present-day voivodships), whereas 31 voivodships

TABLE 1. Ranking of voivodships according to industrial employment (% share in national figures)

Position	% of industrial employment in 1946		% of industrial employment in 1981		% of increase of industrial employment, 1946–1981	
1	Katowice	30.1	Katowice	18.1	Katowice	13.9
2	Lódź	11.6	Warszawa	6.2	Warszawa	7.2
3	Wałbrzych	5.9	Łódź	5.3	Kielce	3.5
4	Poznań	4.0	Gdańsk	3.3	Gdańsk	3.5
5	Bielsko-Biała	3.6	Bielsko-Biała	3.2	Wrocław	3.4
6	Warszawa	3.6	Wrocław	3.1	Opole	3.1
7	Bydgoszcz	3.1	Kielce	3.1	Kraków	3.1
8	Kraków	2.8	Wałbrzych	3.1	Łódź	3.0
9	Jelenia Góra	2.7	Kraków	3.0	Bielsko-Biała	3.0
10	Gdańsk	2.7	Poznań	3.0	Bydgoszcz	2.8
11	Częstochowa	2.7	Opole	2.9	Poznań	2.7
12	Opole	2.4	Bydgoszcz	2.9	Szczecin	2.7
13	Wrocław	2.4	Częstochowa	2.3	Lublin	2.6
14	Kielce	1.9	Szczecin	2.1	Rzeszów	2.2
15	Piotrków	1.8	Lublin	2.1	Częstochowa	2.1
16	Kalisz	1.6	Jelenia Góra	2.0	Radom	2.1
17	Zielona Góra	1.2	Radom	1.8	Wałbrzych	2.1
18	Toruń	1.0	Piotrków	1.8	Legnica	2.0
19	Skierniewice	0.9	Kalisz	1.8	Zielona Góra	2.0
20	Radom	0.9	Rzeszów	1.8	Kalisz	1.8
21	Krosno	0.9	Zielona Góra	1.8	Tarnobrzeg	1.8
22	Lublin	0.8	Toruń	1.6	Toruń	1.8
23	Piła	0.8	Legnica	1.6	Piotrków	1.8
24	Szczecin	0.8	Tarnobrzeg	1.5	Tarnów	1.8
25	Włocławek	0.7	Tarnów	1.5	Jelenia Góra	1.7
26	Tarnów	0.6	Białystok	1.3	Białystok	1.6
27	Płock	0.6	Olsztyn	1.2	Olsztyn	1.5
28	Leszno	0.6	Krosno	1.2	Krosno	1.3
29	Tarnobrzeg	0.6	Płock	1.1	Płock	1.3
30	Nowy Sącz	0.6	Nowy Sącz	1.1	Gorzów	1.3
31	Legnica	0.5	Gorzów	1.1	Nowy Sącz	1.2
32	Białystok	0.5	Elbląg	0.9	Konin	1.1
33	Gorzów	0.5	Konin	0.9	Siedlce	1.1
34	Rzeszów	0.5	Siedlce	0.9	Elbląg	1.1
35	Elbląg	0.5	Piła	0.9	Koszalin	1.0
36	Olsztyn	0.5	Skierniewice	0.8	Słupsk	1.0
37	Zamość	0.4	Koszalin	0.8	Piła	0.9
38	Sieradz	0.4	Słupsk	0.8	Sieradz	0.8
39	Słupsk	0.3	Włocławek	0.8	Skierniewice	0.8
40	Konin	0.3	Sieradz	0.7	Suwałki	0.8
41	Ciechanów	0.3	Przemyśl	0.6	Przemyśl	0.8
42	Siedlce	0.3	Leszno	0.6	Włocławek	0.8
43	Przemyśl	0.2	Suwałki	0.6	Ostrołęka	0.7
44	Koszalin	0.2	Zamość	0.6	Zamość	0.6
45	Chełm	0.2	Ostrołęka	0.5	Leszno	0.6
46	Ostrołęka	0.2	Ciechanów	0.5	Ciechanów	0.6
47	Biała Podlaska	0.1	Chełm	0.4	Łomża	0.5
48	Suwałki	0.1	Łomża	0.4	Chełm	0.5
49	Łomża	0.1	Biała Podlaska	0.4	Biała Podlaska	0.4

accounted for less than 1 per cent of all employees in industry each (including three which had 0.1 per cent each).

If one ranks voivodships by the number of employees in industry, in 1981 51.4 per cent of work-places were concentrated in the ten most industrialized voivodships, whereas the other half were distributed among the remaining 39 voivodships. The proportions have become more even: although 18 voivodships' shares are under 1 per cent, no voivodship now has a share under 0.4 per cent.

Generally speaking, the industrialization levels of voivodships grew more uniform in the years 1946–1981. Nine voivodships recorded a decline in their shares of national employment in industry and the drop was remarkable in the oldest industrial regions (Table 1). On the other hand, 38 voivodships increased their shares by a total of 23.9 percentage of national employment in industry. These are all relative figures which illustrate trends in industry shifts. If one uses the absolute number of employees, the biggest growth was in the most industrialized Katowice voivodship (an increase of about half a million people). However, as other regions were industrializing at a quicker pace, the Katowice voivodship's share decreased steadily, except for the period 1975–1981 when the large Katowice steelworks and several new collieries were opened.

Unfortunately, since relevant data are missing, it has not been possible to perform similar calculations for shifts of fixed assets during that period. However, one may expect that these shifts were even more conspicuous, since new factories consume more capital (they are better equipped) while old ones employ more workforce, since they apply old technologies and pursue traditional manufacturing.

The statement that there exist 'strong' regions which dominate the economy was examined. Assuming that 'strong' regions are voivodships whose capitals have more than 250 thousand inhabitants, the share of these ten voivodships in industrial employment decreased by 12.8 percentage points. The share of seventeen 'old' voivodships, i.e., those which existed before 1975 (but had larger areas then), decreased by 7.1 percentage points during the discussed period and the share of 'new' voivodships, i.e., ones established in 1975, increased by the same amount. These data refer to the whole post-war period (1946–1981), and not only the period after 1975, when the role of new voivodship capitals grew further. Thus, the so-called 'strong' regions are becoming relatively weaker and the 'weak' regions are growing in importance.

REFERENCES

Dawson A. H., 1970, The changing distribution of Polish industry 1945–65: a general picture, *Transactions, Institute of British Geographers*, 50, 177–197.

Geografia przemysłu Polski (Geography of Polish industry), 1974, S. Leszczycki, T. Lijewski, eds., 2nd ed., PWN, Warszawa.

Lijewski T., 1978, *Uprzemysłowienie Polski 1945–1975, przemiany strukturalne i przestrzenne* (Industrialization of Poland 1945–1975, structural and spatial changes), PWN, Warszawa.

Misztal S., Kaczorowski W., 1983, *Regionalne zróżnicowanie procesu uprzemysłowienia Polski 1945–1975* (The regional pattern of the industrialization process in Poland 1945–1975), Studia KPZK PAN, 76, Warszawa.

Wilczewski R., Lijewski T., Kortus B., 1978, Spatial industrial changes in Poland since 1945, in: F. E. Ian Hamilton, ed., *Industrial change: international experience and public policy*, Longman, London – New York, 80–98.

GEOGRAPHIA POLONICA 51, 1985

TOWARD A MORE 'HUMANISTIC-SOCIAL' APPROACH IN POLISH INDUSTRIAL GEOGRAPHY

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A new trend is gaining momentum in socio-economic geography, namely a tendency to treat man as a subject of economic activity. In the analysis of economic phenomena the interest in social and human problems is increasing and a strong emphasis is being put on an approach concerned with human beings, their needs, attitudes, behaviour and motives of their activities (Eliot Hurst, 1974; Smith, 1977; Törnqvist, 1980; Cox and Golledge eds., 1981).

Though this 'behavioural approach' is quite popular in the west, Polish geographers have only recently begun to be aware of the need for its application (Eliot Hurst, 1978; Taylor, 1980; Kortus, 1981; Domański, 1982; Kukliński, 1982; Kortus and Domański, 1983).

Moreover, since the function of industry itself is now changing, the social and humanistic aspects of research cannot now be ignored by industrial geography.

THE BEHAVIOURAL APPROACH IN INDUSTRIAL GEOGRAPHY

The behavioural approach is based on the assumption that all spatial patterns of socio-economic phenomena, including industry, result from man's activity, that is, his decisions. Thus no objective factors of the natural and socio-economic environment directly influence spatial patterns but they do so through man's consciousness since he takes decisions and is therefore the decision-maker.

The behavioural approach serves to investigate attitudes and behaviour of three categories of persons: decision-makers, industrial employees, and society in its attitude towards industry. The attitudes and behaviour of these groups depend in turn on their perception of the space and the environment in which they are living and acting.

ATTITUDES AND BEHAVIOUR OF DECISION-MAKERS

The assumption that economic decisions are taken in a fully rational manner, including those concerning location, has been undermined by research on the 'behaviour' of industrial firms as well as of their decision-makers; the existence of 'economic man' has been questioned. It has been proved that non-economic and subjective factors exert an influence on decision-making in industry and the way it functions.

In a planned economy, state-owned industry decisions and economic activities are also far from rational. They are often made under conditions of risk and uncertainty (Minc, 1974) and on the basis of inadequate information, or they may be conditioned by subjective views of decision-makers. The above observations have been corroborated in empirical research on the location of selected industrial enterprises built in 1950–1955 (Zajda and Zawadzki, 1961), and also by more recent studies concerned with the assessment of locations and the functioning of selected industrial developments (Kortus and Adamus, 1982). In this research work, it was discovered that decisions on location, construction or expansion of many industrial enterprises in Poland resulted from subjective approaches or the ambitions of certain decision-makers, both at central and lower levels. Location decisions, for instance, as regards material supply or labour resources were also based on inadequate information. In a situation where local authorities were deprived of the right to make decisions, the 'behaviour' of industrial enterprises and their decision-makers toward the centre, usually a town and its local authorities, differed greatly and oscillated between positive co-operation and arrogant licence, including disregard of elementary principles of environmental protection. The pending reform of territorial self government should endow the local authorities with real powers which will enable them to make their own decisions and thus to combat such negative attitudes in the behaviour of industrial enterprises and their decision-makers.

ATTITUDES AND THE BEHAVIOUR OF INDUSTRIAL EMPLOYEES

It is a known fact that hitherto in Poland the 'objective' treatment of workers was as man-power differentiated quantitatively or qualitatively. Analyses were made of labour force structure (sex, qualifications, age, education, etc.), the volume of commuting to work and its directions, surpluses and deficits, etc.

However, the personal motives and choices of workers, for instance, that make them select this or the other kind of work and its place, the role of economic and non-economic incentives, satisfaction obtained from work etc, together with respective spatial determinants were not analysed at all, or only sporadically.

The stern slogan of shipyard workers in Gdansk, launched in August 1980, 'we are not just robots', has put an end to such 'objective' analyses and treatment of workers.

'A new philosophy of work' is being born in post-industrial societies. Hired labour, supported by trade unions and other organizations, is striving to shape work relations in such a way as to obtain maximum satisfaction not only of material but also of non-material needs. The workers' assumption is that work is highly effective only when there is full democracy, that is when they are involved in decision-making processes concerned with production programmes in co-determination of work. They want to exert an influence on the way in which the enterprise is managed and profits distributed, have guaranteed rights as trade-union members and human beings. In other words the aim is to secure full 'human rights in the place of work' (Lindholm, 1982).

Following this trend new forms of production organization and technology are being sought (among other countries in Sweden and Norway), which may guarantee the implementation of these postulates. For example, efforts are being made to stop the conveyor-belt system in production, which – as many believe – deprives the worker of his identity, makes him lose all invention and qualifications. It is endeavoured to replace that system with other forms, such as more independent, autonomous production groups, while, of course, satisfactory economic efficiency is preserved. The same is true of the increasing automation and computerization of work; economic effects brought about by these new technologies do not always fulfill

expectations of the workers and give them personal satisfaction (Törnqvist, 1980; Lindholm, 1982).

All these elements have also their spatial dimensions, they are differentiated depending on the socio-economic and legal-political structures of the country's various social and professional groups, and even more so on the international scale; this is the aspect which should be investigated by industrial geographers.

STUDIES OF SOCIAL ATTITUDES TOWARD INDUSTRY

In Poland, there is an evident evolution in this respect, though in the initial period of our country's industrialization the process was generally accepted everywhere since it laid economic foundations for existence. However, lately certain negative effects of industrialization have appeared and therefore social attitudes toward industry differ, both in space as among the separate social groups and strata. To illustrate this remark we may quote the example of the attitudes of Podhale region's inhabitants toward a large shoe factory built in the town of Nowy Targ in the 1950s. The factory thought to be beneficial to the population of this hilly, over-populated, agricultural area, has come up against a barrier of specific features in the consciousness of the local population. A strong feeling of their own individualism and independence when confronted with the technological regime of conveyer-belt production of shoes has brought about a tremendous turnover of workers. With time, work in the factory has become less and less attractive, especially as some new competitive opportunities for earning money have been created outside agriculture, predominantly from the tourist trade. The attitude of the regional community toward the factory has become strongly negative especially as a result of the line taken by the factory management toward the workers during the strike of June 1976 and three years later during the Pope's visit to Nowy Targ. The effect of this negative attitude is a steady decrease in the number of workers and output at the factory of Nowy Targ (B. Domański, 1983).

The ecological effects of industrial activities are also meeting with a particulary vigorous protest. A decision of the local authorities in the voivodship of Cracow, taken in December 1980, concerning the closure of the aluminium works at Skawina is a good illustration. It was taken under the pressure of public opinion protesting against the particularly noxious effects, which were damaging to the environment. It is also under the pressure of public opinion that the production of coke, pig-iron and steel in Lenin's Metallurgical Works in Cracow is being reduced since again it is harmful to the city and its population.

The growing contradictions between the rising levels of civilisation in society, its hopes and requirements on the one hand, and an industry obsolete in many fields, its structure of organization and management, poor effectiveness, out of date technologies, and finally harmful effects on the environment, on the other, are the source of society's critical attitude toward the functioning of this sector. In other words-changes (progress) in industry are not keeping pace with the increasing awareness of society. In his book Szczepański (1973) maintains that beside economic and technological factors one should see and appreciate the motives guiding people – individuals, social strata, or social classes. However his book has not yet had any effect. The analysis of attitudes and behaviour of human beings toward industry should be referred to the currently valid system and hierarchy of value (R. Domański, 1973).

The development of the behavioural trend in research requires that research methods are well known and that geography collaborates with psychology and sociology. In the current sociopolitical situation in Poland, research on the social perception of the environment, including industry, is very difficult, if at all possible.

NEW FUNCTIONS OF INDUSTRY

The task facing contemporary (and future) industry is not only to meet the needs of the consumer, but also to shape them by introducing respective changes in the structure of production. The question therefore is not how much to produce but what and how to produce (Hall, ed., 1978). The question 'what to produce' implies that production should be adapted to the needs and requirements of modern man, that is among other things to increase production for services, hospitals, schools, recreation and sports, science, management, transport and communications, facilities for the protection of the environment, etc. Table 1 presents the evolution of the

TABLE 1. Evolution of social functions of industry

Social functions of industry	Period of realization of the function	Place of realization of the function
Production to satisfy the consumers' demand ('how much to produce')	initial industrialization	inside production works
Shaping social needs ('what to produce'), adaptation of the production structure to the social needs, production restricted by the barriers: ecological, labour safety and others	high level of industrialization	in contact of the works within its environment
Participation of industry in solving major problems of changing society. 'How to produce' i.e. 'social responsibility of industry' for: rational use of raw materials and space; rational distribution of industry; clean technologies as regards the environment; improved infrastructures in the environment; material and non-material satisfaction for employees; satisfactory working conditions, etc.	postindustrial society	functioning of industry on the regional, national, and international scales

increasing, new, social functions of industry. The question 'how to produce' consists actually of two questions: First, what technologies should be used? This, of course, implies the use of 'clean' technologies, material and energy-saving, depending on the supply of labour and qualifications of the workers. Secondly, what organizational forms should be adopted? There is, for instance, a tendency to build medium and small works, this is a quite opposite view to the 'gigantomania' which characterizes Poland's industrial development. Scale economies may often become disadvantageous, as happened for example, in the Shoe Factory at Nowy Targ quoted above, in which, because of lack of workers, approximately 20 per cent of production capacities are not used (B. Domański, 1985). Lenin's Metallurgical Works, because of their scale, complicate the functioning of the city and pollute the environment to such an extent that this brings about the hardy assessable losses to the health of Cracow's inhabitants and its urbanistic substance.

Finally, there is also the question of securing satisfactory working conditions. In Poland, in many cases industry has ceased to be an attractive place of work, predominantly because of obsolete technologies and difficult, inadequate working conditions; this is true, for instance, of Lenin's Metallurgical Works in Cracow, which suffer from a shortage of labour.

REFERENCES

Cox K. R., Golledge R. G., eds., 1981, *Behavioural problems in geography revisited*, Methuen, London.

Domański B., 1985, Ocena lokalizacji fabryki obuwia w Nowym Targu (The assessment of location of the shoe factory at Nowy Targ), *Zeszyty Naukowe UJ, Prace Geograficzne*, 88.

Domański R., 1978, System wartości – cele przestrzenne (System of values and spatial objectives), *Folia Geographica, ser. geographica oeconomica*, 9, 44–45.

Domański R., 1982, *Teoretyczne podstawy geografii ekonomicznej* (Theoretical bases of economic geography), PWE, Warszawa.

Eliot Hurst M. E., 1974, *A geography of economic behaviour*, Prentice-Hall, London.

Eliot Hurst M. E., 1978, Geografia zachowań ekonomicznych (A geography of economic behaviour), *Przegląd Zagranicznej Literatury Geograficznej*, 2.

Green K., Coombs R., Holroyd K., 1980, *The effects of microelectronic technologies on employment prospects. A case study of Tameside*, Gower, Aldershot.

Hall P., ed., 1978, *Europe 2000*, Duckworth, London.

Kortus B., 1981, Geografia przemysłu i jej aktualne problemy badawcze (Industrial geography and its present research issues), *Przegląd Geograficzny*, 53, 285–294.

Kortus B., Adamus J., 1982, Z badań nad oceną lokalizacji i funkcjonowania zakładów przemysłowych (Evaluation of location and functioning of industrial plants), *Czasopismo Geograficzne*, 53, 289–301.

Kortus B., Domański B., 1983, *Społeczne aspekty w badaniach geografii przemysłu* (Social aspects in spatial industrial researches) (in print).

Kukliński A., 1982, Dylematy rozwoju nauk geograficznych w Polsce (Dilemmas of the development of geographical sciences in Poland), *Biuletyn KPZK PAN*, 118, 230–244.

Lindholm R., 1982, *Toward a New World of work, Swedish Development of Work Organizations, Production Engineering and Co-Determination*, Swedish Employers' Confederation, Stockholm.

Minc B., 1974, O ekonomice niepewności (On the economics of uncertainty), *Gospodarka Planowa*, 6, 367–372.

Smith D., 1977, *Human geography – a welfare approach*, Arnold, London.

Szczepański J., 1973, *Zmiany społeczeństwa polskiego w procesie uprzemysłowienia* (Changes in Polish society in the process of industrialization), Inst. Wyd. CRZZ, Warszawa.

Taylor Z., 1980, Origins and problems of social transport geography, *Geographia Polonica*, 43, 259–268.

Tornquist G., 1980, *Geography of working life*, Dept. of Social and Economic Geography, University of Lund, Lund, 62 pp. (typescript).

Zajda Z., Zawadzki S. M., 1961, Z badań nad ekonomiczną efektywnością lokalizacji zakładów przemysłowych (On research into economic effectiveness of the location of industrial works), *Biuletyn KPZK PAN*, 7/9, 63–179.

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ENERGY RESOURCE MANAGEMENT IN THE UK: THE CASE OF COAL

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INTRODUCTION

The last thirty years have witnessed major changes in the structure and geography of British energy supply. In 1950 coal still dominated, accounting for 89.6 per cent of primary inland fuel consumption. In the 1950s and 1960s Britain became a multifuel economy, with oil (imported) finally usurping coal's leading position in 1971. (Coal regained the lead in 1981, cf. Table 1). In the 1960s the exploitation of natural gas from the North Sea created a major new element in the energy map: this source has taken a steadily increasing share of the British market ever since. A second new feature dating from 1957 was the creation of nuclear power stations: these have grown at a more modest rate, and now number 16. They produced 11 per cent of United Kingdom (UK) electricity in 1982. With the exception of uranium mining, the UK now houses all stages in the nuclear fuel cycle. In the 1970s the most spectacular new entrant has been North Sea oil (from 1975). By 1981 the UK was exporting more oil than she imported and the country for the first time in recent history had an overall positive energy trading balance. Today the UK is the largest producer of coal and oil in Western Europe. These dramatic changes have been accompanied by an increasing emphasis in all sectors upon large scale, centralized, capital-intensive operations.

Of the major energy supply sources only production of gas and oil are substantially in private hands, and developments in these sectors are strongly affected by government policies on exploration licensing, taxation and pricing; the British Gas Corporation and the British National Oil Corporation play an important role. Coal production, gas distribution, and electricity production and distribution are all state-owned nationalized industries. Thus the geography of energy in the UK is in large measure the geography of state activities – allied in the case of oil and gas to the multinational corporations. The state is dominant in the ownership, financing and control of the energy sector; its policies provide the framework for energy development.

The involvement of the state is not new. The Central Electricity Generating Board (CEGB) was established in 1957, and the National Coal Board (NCB) in 1947. For many years the importance of the energy base to the successful operation of a capitalist economy has been recognized. During an energy crisis the threat posed to the process of capital accumulation makes it inevitable that the state will emphasize its role as 'facilitator' whereby the state underwrites the economic operations of society (Johnston, 1982), and will act to maintain secure energy supplies essential to the infrastructure of a modern economy.

ENERGY STUDIES AND HUMAN GEOGRAPHY

The growth of public interest in energy issues and their recent prominence on the political agenda has been mirrored by the emergence of energy studies as a major growth point in the social sciences. This was illustrated by the establishment of a separate Energy Panel in 1977 in the Social Science Research Council. British geographers, however, have been loth to jump on to the energy bandwagon. According to Hoare (1979), a count of research interests of British economic geographers revealed 'an almost total absence of interest' in energy. Since 1979 there is evidence of some growth of interest, including the first synthesis of British energy geography for many years (Fernie, 1980), but the number of participants in research remains small. The Institute of British Geographers has no separate study group relating to energy. Over the last decade each major energy sector in the UK has attracted a small number of individuals: for example, Manners (1981), North and Spooner (1978, 1982) and Spooner (1981, 1983) on coal; Mounfield (1981), Openshaw (1982) and O'Riordan (1982) on nuclear; Odell (1981), Odell and Rosing (1980) and Chapman (1976) on oil; Hoare (1979, 1983), on "alternative energies", (especially tidal power); Beaumont and Keys (1982) on urban energy systems, including combined heat and power schemes.

Why have British geographers been slow to show an interest in a sector of such fundamental importance to society? In the 1960s Manners (1964) and Odell (1963) had both produced substantive analyses of the economic geography of energy, but the subject appeared to be by-passed by the revolutionary changes in geography that characterized British geography in that decade, and has remained relatively neglected during the energy crisis. The reason for this neglect would appear to lie at least in part in the way in which British energy supply is developed and administered. The dominance of large scale, bureaucratic, state-owned organizations (or in the case of oil a small number of massive multi-national corporations), and the relative rarity of location/investment decisions (in time and space), discourages interest. Nationalized industries often co-operate unwillingly (or not at all) in the provision of useful and revealing data; secrecy and confidentiality bedevil inquiry in many politically sensitive areas. Openshaw's comment (1982) that 'the CEGB simply refuse to provide any details of their siting policies' illustrates the problem. It may be relatively easy to obtain data on spatial patterns of production but it is extremely difficult to penetrate the decision-making processes that underlie the patterns. These processes often remain locked in the bureaucratic fastnesses of the nationalized industries and government departments, glimpsed occasionally, but generally inaccessible to the academic researcher.

Decisions in the energy sector are intricately linked to government policies. The British style of policy-making has been described as 'consensus-seeking on the basis of selective consultation' (O'Riordan, 1979); it is part of the tradition of conflict resolution in political affairs that discussions are kept as far as possible from the public at large. Moreover the UK's civil service is highly secretive about its operations, and this secrecy is protected by legislation and convention (O'Riordan, 1982). However, there has been some opening of this 'black box' of policy-making since the mid-1970s.

ENERGY RESOURCE MANAGEMENT

Despite these problems, it is possible to detect a number of areas in which geographers are showing increasing interest. These include, for example,

(a) the supply/demand relationships in individual energy sectors, and the forecasting of future needs;

(b) the changing locational patterns of energy production, and the problems of siting energy facilities;

(c) the impact of energy facilities upon the physical and socio-economic environment, particularly at the local scale;

(d) the role of energy in regional development;

(e) the process of policy-making and resource management.

These categories frequently overlap; for example, the potential environmental impact of energy facilities may influence siting, and will be a factor in the determination of management policies. In particular, many of these aspects coalesce in the problems of energy resource management.

The purpose of this paper is to illustrate the problems of resource management with respect to coal which is still marginally the largest contributor to UK energy consumption (Table 1). The process of 'resource management' is as much a political as an economic process. It has been defined as a process of 'determining the need

TABLE 1. Primary energy consumption in the UK

m.t.c.e.	1950	%	1960	%	1970	%	1981	%
Coal	204.3	89.6	198.6	73.7	156.9	46.6	118.4	37.4
Petroleum	22.9	10.0	68.1	25.3	150.0	44.6	110.8	34.9
Natural gas	–	–	0.1	–	17.9	5.3	72.1	22.7
Nuclear electricity	–	–	0.9	0.4	9.5	2.8	13.7	4.3
Hydro-electricity	0.9	0.4	1.7	0.6	2.3	0.7	2.3	0.7
TOTAL	228.1		269.4		336.7		317.3	

for and value of utilizing resources in the context of environmental constraints, social implications, technological investiveness and national policy guidelines' (O'Riordan, 1977). The process will be influenced by the prevailing ideology of those who make decisions to allocate resources, to permit, modify or prevent development. Who are the decision makers, or 'resource managers' in the context of coal? They include the resource *developer* (the NCB) but also those local and national government bodies involved especially in energy and environmental policies. These bodies, and their decisions, will be influenced by the activities of a series of *interest groups* operating at both local and national scales. Conflicts between competing interests may need resolution.

The central problem of energy resource management is sometimes conceived as one of reconciling national economic interest and local environment concern. This does not do justice to the variety of interests that will exist in any local area, or to the difficulties of defining the national interest. At the national level, government policies in a whole series of areas have implications for the energy sector, including for example incomes policy (wages for miners and power workers), regional policy (employment and investment in depressed areas), and foreign policy (security of energy supply). Thus energy policy often 'owes its direction and impetus as much to other elements of political and economic life as to the perceived exigencies of the energy sector itself' (Eden et al., 1981).

Thus the process of coal resource management takes place in a context of administrative and institutional complexity: there are numerous actors, including several government departments, different tiers of local government, nationalized industries and interest or pressure groups (Spooner, 1983).

Among *government departments*, the Department of Energy has responsibility for policies towards the individual sectors and for an overall strategy towards the national energy mix:

it also authorizes directly the working of coal on open-cast sites and adjudicates on power station planning applications. The Department of Environment is frequently called upon to adjudicate on planning applications for new underground mines through the public inquiry procedure. Its responsibilities embrace the field of physical planning and environmental protection. Conflicts between these two departments can occur which may have to be resolved at the highest level in Cabinet. But the Treasury is also important through its policies on public expenditure and borrowing by state industry, and several other Departments e.g. Agriculture, Employment, Transport, may have an interest in coal decisions. The relative importance of these departmental interests in coal decisions will fluctuate, depending upon the political priorities ruling at any particular point in time.

The National Coal Board, the largest coal producer in the Western world, has controlled the vast majority of British coal production since 1947. As a nationalized industry it is expected to 'pay its way', but cannot act with the freedom of private enterprise either in the matter of pricing or social responsibilities. Two other state industries play a crucial role in the process of coal resources management. The Central Electricity Generating Board and the British Steel Corporation are the NCB's two largest customers by far, and their investment and disinvestment decisions and purchasing policies are of great significance for the coal market. Despite common ownership, the extent of co-ordination between the planning of these industries is very limited.

The third group of actors comprises *local authorities* at both district and county levels. Their physical planning powers give them an important role in the approval of new projects. Attitudes towards coal development are conditioned by the political composition of local councils, and thus may change through time: they are also influenced by local economic conditions, especially employment, as well as environmental considerations.

Seeking to influence decision-makers at both national and local government level are interest groups, working in both private and public. Some of these *interest groups* are particularly powerful. The National Union of Mineworkers was rejuvenated as a political force by the successful strikes of 1972 and 1974: it seeks to slow disinvestment at old collieries and is vociferous in its support for new projects (and jobs). Pay settlements with the NUM are regarded as pace-setters for all public sector pay policies. On the opposing side in arguments over greenfield developments may stand the National Farmers' Union, a highly successful pressure group, with strong representation in local government. Environmentalist and community protection groups are of growing importance. The relative influence of these pressure groups will vary according to the social bias of the governing party (Johnston, 1982): some pressure groups can be clearly identified with either capital or labour.

This varied array of actors provides the cast for the process of decision-making and resource management with respect to coal. In the recent past, this process has been directed to the resolution of problems in three inter-linked areas: the size of the industry as a whole, the environmental impact of new investment, and the closure of old, high-cost collieries. Each of these problems will continue to vex the resource managers during the remainder of this decade.

COAL: SOME RECENT HISTORY AND GEOGRAPHY

Since nationalization in 1947 the British coal industry has been on a roller-coaster of fluctuating fortunes. Four main phases can be identified. The first decade, which included the original *Plan for Coal* (1950), was an expansionist phase in which the needs for industrial and domestic reconstruction of the post-war economy led to a high demand for coal, outrunning supply, and stimulating heavy investment in the re-equipping of the industry, but at the same time encouraging the emergence of competition in many markets from other fuels. In the second, catastrophic, phase, the industry plummeted from its 1957 post-war production peak as a series of markets

were lost (mainly to imported oil and North Sea gas): coalmines closed by the hundred. This period of rapid decline petered out in the early 1970s and was finally dispelled by the 1973–1974 OPEC actions. The 1974 *Plan for Coal* heralded a new phase of exaggerated optimism about the industry's prospects and launched a massive investment programme in modernization and coalfield extension. This phase proved brief: although investment continued on a large scale, from 1979 the political and economic climate shifted against coal. The national (and international) recession grievously affected the industry's market prospects, while the election of a Conservative government intent on reducing the level of public expenditure (as well as the extent of trade union power) placed the industry in a tighter financial framework and induced a new mood of realism among management and workforce alike. In this fourth phase the industry's future remains uncertain, and coal's projected role as 'bridge to the future' looks less secure than in the heady days of 1974.

During these phases trends in the geography of coal production have remained relatively constant, and have continued an erratic process of regional concentration which has been evident since the late 19th century. A shift in the Yorkshire and the East/South Midlands, and away from the longer-worked 'peripheral' fields, has been developing over a long period. It was clearly apparent during the phase of rapid contraction in the 1960s: contraction proceeded much faster in the peripheral fields (North and Spooner, 1978).

The differentiated pattern has been explained mainly in terms of cost and market factors. In the longer-worked peripheral fields, like South Wales and Central Scotland, mining has been encumbered with adverse physical conditions, giving higher production costs and lower productivity levels than in the younger mines of Yorkshire and Nottinghamshire, working thicker more regular seams. The peripheral fields tended to produce special coals for which markets have shrunk rapidly – notably coking coal in South Wales and N.E. England. In the central fields 'general' coals, with better market prospects in the electricity-generating industry, have predominated. Power station coal-burn now dominates the coal market, and power station construction and coalmining development have become closely linked in a reciprocal relationship. The siting of large coal-fired power stations in the Yorkshire and Midland regions in the 1960s was 'both the cause and effect of expanded (coal) production there' (Blunden, 1975).

Under the 1974 *Plan for Coal* heavy capital investments are being made to modernize and extend production capacity, both at new 'greenfield' sites and in some existing areas of coal working, referred to subsequently as "blackfield" sites. The original estimate of investment under this *Plan*, was £1400 M (1974 prices): this had risen to £5170 M at 1979 prices – a real increase after inflation of 43 per cent – creating a major problem of indebtedness. 42 M tonnes p.a. of new capacity was to be created by 1985, of which 20 M tonnes would be at new mines. Given the expected loss of capacity at exhausted mines, this would stabilize the level of national output, and check the process of decline. By 1982 170 major investment projects at existing collieries had begun, of which 97 were already completed (NCB, 1982). Despite the closure of 59 collieries between 1974 and 1982, eliminating around 9 M tonnes p.a. of outworn, high-cost capacity, national output has been maintained at a relatively stable level, oscillating in the 119–127 M tonnes p.a. range. Productivity has improved considerably since 1979, the combined result of new investments and the introduction of wage incentive schemes. Three small new drift mines have already been opened (Royston, Kinsley, Betws) and output commenced from the massive is 10 M tonnes p.a. Selby complex is due in July 1983. The basis for these investments has been an intensive exploration programme over the last decade which has revealed abundant reserves of coal, enough to sustain present levels of production 'as far into the future as has any practical meaning' (C.En.E., 1981).

Under the 1974 *Plan for Coal* the trend towards regional differentiation of central and peripheral fields is clear. The lion's share of investment is taking place in the great Yorkshire – Nottinghamshire – Derbyshire field (North and Spooner, 1982). In 1982 this area had been allocated 82 per cent of total capital investment in progress (it accounts for 56 per cent of current production). New greenfield sites are being developed on the eastern frontier of this coalfield, especially at Selby, while some blackfield areas are undergoing a massive restructuring (most notably the Barnsley district). Most of the outstanding 'prospects' for development identified by the exploration programme lie in the Yorkshire and Midland regions.

While the pattern of investment focuses upon the central coalfields, the continuing series of disinvestment decisions (closures) remains concentrated upon the peripheral fields. Three regions – South Wales, Scotland and NE England have borne the brunt of closures since 1974, losing 40 of their 110 collieries. It is true that Yorkshire lost 11, mainly in the NW part of its region (around Wakefield), but this was a much smaller proportion of its total of 66 collieries in 1974. The East and South Middlands lost only 6 of their 69 collieries.

The development of new coal prospects by the NCB takes place through a series of stages or 'rungs' on a 'ladder' of exploration (C.En.E., 1981). The NCB has been reluctant to admit that it has much freedom of choice between alternative prospects. For example at the 1979–1980 Belvoir inquiry the NCB declared that 'there is no other prospect which would create a viable alternative at this time or in the next few years' (Moses, 1979). However, the success of their exploration programme suggests that there is a growing range of options available, with a more flexible approach to the sequence of development possible.

The allocation of investment between greenfield and blackfield sites has been influenced by the mechanisms of the UK's physical planning system. Plans for greenfield sites like Selby and Belvoir are normally scrutinized (and contested) in the forum of the public planning inquiry, a process of decision making that may last several years and add substantially to the total 'lead time' of individual projects. The Belvoir case is a notorious example: the consultation and planning process has already taken six years. By contrast, at blackfield sites, the NCB has much greater freedom of operation. At existing mines inherited from the pre-nationalization (1948) period, new planning permissions are not required for underground or ancillary pithead development – under the General Development Order system. Thus ability to proceed rapidly at existing sites without the delays of public planning inquiries has been some compensation for the problems of greenfield development, and has lead to a much heavier emphasis on existing sites in the period up to 1985 than originally included under the *Plan for Coal*.

COAL RESOURCE MANAGEMENT PROBLEMS

THE SIZE OF INDUSTRY AND THE MARKET FOR COAL

Since 1974 the total size of the coal industry, present and future, has been a central issue. Both national plans and individual projects have been justified by the NCB in relation to a projected level of need. In the immediate aftermath of the 1973–1974 oil crisis there was a brief period of consensus that expansion of coal-producing capacity was needed. Thus the government's inspector at the planning inquiry into the Selby project concluded in 1976 that 'the principle that coal contained in the site should be worked in the national interest was accepted by all witnesses' (Dept. of the Environment, 1976): the need for the project in the national interest was not seriously contested. However, by the time of the planning inquiry into the next major greenfield project – the Vale of Belvoir – in 1979–1980, the consensus had disintegrated. The central part of the objectors' case was the absence of proven need for the

coal produced. Among the leading witnesses who argued this case was the geographer, Manners, who attacked coal's 'false market prospectus' (1980, 1981). Manners' analysis of trends in the national demand for coal led him to believe that the UK was in danger of over-investing in an unmarketable commodity. Although the government inspector at Belvoir did not accept these arguments (Dept. of the Environment, 1981), it is true that recent government estimates of future coal demand are substantially lower than those emanating from the 1974–1977 period, while the NCB have also now produced much lower estimates in evidence to the House of Commons Select Committee on Energy (1982b).

In the UK the approach to energy planning is generally based upon the manipulation of supply to meet estimated forecasts of demand: attempts to manage demand have been sporadic and half-hearted. Thus planning in the coal industry consists essentially of attempting to build production to meet an estimated level of demand. The 1974 *Plan for Coal* was a short – to medium-term plan concerned with the period to 1985, when demand was expected to lie in the range between 125–150 M tonnes p.a. (This compared with 132 M tonnes produced in 1973). A longer-range plan published in 1977 (Department of Energy, 1977) gave targets for the year 2000 in the very broad range 130–200 M tonnes; these have now been revised down to 100–140 M tonnes (House of Commons Select Committee on Energy, 1982b), see Table 2.

TABLE 2. Actual and forecast UK markets for coal (inland consumption only, M tonnes)

Market	Actual		D. Energy 1978 forecasts		NCB 1982 forecasts			
	1973	1982	1985	2000	1985/1986		2000/2001	
					High case	Low case	High case	Low case
Power stations	75.6	85.3	88.2	64.1	87	82	85	73
Coke ovens	21.5	11.1	22.4	26.8	10	10	9	8
Manufactured fuel	4.0	2.4	1.6	0.6				
Collieries	1.4	0.6	0.5	0.4	12	11	13	11
Domestic	14.3	8.8	5.9	2.5				
Industry	11.9	7.0	9.7	41.0	12	11	35	21
Other	2.5	1.9	1.2	1.0				
Total	131.2	117.1	129.5	165.3	121	114	142	113

These forecasts were based upon a breakdown of demand into individual sectors, as well as upon forecasts for the rate of economic growth in the UK and for the energy co-efficient (the relationship between economic growth and energy consumption). The more optimistic estimates for the latter part of the century were based especially upon a considerable (re-)growth of the industrial and commercial use of coal, in turn based partly upon the development of attractive cost effective new technologies (including possibly fluidized bed combustion, pyrolysis and synthetic natural gas). For 1985 the major source of demand growth was expected to be power station demand plus modest expansion of the coke oven (steel) market.

Table 2 indicates the extent to which by 1973 the coal industry had become dependent on the electricity generating market. Increasingly it is necessary to examine the development of the 'coal chain' – comprising the linked sequence of coal mines, preparation plants, transport systems and power stations, which leads to the conversion of coal into a secondary energy source: 'coal by wire'. The electricity market provides the motor of demand for development of this chain. Each part of the coal chain presents widely different requirements in terms of construction 'lead times',

capital costs and labour requirements: each is in the hands of separate nationalized industries. In terms of capital costs the power station is usually the largest individual component and has the longest lead time: power station investment decisions are of crucial significance to the development of the chain as a whole.

The problem of the coal market in the UK in the 1980s is related firstly to changes in the performance and structure of the national economy – itself influenced by international relationships – and secondly to the attitudes and aspirations of its major customers – themselves influenced by national ideologies.

In the first case, since 1974 the global recession and deindustrialization of the British economy have reversed the previous relentless upward growth of energy consumption. Total inland energy consumption in 1981 was at its lowest level since 1968, and was nearly 11 per cent lower than in 1973 (the peak year). In the short run, the energy crisis has become one of surplus rather than scarcity. Economic growth has petered out, and there are serious doubts as to the validity of the energy coefficients being used by official forecasters: in an era of expensive energy they may be much lower than in the past. More certainly, market forecasts have failed to anticipate the major, and probably irreversible decline in manufacturing industry in the 1970s and especially since 1979: a decline that has been particularly marked at the 'heavy' end of the manufacturing sector. Since 1979 manufacturing output in the UK has fallen by at least 16 percentage points. It is not surprising that the level of industrial demand for coal was substantially lower in 1982 than in 1973 – despite recent Government grants for boiler conversion (from 1981). In the same period 'disinvestment' in the British steel industry almost halved the coke market. It would be a brave man indeed who would argue that these changes are not permanent: the House of Commons Select Committee (1982b) were in no doubt that the expansion of the markets for British coal assumed in the 1974 *Plan for Coal* and the 1977 document 'now appears to be highly unlikely'.

In the second case, the CEGB is displaying considerable reluctance to invest in further coal-fired power stations, thereby threatening to squeeze the market for coal in the long term. Only one major coal-fired station, Drax 'B', is currently under construction. Instead, plans of the CEGB are heavily biased towards nuclear power. In 1979 the Government announced support for a CEGB programme of ordering one new 'nuke' per year from 1982 (or some 15 GW of generating capacity) over 10 years. Sizewell 'B' PWR is the first of the series. The scale of this commitment was criticized by the House of Commons Select Committee on Energy (1981) as excessive, but the Government rejected such criticism (Department of Energy, 1981). Although a programme of this scale is now unlikely, the pro-nuclear stance of CEGB and government is clear. In the past the preference for nuclear over coal-fired electricity has been argued by the CEGB to be based on lower costs of electricity production. These arguments have been increasingly challenged (especially during the Sizewell inquiry), and recent cost comparisons published by the CEGB (1983) suggest that the cost advantages of nuclear have been exaggerated in the past, and may even be non-existent.

The preference for nuclear power is better explained by the 'technocentric' approach towards resource use that characterizes the professional elites in the electricity industry and in government. The massive 'technical fix' inherent in the nuclear power industry is attractive to the politically and economically powerful, 'who are soothed by the confidence of technocentric ideology and impressed by its presumption of knowledge' (O'Riordan, 1976). Moreover, nuclear power protects the interest of capital rather better than coal, with its inconvenient reliance on a strongly organized large labour force. Leaked Cabinet minutes in 1979 contained the significant quotation that 'a nuclear power programme would have the advantage of removing a substantial proportion of electricity production from the danger of disruption by industrial

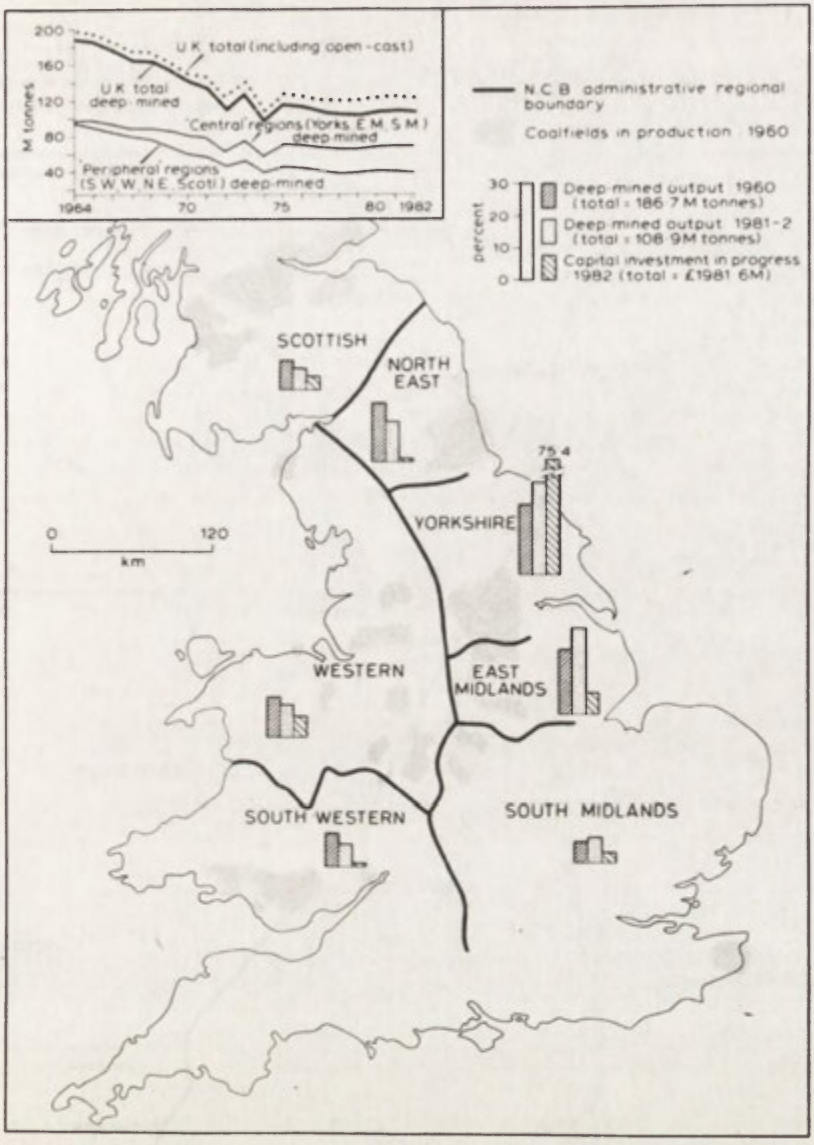

Fig. 1. The British coalfields in 1982

action by coalminers or transport workers' (Raphael, 1979). The veiled military connections of nuclear power are also significant.

In this section we have been concerned essentially with examining aspects of the national market for coal, which have captured the attention of geographers and other social scientists. We should note finally that the scale of British coal production may also be affected by the growing international trade in coal. Export possibilities are largely limited to the EEC, where in 1981–1982 the UK was able to double its exports to fill the partial vacuum left by temporary disruption in Polish production. The growth of large scale low cost exports from the USA, Australia and South Africa especially (based particularly on surface-mined coal) makes major growth of UK

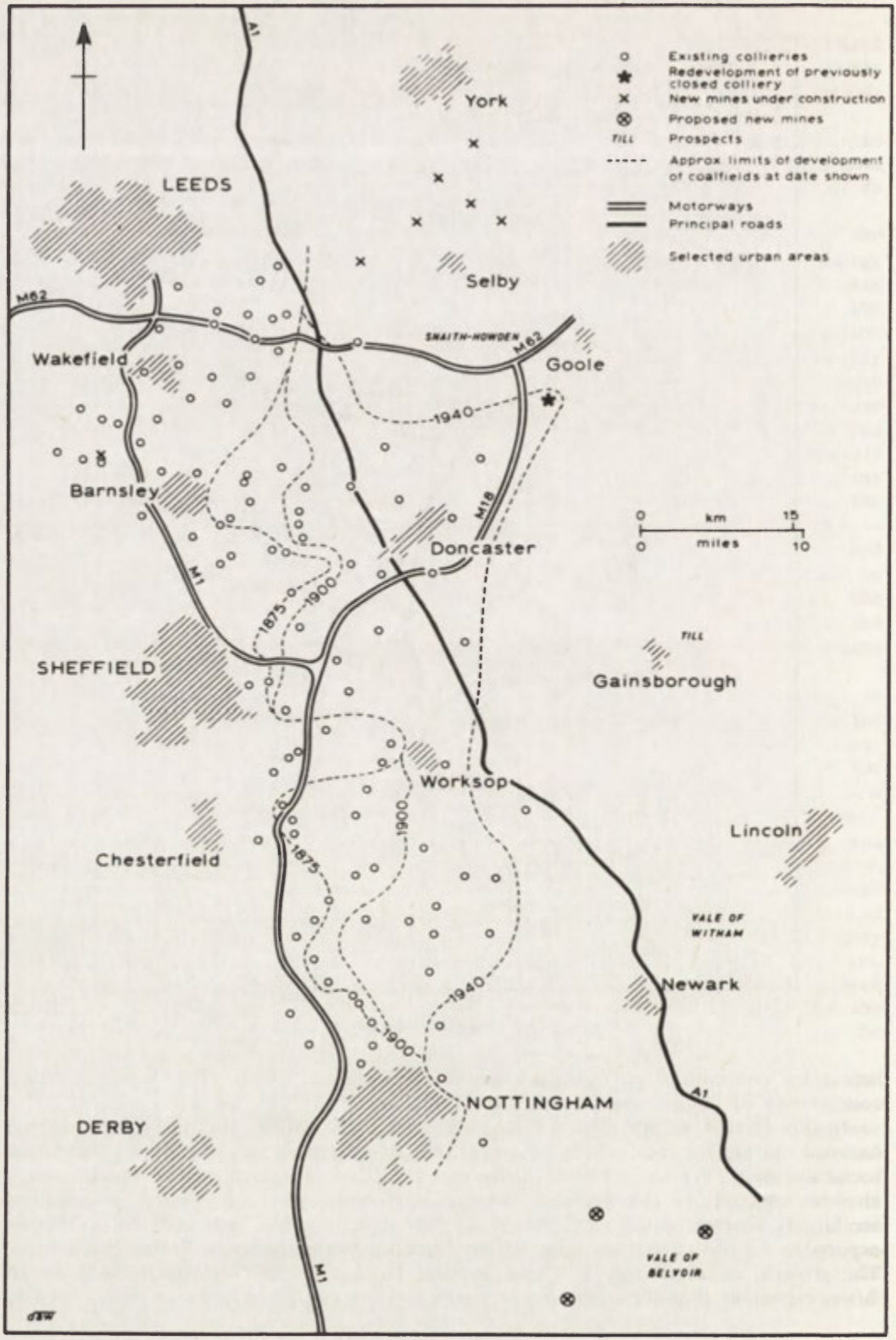

Fig. 2. The Yorkshire, Nottinghamshire and Derbyshire coalfield in 1982

exports unlikely: indeed cheap coal imports pose a threat to some domestic markets, and increase the pressure on the British coal industry to modernize further and eliminate more high-cost capacity. The 'scale of reality' (Taylor, 1982) for British coal is international in more than one sense.

THE ENVIRONMENTAL IMPACT OF NEW INVESTMENT

If the overall dimensions of the coal industry are largely determined by the realities of the international-scale economy, and by the ideologies prevailing at national level in government and state industry, it is at the local or sub-regional scale that the impact of investment decisions is experienced. While such decisions are usually made at the national level, local participants in the resource management process (both in local government and interest groups) may exert some modifying influence.

Coalmining produces a wide range of 'externalities' or social costs, especially for the districts in which mines are located. At the local scale, the environmental impact of new development is a dominant issue. At the same time environmental problems have become more prominent on the national political agenda (though easily pushed aside by economic problems). Growing public concern at the environmental impact of energy development has led to government appointment of a commission, chaired by Lord Flowers, to investigate the problem. Flowers' only report before being disbanded was a comprehensive examination of the environmental implications of increased coal production and use (Commission on Energy and the Environment, 1981), described by O'Riordan (1982) as a form of 'technology assessment'. Impacts from coalmining accrue directly from productive operations, but also indirectly from ancillary facilities, or the population necessary to service the primary development: such impacts will have varying durations. The physical planning system is used to modify, control or limit the magnitude of impact. Much of the discussion embodied in the Flowers report was concerned with methods of improving and standardizing controls though few radical proposals were presented. New planning techniques, such as environmental impact analysis, may play an increasing role in site selection and approval in the future.

Although there is no national environmental lobby which is strongly anti-coal, individual coal projects are frequently opposed by local groups parading under an environmentalist banner. Many such groups are in fact primarily concerned with protection of property interests and preservation of the *status quo*. According to Muir and Paddison (1981), interest groups in the environmentalist field fall into two categories – sectional groups (out to promote privately oriented wants) and principle groups (interested in publicly oriented wants and a more 'ideological' form of conservation). Local anti-coal groups tend to fall into the first category. The 'Alliance' formed to fight coal development in the Vale of Belvoir consisted of a coalition of essentially 'material' interests – farmers, landowners, private householders living in dormitory villages – who were concerned to prevent mining in the Vale, but not concerned if it took place elsewhere.

The focus of new mining activity has shifted to lowland England; the mining 'frontier' is being pushed across farmlands characterized by modern, efficient, capital-intensive agriculture. At Selby, for example, much of the land to be undermined had been improved by elaborate drainage operations to the highest land quality grades. Accommodation between coal and farming interests was the dominant issue at the Selby inquiry, centring upon the problems of subsidence. Grant of planning permission for the Selby development carried express conditions about the limitation of subsidence in this flood-endangered lowland. In the Vale of Belvoir the loss of land to spoil tips, and their visual impact on the landscape, was cited by the Secretary of State for the Environment as the main factor in his refusal of the NCB's initial planning application in 1982.

The possible socio-economic impact of the immigration of mineworkers to greenfield sites also arouses opposition, particularly in dormitory villages in parts of these lowland areas. A substantial proportion of the workforce at new mines will come from mineworkers transferring from the older declining mining districts of the central coalfields – these mineworkers actively lobby in support of new developments. The image of the mineworker as a cloth-capped, militant feeds antagonism: even the *Financial Times* has conceded that 'social bias underpins the environmentalist case'. Arguments arise between the NCB and local authorities about the financing of public housing for miners in the new areas, but given the dramatic improvement in the earnings level of the mineworker since the early 1970s, it is the private housing market that may ultimately experience greater pressures. Neither the NCB nor local authorities wish to see the creation of new colliery villages; new housing developments are likely to be dispersed, or clustered at the larger settlements.

In the greenfield areas, local attitudes are conditioned also by the regional economic condition; in some areas (like Leicestershire) antagonism towards new coal mines has weakened as local unemployment has risen. The extent of stimulus to the sub-regional economy likely to arise from new mine development has become the matter for some debate. The net direct addition to employment may in fact be small. New projects like Selby or Belvoir are highly capital intensive and labour requirements relatively modest. When Selby reaches full production it will employ c. 4,000 mineworkers to produce 10 M tonnes of coal p.a.: by contrast in 1982 25,000 mineworkers in South Wales produced 7.7 M tonnes. The continued rundown of old collieries ensures that much of the workforce at new greenfield projects will be supplied by intra-coalfield transfers of mineworkers: this is NCB policy.

At the Vale of Belvoir inquiry the NCB calculated that to run three mines it would have to recruit 8,000–8,500 workers over a 13-year period (using wastage rates based on past experience), to provide a peak employment at the mines of 4,100 workers. Only 2,500 of these would comprise 'green' adults and juvenile entrants to the industry. Leicestershire CC, the local planning authority, using a multiplier of 1.5, calculated that mining would create 6,000 extra jobs in the sub-region, but because of the substantial immigration of mineworkers and their dependents 9,000 extra workers would be introduced. They argued that as a result job shortages would grow by as much as 30 per cent with a steep rise in the female workforce (Department of the Environment, 1981).

Also controversial in the longer term is the possible enhanced attractiveness of such areas to other related economic activities. Most greenfield projects in the UK at present in the construction or planning phases will supply coal to existing power stations; new coal-using activities are not anticipated. In the long term however, new uses for coal may lead to the development of 'coalplexes' – complexes manufacturing a whole range of coal chemicals, as well as converting coal to electrocity, coke, synthetic gas or liquid fuels. At present this type of 'downstream' development remains hypothetical, as are its possible locational requirements.

Despite the enormous publicity given to the problems of the greenfield areas – with scarcely disguised class warfare in the Vale of Belvoir there are strong grounds for believing that the more serious environmental problems associated with coal investment projects under the *Plan for Coal* lie at blackfield sites in the older mining areas (Spooner, 1983). Particularly in Yorkshire, huge investments in large-scale mining are being grafted on to a legacy of more than a century's mining dereliction with which local planning authorities are still trying to grapple (with some national government aid). The environment of the Yorkshire coalfield – with its dense population – is already overstressed. The programme for restructuring its coal industry will greatly accelerate the production of colliery spoil. Large quantities of power station ash will also need disposal. Spoil tipping is just one aspect of the environmental impact:

lagoons, noise, subsidence damage, air and water pollution all contribute to the physical degradation. Open cast mining – particularly attractive to the NCB on profitability grounds – is still locally important – often in close proximity to residential areas – and in the view of the Flowers Commission 'has a severe impact on the environment in both the short and long term' (C.En.E., 1981).

The extent of these problems suggests strongly that additional measures are needed to deal with the environmental problems of the blackfield areas on an integrated, long-term basis, with national government finance on a scale greater than currently available.

The problem of environmental impact at the local scale has tended firstly to slow the process of new mine development since 1974, as the local participants in the resource management process have striven to protect their interests; secondly, the imposition of standards, conditions etc upon mine development inevitably increases the costs of mining for the NCB (for example by restricting the extent of highly profitable open-cast operations), and thereby affects its ability to compete in the energy market.

COLLIERY CLOSURES

The third and final problem for resource managers in the coal industry is the problem of colliery closure. The elimination of high-cost, loss-making mines is seen by many observers as vital to the financial well-being of the industry; the rate at which this process takes place will influence the overall scale of production. The 'problem' arises from the social and economic consequences of closure for coal-mining communities, and from the pressures upon a state industry to act humanely towards its workforce.

The programme of colliery closures has continued since 1974, with the greatest number of closures occurring in the peripheral fields. The disparity in regional fortunes in this respect is illustrated by the pattern of accompanying job losses. Of a total net loss of 39,000 jobs in the industry between 1974 and 1982, 33,000 were lost in the four peripheral NCB regions (N.W., S. Wales, N.E., Scotland). In some regions, particularly South Wales, disinvestment is still the most conspicuous type of change in the industry. Although it is the recent decline of manufacturing that is now the dominant source of unemployment growth in these depressed regions, there are sub-regions and communities that remain dependent on coal, making colliery closure an explosive local political issue.

Recent closure programmes in the British coal industry reflect the contradictions faced by the modern state arising from the clash of economic efficiency and political/social imperatives (Krieger, 1979). They reflect the realities of the competitive national and international energy market in which the coal industry is forced to operate, while at the same time attempting to carry out a socially responsible policy towards its workforce and their associated communities. In the last three years the Conservative government has attempted to place the coal industry's finances on a new basis which would eliminate the need for subsidies; although this attempt has not been successful, it has increased the pressure upon the industry to divest itself of high-cost, loss-making, capacity.

The explanation of why closures occur in an extractive industry is superficially a simple one: the coal has run out. Reality is rarely so simple. Decisions about closure may be made on economic grounds; the market situation at a particular time may be the factor that precipitates a decision to close the least economic colliers – or perhaps those producing a particular type of coal. A point may be reached in the operation of the mine whereby future production can only be sought by substantial further investment and with no guarantee of adequate returns. Contention between

NCB and the miners' union often centres upon the commital of expenditure by the NCB to open up new underground areas; future production prospects being dependent upon further investments, which the NCB may regard as highly speculative. According to the NCB 'it is not possible to make a clear-cut distinction between closures which arise from exhaustion of reserves (since such exhaustion is rarely absolute in a physical sense) and those which arise from economic considerations', but it remains clear 'that the Board accept the overall importance of economic criteria in planning the level and location of future capacity' (Select Committee on Energy, 1982b). Recent evidence to the Select Committee indicates a 'wide philosophical gulf' between the NCB and the unions about the admissibility of economic criteria in judging the future of a pit – with the NUM declaring that the coal should be mined whatever its cost.

In the 1970s, with the prospects for coal production apparently improved, most closures that did take place attracted comparatively little controversy, though ritual resistance was undertaken by miners. Normally a regular set of procedures (agreed in 1973), at area level, would be followed to review the position of threatened collieries, over a period sometimes of several years. In the 1980s the problem re-emerged with the recession. The build-up of coal stocks, and new financial strictures imposed by the 1980 Coal Industry Act, forced the NCB to attempt to speed-up the closure of the most marginal set of collieries. A list of 23 doomed collieries was dramatically announced in early 1981. This short-circuiting of the normal procedures brought a stormy reaction from the coalfields and with a national coal strike threatened the Government made additional finance available and the 'list' was withdrawn.

The 23 collieries had an average age of 93 years, a total production of only 4.27 M tonnes in 1980–1981 and were expected to lose £74M in 1980–1981. 14 out of the 23 lay in the peripheral fields of Scotland, S. Wales and N.E. England. Closure of three of the 23 pits had in fact been already agreed with the NUM through the normal negotiating machinery: in fact by March 1982 9 of the 23 had closed or been agreed for closure. The Government decision to back down on the closures issue and provide extra finance was strongly criticized by the House of Commons Select Committee (1982a): there had been no proper calculation of the trade-off between the extra costs of keeping open uneconomic pits and the resultant savings on welfare payments. The Flowers Commission is clearly in favour of phasing out heavily loss-making capacity – 'failure to face this challenge would be to tether the UK to the industry's past' (C.En.E., 1981). Yet on the other hand the Rinsche report to the European Parliament deplored proposals for large scale closures: 'it would have disastrous consequences for energy policy as a whole if pits were to be closed simply on the basis of short-term financial considerations where there were no cogent necessity due to reserves being exhausted, major geological problems or on other over-riding grounds' (European Communities, 1981).

In 1982–1983, the continuing pressures on the NCB imposed by the weak market for coal, and the growing mountain of coal stocks, led to a running feud between labour and management over closure lists and plans, though the NUM executive failed to mobilize sufficient support for a national strike on this issue. Militance against closures has been particularly strong in South Wales, where the workforce can see little compensating large-scale investment in modernization.

The Select Committee on Energy (1982b) concluded in its investigation of the pit closures controversy that the NCB must take steps to bring its capacity more into line with existing and expected demands for coal: this was bound to entail closures of some of the highest cost collieries – some acceleration of the closure process seemed to them unavoidable. They rejected most of the NUM's philosophy and arguments.

CONCLUSION

This paper has attempted to illustrate the problems of resource management in the British energy sector from a geographical perspective. Geographers have become increasingly aware of their need to examine the decision-makin process in these industries if they are to reach meaningful explanations of the observed patterns of energy development. The nature of the energy industries and their association with the apparatus of the state inevitably means that insights remain partial, but the process of decision-making has become more open to view. Some geographers have gone further, and played an active role in the resource management process – for example in the development and promotion of techniques such as environmental impact analysis, or in the submission of evidence or advice to public inquiries or parliamentary select committees.

The description of the three major and inter-related problems confronting resource managers concerned with British coal has illustrated the variety of forces that are brought to bear upon the energy sector, and, in particular, that these operate at a variety of scales. It becomes increasingly clear that to advance our understanding of the geography of energy it will be necessary to adopt explanatory frameworks and modes of analysis borrowed from the political sciences. In this field it is difficult to refute 'the fundamental materialist argument for the unity of the political and the economic', recently advanced by Taylor (1982). Taylor identified three scales as an organizing principle, in his attempt to place political geography within a 'political economy' framework – respectively the scale of reality (global), the scale of ideology (national) and the scale of experience (urban). We may conclude by emphasising the relevance of this framework to the study of energy. The scale of reality for the energy industries is the global scale – the world economy – the fortunes of individual industries are bound up with international economic relationships. The scale of ideology is the national scale, and we have seen this demonstrated in the problems of managing the publicly owned coal industry. But the scale of experience is still local; this is the scale at which the effects of investment and disinvestment decisions are felt in the daily lives of individual communities – whether through employment or environmental impact.

REFERENCES

Beaumont J. R., Keys P., 1982, *Spatial analysis of energy issues*, Wiley, Chichester.

Blunden J., 1975, *The mineral resources of Britain*, Hutchinson, London.

Central Electricity Generating Board, 1983, *Analysis of generating costs*, CEGB, London.

Chapman K., 1976, *North Sea oil and gas*, David and Charles, Newton Abbot.

Commission on Energy and the Environment (C.En.E.) (Flowers Commission), 1981, *Coal and the environment*, HMSO, London.

Crossman R. H. S., 1976, *Diaries of a Cabinet Minister*, Hamish Hamilton and Jonathan Cape, London.

Department of Energy, 1981, *Nuclear power* (The Government's response to the Select Committee on Energy's Report on the Nuclear Power Programme), HMSO, London, Cmnd. 8317.

Department of Energy, 1977, *Coal for the future, progress with the plan for coal and prospects to the year 2000*, HMSO, London.

Department of Environment, 1981, *The Vale of Belvoir coalfield inquiry*, HMSO, London.

Eden R., Posner M., Bending R., Crouch E., Stanislaw J., 1981, *Energy economics: growth, resources and policies*, CUP, Cambridge.

European Communities, 1981, *Report on aspects and requirements of coal supplies for the European Communities* (Rinsche report), European Parliament Working Document 1–662/81.

Fernie J., 1980, *A geography of energy in the United Kingdom*, Longmans, London.

Hoare A. G., 1979, 'Alternative energies', *Progress in Human Geography*, 3, 506–537.

Hoare A. G., 1983, Alternative energies and their environmental impact, with special reference to the Severn Barrage, in: *Studies in Geography*, Hungarian Academy of Science, Budapest.

House of Commons Select Committee on Energy, 1981, *The Government's statement on the New Nuclear Power Programme*, HC 114–I, HMSO, London.

House of Commons Select Committee on Energy, 1982a, *The Department of Energy's* estimates for 1981–2, HC 231, HMSO, London.

House of Commons Select Committee on Energy, 1982b, *Pit closures*, HC 135, HMSO, London.

James P., 1982, *The future of coal*, Macmillan, London.

Johnston R. J., 1982, *Geography and the state*, Macmillan, London.

Krieger J., 1979, British colliery closure programmes in the North East: from paradox to contradiction, in: I. G. Cullen, ed., *London Papers in Regional Science*, 9, Pion, London, 219–232.

Manners G., 1964, *The geography of energy*, Hutchinson, London.

Manners G., 1980, *Vale of Belvoir inquiry, proof of evidence*, days 67 and 68.

Manners G., 1981, *Coal in Britain: an uncertain future*, George Allen and Unwin, London.

Moses K., 1979, *Vale of Belvoir inquiry, proof of evidence*, days 9 and 10.

Mounfield P., 1981, Another look at nuclear power: the uranium market, *Geography*, 66, 15–28.

Muir R., Paddison R., 1981, *Politics, geography and behaviour*, Methuen, London.

National Coal Board, 1974, *Plan for coal*, NCB, London.

National Coal Board, 1982, *Reports and accounts, 1981–2*, NCB, London.

North J., Spooner D. J., 1978, The geography of the coal industry in the UK in the 1970s: changing directions?, *GeoJournal*, 2, 255–272.

North J., Spooner D. J., 1982, The Yorkshire, Nottinghamshire and Derbyshire coalfield: the focus of the Coal Board's investment strategy, *Geographical Journal*, 148, 22–37.

Odell P. R., 1963, *An economic geography of oil*, Bell, London.

Odell P. R., 1981, The energy economy of Western Europe: a return to the use of indigenous resources, *Geography*, 66, 1–14.

Odell P. R., Rosing K., 1980, *The future of oil*, Kegan Page, New York.

Openshaw S., 1982, The geography of reactor siting policies in the UK, *Transactions of the Institute of British Geographers*, 7, 150–162.

O'Riordan T., 1976, *Environmentalism*, Pion, London.

O'Riordan T., 1977, *Resource management*, Unit 23, Fundamentals of Human Geography, Open University, Milton Keynes.

O'Riordan T., 1979, Public Interest Environmental Groups in the United States and Britain, *Journal of American Studies*, 13, 409–438.

O'Riordan T., 1982, *Assessing the environmental consequences of energy development in the UK*, Symposium on the role of technology assessment in the decision-making process, Bonn.

Raphael A., 1979, Go-ahead for 15 nuclear reactors, *The Observer*, 9th December.

Spooner D. J., 1981a, The geography of coal's second coming, *Geography*, 66, 29–41.

Spooner D. J., 1981b, *Mining and regional development*, OUP, Oxford.

Spooner D. J., 1983, Environmental problems of the old and new coalfields in the UK: managing the coal revival, in: *Studies in Geography*, Hungarian Academy of Science, Budapest.

Taylor P. J., 1982, A materialist framework for political geography, *Transactions of the Institute of British Geographers*, 7, 15–34.

LAND USE PLANNING RESPONSES TO STRUCTURAL CHANGE IN THE DISTRIBUTIVE TRADES

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The distributive industries consist of the marketing activities directing the physical flows of goods and personal services in the economy. In a straightforward institutional view of the economy, as shown in Figure 1, the distributive trades traditionally comprise the wholesale and retail institutions together with the transport agencies linking wholesaler and retailer. Somewhat illogically this traditional West European

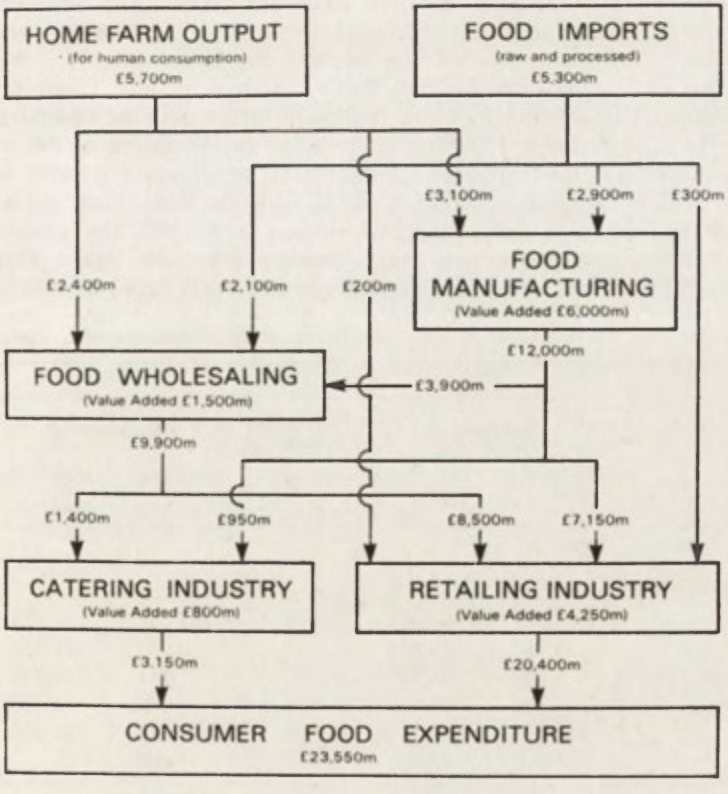

Fig. 1. Channels of food distribution in Britain, 1979

view excludes catering service activity, in contrast to East European views of distribution. Figure 1 gives an indication of the magnitude of the sector in respect of food distribution in Britain in 1979. Distribution activities are dominanty city based and so are influenced by attempts to control, influence and plan urban lanl uses. The distribution sector of the economy, in Britain, and indeed throughout Western and Eastern Europe, has expanded and undergone radical structural change in the last 30 years (Dawson, 1982). It might be expected therefore that land use planning ideas and policies will have responded to the changes in distribution. Opportunities have occurred for using the investment in distribution as a planned catalyst for general urban development and renewal. Rates of capital investment in distribution in several West European countries have been higher than in manufacturing for much of the last 20 years. This paper is limited to consideration of Britain and first considers three, of several, changes in the structure of distribution, secondly it reviews the legislative framework in which retail and wholesale land use planning has operated and thirdly it considers the policy approaches of planners in responding to structural change in distribution.

STRUCTURAL CHANGES IN DISTRIBUTION

THE RISE OF THE LARGE ENTERPRISE

Distribution traditionally has been characterised by small unit operation and, at least in Western Europe, small business operation. British city shopping districts and wholesale markets and districts in 1950 could be typified as concentrations of small business. Table 1 shows, for this date, the very large numbers of small retail firms, the majority of which operated through small establishments most of which are shops but also included are kiosks, market stalls, etc. A number of changes within the operation of the British economy has resulted in a very different pattern to distribution in 1980. Although direct detailed comparisons cannot be made for the data in Table 1 the figures provide an indication of the magnitude of change since 1950. The 1980 figures exclude very small scale traders who are not registered for Value Added Tax purposes and so a slight undercounting has occurred. The 1950 survey had a 9 per cent non-response rate with the presumption that most of the non-respondents were very small traders so again there is some slight undercounting. There are also differences in definition between 1950 and 1980 but

TABLE 1. Numbers of enterprises in retail and wholesale distribution

	1950			1980		
	Number of		Percentage of sales	Number of		Percentage of sales
	enterprises	establish-ments		enterprises	establish-ments	
RETAIL						
Enterprises operating						
1 shop	360,808	360,808	48	197,884	197,884	31
2–9 shops	25,887	70,819	17	28,932	76,920	14
10–100 shops	1,707	38,931	17	1,111	29,256	18
over 100 shops	118	37,958	18	150	44,540	37
All	388,522	508,516	100	228,077	348,600	100
WHOLESALE	33,000	43,000		91,000		

Sources: Data for 1950 reworked from *Census of Distribution and other Services, 1950* (1954).
Data for 1980 based on *Business Monitor* SDA25 1980 (1982) and *British Business*, 6/8/82.

these figures represent an attempt to adjust the 1950 data to 1980 definitions. The data for the wholesale trade must be treated with extreme caution as this economic sector is inadequately provided with statistical measures. Although the financial volume of goods in the distributive system has more than doubled (in real terms) between 1950 and 1980 the numbers of firms and establishments have declined substantially in retailing but have increased within wholesaling. Retailing, and to a lesser extent, wholesaling, have become characterised by large enterprise operations, which sometimes but not always operate through large shops and warehouses. This first feature of structural change, the increased importance of large firms, is having important effects on the appearance and spatial structure of British cities, not least in respect of the amount and origin of capital used in investments.

Within the retail sector there has been a considerable reduction in the number of small enterprises and consequently in their market power. The number of large enterprises has increased only slightly but their market power and market share have shown substantial gains over the period. By 1980 the five largest retail enterprises accounted for 13.2 per cent of national retail sales whilst for the ten largest enterprises the corresponding concentration figure is 21.4 per cent. Since 1980 the trend has continued with, between 1980 and 1982, a net loss of a further 15,700 enterprises, mainly small shop operators, and further gains in market power by large enterprises. This pattern is seen repeated in all branches of the retail trade but the change began first in the food, particularly grocery and footwear trades and so has developed furthest in these two trades. The number of small enterprises retailing primarily general grocery products has fallen from approximately 108,000 in 1961, to 82,000 in 1971 to 37,000 in 1980. At the same time the market power of large enterprises has grown such that ten enterprises in 1980 controlled 43.6 per cent of grocery sales. Within the footwear trade ten enterprises controlled 54.1 per cent of sales. The trend is least developed in specialist non-foods goods where large multistore enterprises have yet to make their mark. The decline of small retail businesses is readily apparent

TABLE 2. Reasons for the decline of small business in retailing

Reason for decline	Possible small business response
1. Broad economic and social change (inflation, recession, buying behaviour)	Nothing except increased awareness of change
2. Competition from large enterprises and their large establishments	Join buying consortia Compete by service not price Seek effective locations Market to defined consumer segments
3. Increased operation costs (energy, property tax, etc.)	Better accounting procedures to isolate cost items Energy budget analyses
4. Lack of capital for investment	
5. Non/poor availability of supplies of goods (price, quantity, delivery, etc)	Join buying consortia Co-operate with wholesalers
6. Urban renewal	Develop retailer co-operative shopping centres
7. Age of entrepreneur (many approaching retirement)	
8. Poor locations	Locational assessments and possible relocation
9. Inflexible management attitudes	Be more willing to co-operate with other small businesses Seek advice on store operation and management Explore applications of new technologies

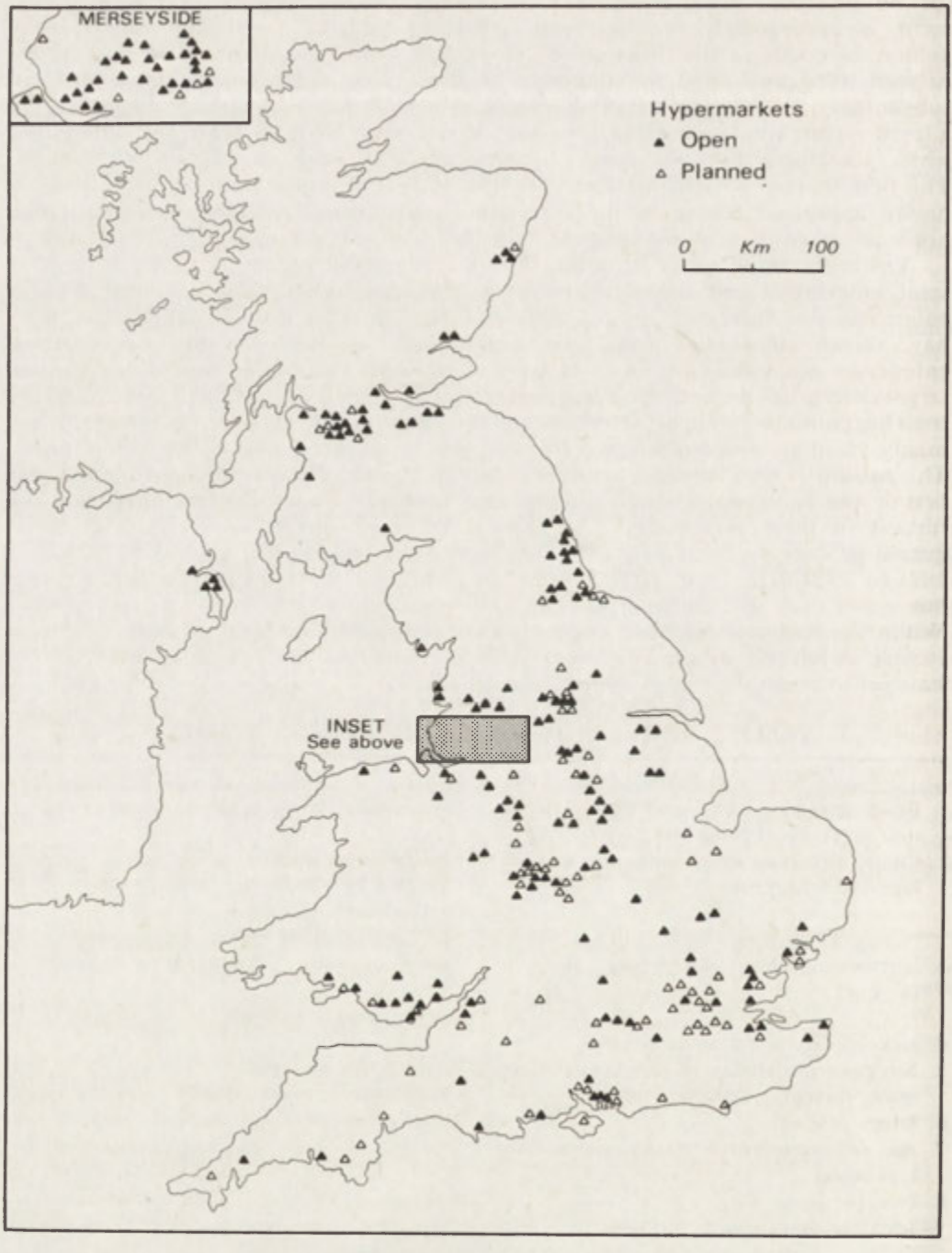

Fig. 2. Hypermarket development in the United Kingdom. 1980

in British cities. Table 2 lists the reasons for the decline of smallscale enterprise (Dawson and Kirby, 1979). The causes of decline are many and act in conjunction with each other to create a steady and continuous decline in profitability and in market power.

THE GROWTH OF LARGE ESTABLISHMENTS

A second major structural change, in retailing and wholesaling, has been the growth of very large, mass distribution, units. Although average warehouse size has increased in the last 30 years the trend is best illustrated in respect of retailing. In the 1950s supermarkets were developed within shopping districts in urban Britain. The innovators in supermarketing were the consumer co-operatives and emerging large grocery retailing enterprises. The early developments were small by today's standards and rarely were more than 1,000 m² (Stacey and Wilson, 1965; McClelland, 1963). Currently supermarket developments of 2,000 m² and larger are widespread. Approximately 7,400 supermarkets of all sizes are now in operation with an anticipated saturation level of around 8,500 (cf. Table 3). Supermarkets have spread throughout the urban system with settlements of less than 5,000 people now

TABLE 3. Cumulative totals of supermarkets and hypermarkets in UK

	Supermarkets [1]		Hypermarkets [2]	
	Total	of which over 400 m²	Total	of which over 5000 m²
1960	427			
1961	642			
1962	996			
1963	1366	494		
1964	1628		1	1
1965	2130	830	2	1
1966	2500		2	1
1967	2803	1129	3	2
1968	3300		7	4
1969	3800		13	4
1970	4400	2000	24	5
1971	4800		32	6
1972	5140		44	8
1973	5840		67	9
1974	5800		81	13
1975	5700	2650	104	17
1976	5890		124	22
1977	6190	3115	151	25
1978	7160		186	31
1979	7130	3578	218	34
1980		3786	241	38
1981		3927	276	41

[1] Supermarkets are self-service stores of over 200 m² floorspace retailing mainly food items.

[2] Hypermarkets are self-service stores of over 2500 m² floorspace retailing a broad mix of food and non-food items.

Sources. Institute of Grocery Distribution, Unit for Retail Planning Information, Self Service Directory.

often having a store of over 1,000 m^2. Such stores are essentially food shops although perhaps 10–15 per cent of sales space may be accounted for by a limited range of household goods and toiletries. These large food stores account for an increasing share of national food sales.

After experiments in the 1960s which increased the amount of non-food items sold in supermarkets a new store type began to appear in Britain. This second type of large unit is the hypermarket, a large, in excess of 2,500 m^2 sales space, mass merchandising self-service store with less than half the sales space accounted for by food items. The stores carry a very wide assortment of goods but a relatively shallow mix of any one product type. Such stores are significantly different, in various operating processes, from the now traditional supermarket. Management methods, purchasing techniques, development processes and many other aspects of operation differ in hypermarkets compared with supermarkets. Hypermarkets usually have associated car parking but are not used exclusively by car borne shoppers. Stores of over 6,000 m^2 have been built but more usual are stores of around 4,000 m^2. Table 3 shows the growth in numbers of these stores alongside the growth in supermarket numbers. Figure 2 shows the distribution of hypermarkets in 1981 based on data from the Unit for Retail Planning Information (1982). As with supermarkets they have spread throughout the urban system with developments in some cities with fewer than 30,000 population.

A third type of large store unit which is of increasing importance is the mass-merchandising non-food shop. Recent years have seen the development of large furniture, furnishing or home improvement centres. Such stores are usually over 3,000 m^2 with the largest units twice this size. Their product range includes all goods associated with home refurbishment. Development has been mainly, but not exclusively by large enterprises who operate chains of stores. Again they provide easy shopping for car borne consumers but unlike their counterparts in the USA, they are frequented by consumers using other transport modes, even providing self-drive delivery vans for customer use. Of somewhat longer history are the mass merchandising clothing stores typified by companies such as Marks and Spencer and Littlewoods. These store chains have undergone considerable development and expansion in the last 20 years. They have undertaken some diversification into other product groups, including limited entry into food goods, but they remain dominantly mass merchandising clothing stores. These stores have formed the anchors to many traditional shopping districts and new developments have continued in this role in shopping centres.

INCREASED CONTROL OVER MARKETING ENVIRONMENTS

Alongside the structural changes associated with large enterprises and large mass merchandising establishments there also has been a third structural change directly relevant to the theme of this paper. This is the widespread imposition and acceptance, by retailers and consumers, of more consciously controlled marketing environments. The market place is no longer characterised by free market processes. Marketing processes are finely tuned to respond to corporate and public policy objectives. For example, demand and buying patterns for particular products are stimulated or depressed by corporate marketing strategy; enterprises open and close stores or warehouses in response more to conscious corporate policy and to public policy attitudes than to consumer demand; controlled shopping environments are created in shopping centre developments; traffic free precincts are created and managed in shopping districts so consciously altering market conditions in these districts. Many other examples could be given of the ways large enterprises and government, at many levels, intervene in market process. A very clear and effective form of intervention

affecting retail activity in cities is the development of shopping centres. The creation of a retail complex in which there is careful control over the mix and type of shops, their size, shopper movement and, in the case of enclosed centres, the physical atmospheric environment can have far reaching repercussions on retailing elsewhere in the host city (Bennison and Davies, 1980). Figure 3 shows the amount

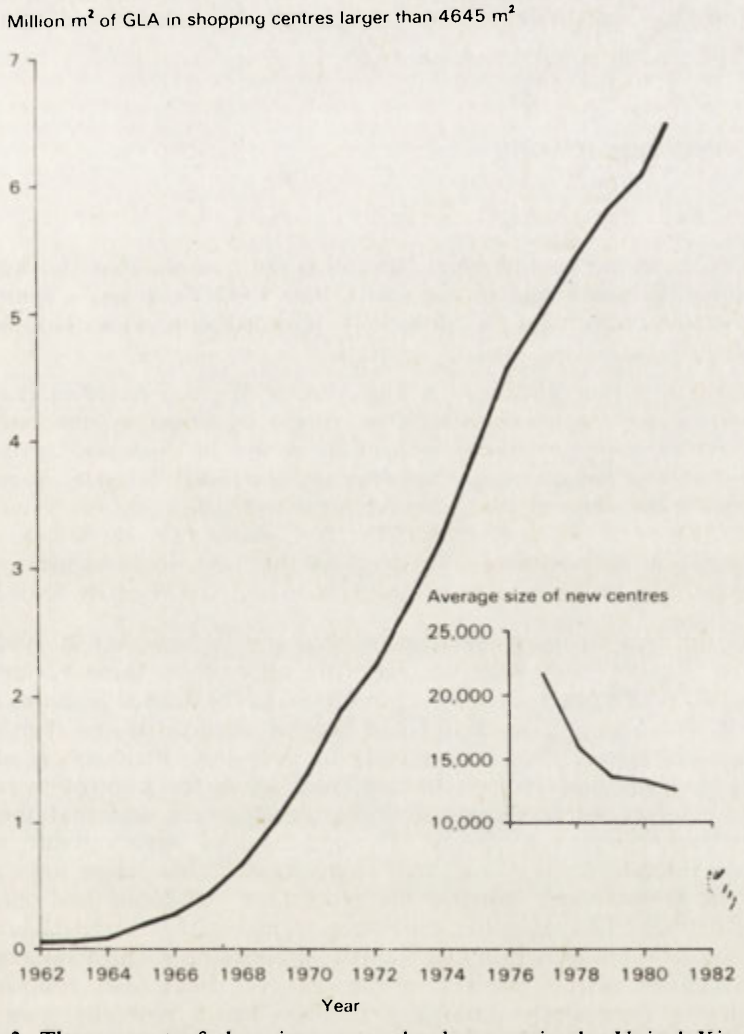

Fig. 3. The amount of shopping centre development in the United Kingdom

of floorspace in the larger shopping centres in British cities and is based on data from Hiller Parker May and Rowden (1982). The total of almost 7 million m² of space represented, in 1982, approximately 20 per cent of national retail floorspace and, it may be assumed, a greater proportion of national retail sales. Within these centres there is tight control over characteristics, such as shop mix, tenant type, product range of tenants, rent, even the atmosphere and another sensory stimuli (Dawson, 1983). The shopping centre is only one, albeit important, of several examples of the greater degree of management and control of market processes.

The structural changes underway in British distribution manifest themselves in

various ways. Three important dimensions to the changed operations of distribution in cities are the dominance of large companies, the greater market power associated with large establishments and a greater degree of management of market processes. The land use planning system has had to respond to these changes as each has significant implications for urban land-use and urban activity processes. The legal framework in which British land-use planning operates, the topic of the next section, provides potentially extensive powers of control over new retail and wholesale development.

THE PLANNING FRAMEWORK

LEGISLATION, 1947–1968

Before 1947 land use planning legislation was not consolidated and was linked to a variety of public health and housing acts. The 1947 *Town and Country Planning Act*, which became operational on 1 July 1948, repealed all previous land use planning legislation and, in summary, had two effects.

First, it required anyone wishing to develop land, in any way including changes of use, to seek permission for the development. Development is defined as 'the carrying out of building, engineering, mining or other operations in, on, over or under land, or the making of any material change in the use of any buildings or other land'. Secondly, it required local government authorities, through their planning departments, to carry out a survey of their county and to prepare a *Development Plan*. The *Development Plan* was to consist of a map and written statement showing how it was proposed that land would be used in the future. The *Development Plan* had to be approved by Government and regularly revised.

The 1947 Act was amended and consolidated into a New Act in 1962. The two basic ideas of the 1947 Act were not seriously affected by these various revisions and amendments which generally sought ways to make the defined planning mechanism more efficient. The planning machinery had become overloaded and there was considerable delay, sometimes years, in arriving at decisions. Planners, academics and developers felt, also, that the mechanism was good for controlling undesirable development but bad for promoting desirable development and that the scope for public participation was too limited. These difficulties were notable in retailing and wholesaling development (Guy, 1980) where considerable delays were experienced which resulted in increased costs to the retailer or developer and inconvenience to the consumer. The lack of public participation meant that planners often did not know what sort of retail provision was wanted by consumers whilst the concentration on negative control placed barriers in the way of widespread adoption of new types of retailing, particularly through large units which generally were more cost effective and had higher labour productivity than existing small units. Almost universally, within the framework of the Act, a hierarchy of retail districts was defined as part of the development plan. The hierarchical relationships generally reinforced existing intra- and inter-urban size relativities of shopping districts (Burns, 1959; Keeble 1959). In the larger towns detailed town maps were drawn up which frequently included plans for the redevelopment of shopping districts again usually reinforcing existing patterns (Ministry of Housing and Local Government, 1963). Generally applications for new retailing floorspace were refused permission if the proposal involved developments outside existing defined shopping districts or if the proposal was thought to have a potential disruptive effect on existing hierarchical relationships.

LEGISLATION AFTER 1968

The result of various criticisms of the 1947 and 1962 *Town and Country Planning Acts* led to a new Act in 1968. Details of the legislation are provided in Garner (1981). This Act retained the basic idea of all development requiring permission but replaced the *Development Plan* by the *Structure Plan* and the *Local Plan.*

The Structure Plan is a broad statement of general policy showing past trends and indicating the basic pattern for future development. Unlike the earlier Development Plan no specific and detailed land use map is required in a Structure Plan but as with the Development Plan the final version of the county structure plan is agreed by Government. Structure Plans are produced by county level authorities (the higher tier) and Local Plans are generally the responsibility of district authorities (the lower of the two tiers of local government). Local Plans consist of a map and written statement containing the detailed discussion and implications of the general policy set down in the Structure Plan. The Town and Country Planning Act of 1968, with some slight amendments consolidated in 1971, remains the core of land use planning legislation. The Act through the control of development has a strong influence on the location and type of new retail and wholesale development and on changes in the use of land both to and from retailing and wholesaling. Structure Plans, because they lack the detailed development maps and proposals of the earlier Development Plans, provide potential scope for a more flexible approach to the planning of retail and wholesale activities. The hierarchy concept no longer has the immutability it had in the 1950s and early 1960s but the legacy of the earlier approach is very evident in the way the Structure Plan idea has been interpreted by land use planners and the hierarchical urban relationships protected and strengthened in the Development Plans are sustained in many of the Structure and Local plans.

Structure Plans deal with planning issues of strategic importance to the county, such as hypermarket location, shopping centre development or the equilibrium of shopping districts in the county. Table 4 shows the type of information usually to be found in Structure Plans. Not all counties have yet produced a fully agreed Structure Plan but most have drafts which state the policies likely to be adopted. The plans provide a description of retail facilities in the county, an appraisal of these facilities and previous plans of retail provision and then a statement of policies to guide future development. Potentially the opportunity exists, in such plans, for encouraging developments in distribution such that they act as catalysts for broader based urban growth.

Local plans deal in much more detail with retail and wholesale planning issues but have to be designed within the framework provided by the structure plan. It is local plans which eventually, when they are all complete, will form the detailed policy statements on retail and wholesale planning in Britain indicating local developments within cities. There are three types of local plan:

District plan – setting out the detailed policies for the comprehensive planning of the area.
Action area plans – setting out detailed plans for small areas where intensive development is expected to take place.
Subject plans – setting out plans for a particular aspect of development, such as retailing. These are only drawn up if it is thought a particular topic raises especially difficult planning problems and issues.

The *Local plans* fulfil four major functions: (1) apply in detail and expand structure plan policy, e.g. a policy on hypermarket development can be dealt with in detail; (2) provide the detailed basis for controlling development and deciding applications for planning permission e.g. the control of service offices, (building societies, etc.) in shopping streets; (3) provide a basis for co-ordinating different

TABLE 4. Information on retailing generally found in *structure plans*

A. Policies and general proposals	
1. General policy	– foster growth in town centres – develop district shopping areas
2. Quantity of floorspace at certain future dates	
3. Distribution of floorspace	– in main retail districts – elsewhere
4. Criteria and policies for	– location of new development – local planning and development control – existing development
5. Priorities and phasing of planning action	
6. Implementation	– promotion and assistance by local authorities – assembly of sites by local authorities – scope of private development
B. Supporting information	
1. **Survey**	
a. Existing situation	– floorspace by retail district – turnover by trade and retail district – accessibility of retail districts – prosperity of retail districts
b. Recent trends	– retailing methods – customers' habits – changes in transportation
c. Commitments	– new shopping centres – new pedestrian precincts
2. **Estimates**	
a. Future changes	– increase in expenditure – changes in retailing methods
b. Future needs	– more out-of-town centres – less shops in main centres – more district centres
c. Constraints	– access problems – land availability
d. Alternative policies	– strengthening suburban facilities – growth in central area

types of development e.g. retailing with housing; and (4) bring local and detailed planning issues before the public, e.g. providing a forum for public debate on a new shopping centre development.

ASSOCIATED LEGISLATION AND MINISTERIAL DIRECTIVES

In addition to the *Town and Country Planning Act* other legislation has had an important effect on retailing in Britain, most notably the New Town legislation. More recently Enterprise Zone legislation is likely to have an effect on retail development. Alongside this legislation are several specific directives which have been issued by central government to local government and which give the central government view on particular types of retail development. These directives comprise Development Control Policy Notes and Ministerial Circulars.

New Towns legislation of 1946, re-enacted in 1965, allowed an area to be designated as the site of a New Town and a Development Corporation to be established. The Development Corporation draws up a plan for the New Town and acquires the necessary land. The building of shops, houses, etc. is then arranged by the Development Corporation. The importance of this legislation is that it allowed completely new patterns of retail provision to be introduced and phased with the rapid increase in population. New and innovative town planning designs for retail provision proved possible in the various New Town schemes. Although with the early New Towns hierarchial patterns of provision were developed in later schemes designs included the use of hypermarkets as development catalysts in shopping centres. During the period of growth of the New Towns the processes of granting planning permission were slightly different than elsewhere in the country and allowed the adoption of a unified view of retailing over the whole town. Again hierarchical patterns of retail provision were planned for most New Towns.

Enterprise Zones are areas within British cities with problems of economic and physical decay in which, in order to promote development, special measures are applied. The idea of such zones was introduced in March 1981 and the first zones became operational during the summer of 1981. Several special measures are applied to all firms including wholesalers and retailers in the specified zones. In these zones, of up to about 200 ha, private enterprise is being encouraged by reducing governmental supervision and taxation demands. Amongst the specific measures are exemption from municipal property taxes, 100 per cent tax allowances on capital expenditure and a simplification of planning procedures aimed effectively to give planning permission automatically to new firms locating in the zone. Each enterprise zone has a plan prepared by the local authority and agreed by central government. The plan shows which classes of development are permitted in each part of the enterprise zone and also sets out any conditions on different types of development. Developers then need not apply for planning permission for development that conforms with the zoning of the plan and meets the specified conditions. As the legislation and the associated designated zones are recent innovations it is not known yet what the full implications of this relaxation of planning control will be for retail and wholesale activity but already it is apparent that retailers and wholesalers are interested in the development opportunities presented by this relaxation of planning controls.

Directives on the control of specific types of development are made by central government to the local planning authorities in Development Control Policy Notes and Ministerial Circulars. For example, in relation to wholesaling Development Control Policy Note 14 of 1974 specifies central government views on the meaning of the terms wholesale warehouse and cash and carry warehouse. The need for this policy directive arose because some developers were seeking planning permission for warehouse type buildings which would effectively function as shops. The purpose of the policy note is to make local planners aware of this problem and to ensure that planning permissions given for wholesaling activities do not get used for the development of discount stores.

Development Control Policy Note 13 of 1972 deals with out-of-town shops and shopping centres. This note was revised in 1976 and its scope widened to include all types of large new stores. Local planning authorities were told to take particular note, in deciding any application for a new large store, of:

(1) the likely effect of the new store on existing shop provision.

(2) the implications of the new store for the existing local policy on retail development.

(3) traffic considerations not only of the generation of consumer traffic and its parking and commercial traffic generation, but also of highway design for access to the store.

(4) assessments of the likely demand for new retail provision and where this demand is currently satisfied.

(5) siting, design and landscaping of the proposed development.

(6) likelihood of the new development acting as a nucleus for other commercial or service development.

(7) environmental impact considerations of the proposed development including non-development in Green Belts around cities.

(8) the need 'to set such developments in the context of shopping centre locations generally and to consider the pattern of shopping centres in relation to the planning objectives for the whole area over which the new development may have some impact'.

Associated with the policy note of 1972 was a requirement placed on local authorities through Ministerial Circular 17/72, to inform central government (Department of the Environment) of all applications for planning permission for shops or shopping centres of 50,000 sq. ft. (4,645 m^2) or more gross floor area so that central government, if it wished, could decide whether these specific proposals were to be given permission. With the 1976 policy note this requirement was kept through a Ministerial Circular (71/76) but the critical size of store was changed from 50,000 (4,645 m^2) to 100,000 sq. ft. (9,290 m^2).

The effect of these central government directives has been to limit, considerably, the ability of local government to adopt non-traditional retail planning policies and to explore non-hierarchical patterns of retail provision. Generally the central government directives have advised local government to refuse planning permissions to the new styles of retail development, except in exceptional cases and when they form part of town centre redevelopment schemes. Despite the attempts of land use planners to refuse development permission, as shown earlier (Figure 2) several hundred such stores have been constructed.

The framework for the planning of retail and wholesale land uses exists therefore in the structure plans and government directives whilst detailed plans for particular shopping districts will exist in local plans. Central government and the two tiers of local government are all involved. There is an inbuilt tendency in the planning framework to try to disallow new and innovative forms of retailing and wholesaling The structure plan is perhaps the most crucial document as it is generated by the higher tier of local government, taking due allowance of central government directives. The plan is agreed by central government and then forms the basis for local plans drawn up by the lower tier of local government. It is in structure plans that land use planning authorities show their responsiveness to the structural changes occurring in the distributive trades either encouraging traditional types of distribution and refusing permission to the newer types or, less common, showing a more positive attitude to the newer types of distribution.

POLICIES TOWARDS DISTRIBUTION

POLICY TOPICS

A review of the 58 structure plans applicable in England and Wales shows that there is almost total unawareness of the changes taking place in wholesaling. Wholesaling in general, and more particularly the changes underway, are virtually ignored in the policy documents associated with structure plans. Only the topic of the retail use of wholesale premises is isolated as a specific policy area. The use of wholesale establishments for retailing is criticised and controls are suggested. Retail policies in operation comprise two main groups. First, there are policies reflecting issue directly related to structural change. These are: (1) hypermarket and superstore development; (2) local shop (often seen as synonymous with small business) loss; (3) the development of large non-food stores; (4) the location of retail establishments outside established shopping districts: and (5) the redevelopment of property in established retail districts. Secondly there are issues relating to the impact of these

changes on existing urban policy: (6) the maintenance of a hierarchy of shopping districts; (7) the regeneration of inner city areas; (8) urban conservation; (9) traffic management within established shopping districts; (10) the maintenance of retail provision as a rural settlement function.

HYPERMARKETS AND RETAIL HIERARCHIES

Table 5 indicates that issues raised by hypermarket development are widely perceived and attempts to limit this type of store development are widespread. The maintenance of the existing retail hierarchy is a conscious and explicit policy in all but a few plans. The two policy topics are closely related with 48 authorities agreeing that the maintenance of the existing retail hierarchy was the reason for their policy on hypermarkets. It is interesting, however, that the authorities with policies towards hypermarkets are almost equally split amongst three policy approaches — total prohibition, restricting development to certain specific sites, within the established hierarchy, and treating each application on its merits. Some observers might argue that this latter approach is not a policy at all. The three policy approaches would all seem to have the same aim of maintenance of the status quo in respect of trading relationships amongst shopping districts within the local authority area. This is further reinforced in over half the plans by policies aimed at directing any expansion of retail floorspace into specific levels of the hierarchy to reinforce and strengthen existing relationships. The development of hypermarket style retailing

TABLE 5. Retail planning policies in structure plans

Policy Area	Number of structure plans		
	with policies on the topic	without policies on the topic	no response or not applicable
1. Control hypermarkets	55	3	
2. Encouragement of local shop provision	46	12	
3. Mobile shops provision	5	51	2
4. Limiting retailing from industrial areas	44	14	
5. Limiting quasi-retail activity in retail districts e.g. Building societies, insurance branch offices	7	51	
6. Control or encouragement of large comparison goods stores	36	22	
7. Inner city regeneration through retail investment	25	20	13
8. Maintenance of an existing retail hierarchy	50	7	1
9. Expansion of retail floorspace for certain levels of the hierarchy	30	25	3
10. Servicing of shops in established shopping districts	15	43	
11. Provision of car parking for consumers	29	29	
12. Shopping centres in refurbished historical buildings	5	53	

Source: Burt, Dawson and Sparks (1983).

has been fought consistently by land use planning agencies. For the most part they have tried to refuse permission for this new type of store but in many cases have had to give permission because of:

(a) the presence of a need for more retail space;

(b) the willingness of hypermarket enterpreneurs to take the risks of development;

(c) the ability of hypermarket developers to obtain sites where planning permission for retailing could not justifiably be refused;

(d) the absence of provision in the land use planning legislation of mechanisms to control the operational, as opposed to spatial, structure of retailing.

In order to coerce the hypermarket concept into the straight jacket of a hierarchy based retail plan particular hypermarket formats have been given preference in granting permissions. Establishments which are part of a shopping centre have been preferred to free standing stores on greenfield sites. Additionally stores within established shopping districts, either individual units or parts of a redevelopment, have been given preference over stores in dominantly residential or industrial areas. The growth of hypermarket retailing has been contained by land use planning policies which, through spatial control, have controlled numbers of stores but virtually no mechanism exists for any control over ownership or operational character. The aim has been to limit hypermarkets to sites where their disruption of the status quo will be least.

Table 5 also shows another area of policy aimed at consolidating pre-existing patterns of provision, namely policies towards local shop provision. Over three quarters of the structure plans claim to contain policies on local shop provision, but almost a half of these are merely statements of the need for traditional type local shops; a third are positive policies towards encouraging new small independent businesses and the remainder aim to maintain current levels of provision. Generally, there appears to be limited awareness of how the new organisational structures of retailing (through franchising or American style convenience stores) could be encouraged to provide a range of retail provision other than of the traditional type. Few authorities see retail provision except in terms of a spatial hierarchy with large enterprises operating branches in high order places and small business dominating low order places yet the 1950s and 1960s concepts of a behavioural and organisational hierarchy for shopping have been refuted in much recent research.

This conclusion is further borne out by planning responses to the potential development of other types of retail activity which are attracted to sites outside traditional shopping districts. In the case of retailing from industrial areas 37 of the plans with a policy advocated tight restrictions on this type of development with the remainder judging applications on their own merits. Similarly with large free standing comparison goods outlets (including the home furnishing units mentioned above), no authority sought to encourage, in a controlled way, this type of development. Fifteen discouraged all development of this type, twelve restricted it to very particular areas which in effect is the nearest structure plan policies come to encouraging the new retail formats, and the remainder again have a policy of treating applications individually

POLICIES AIMED AT MANAGING RETAIL DEVELOPMENTS

A relatively small minority of plans contain policies which view retail planning in a wider perspective than simple shop provision and consider the broader effects of structural change in retailing. There is, however, widespread acceptance of the idea that shopping centre development within an existing shopping district can create economic and social change within the city. Shopping district redevelopment has been encouraged by land use planners as a means of reviving the economy

and the physical structure of urban areas. Not unusually local government itself has taken a financial interest in these redevelopments either jointly with a property company or in a few cases being responsible for the complete development. A survey of 170 of the larger schemes showed local authority involvement in 74 with total ownership in 13 (Davies and Bennison, 1979). Undoubtedly these shopping centres have been important in introducing modern retail methods into many cities but inevitably it has been large retail enterprises who have opened stores in these developments. Survey reports show these centres to be dominated by branch units of large enterprises (Centre for Advanced Land Use Studies, 1975). Unwittingly planning authorities, by redevelopment of this type, have given encouragement to structural change in distribution and to the demise of smaller businesses. Several planning authorities have policies of encouraging small shop provision in suburban sites but at the same time pursue activities such as central city redevelopment which cause increased centralization of retailing and increased dominance by large shops.

The success of shopping developments in central cities has led government to consider the possible scope of retail investment for regenerating the economy of central city fringe areas (inner cities). From the survey of structure plans (Table 5) twenty five authorities see some role for retailing in inner city regeneration but few spell out how this might be achieved and the policy, in many cases, might justifiably be placed in the 'pious hope' category with pedestrianisation being the most common specific policy approach despite evidence from many countries suggesting that this may exacerbate inner city decay unless it is part of a package of commercial policies.

In respect of other approaches to using retailing as the vehicle for urban change, half the authorities have policies directed to encourage more consumer parking spaces but the methods of achieving this must wait for the local plans to be prepared. Surprisingly, few plans have policies aimed at issues associated with the servicing of retailing in established shopping districts despite the very firm policy approaches to endorsing these districts as the major forms and locations of retailing. A few authorities also see that retailing, and the generally buoyant level of investment in the industry, can be directed into refurbishing historical structures. Again, however, and in defence of the county planning authorities, this policy may be more applicable to local plans. It is likely that publication of local plans will show greater awareness of the potential of retailing as a means of local economic growth.

Land use planning agencies have been instrumental in encouraging a more controlled and managed shopping environment. Traffic free shopping streets and greater control over retail activities in these areas is central to the urban management schemes of many local authorities. Approximately 300 traffic free shopping districts have been created in British cities with the majority being designated in the last 30 years. Land use planners have consciously created these zones to improve the physical environment for consumers and retailers but again the inadvertent result has been the encouragement of large scale enterprise and the loss of informal shopping environments. Structural change in the retail industry has been promoted by essentially spatial policies.

CONCLUSION

This paper has suggested that considerable structural change has taken place in distribution, particularly retailing, in recent years. Three notable examples of this change are the increased market power of large companies, the growing strength of large establishments and the increase in more tightly controlled shopping environments. Land use planners have been a powerful force over the last 30 years in influencing

retail and wholesale developments in urban Britain. Land use planning operates within a legislative framework which controls the location of development. Policies therefore are spatially based so responses to structural change in retailing can only be manifest through spatially based policy. The dominant policy has been that of maintaining the imposition of a hierarchy of retail districts. When structural change has supported such a policy then it has been accepted by planners. When structural change has created establishment types which fit uneasily into the hierarchy concept the development of such establishments is refused or they are forced to fit the hierarchical model. The over-concentration on the hierarchical model has created serious difficulties for planning policy when non-hierarchical structural changes have generated problems to which land use planners are expected to respond. Hierarchy based planning policies leave planners impotent in the preparation of plans relevant to sustaining small business or to responding positively to the trend towards large units.

Retail planning has become a notable activity of land use planners in Britain as distribution has become one of few expanding industries during the present economic depression. So far, however, retail planning has tended to be reactive to, and it is argued often several steps behind, changes both in the distributive industry and consumer demand. Planning has responded, however, to structural change in the industry but often in a somewhat negative way. The increased awareness, in distribution, of the economic benefits obtainable from the application of microelectronics and information technology will create many new issues for local planning agencies associated with a likely surge of investment as the overall economy moves out of recession. There is widespread current debate on what forms distribution is likely to have in the 1990s and the opportunity now exists for land use planners to move from a reactive position to one which will promote the creation of a more effective and efficient distributive industry.

REFERENCES

Bennison D. J., Davies R. L., 1980, The impact of town centre shopping schemes in Britain, *Progress in Planning*, 14, 1–104.

Burns W., 1959, *British shopping centres*, Leonard Hill, London.

Burt S., Dawson J. A., Sparks L., 1983, Structure plans and retailing policies, *Planner*, 69, 11–13.

Centre for Advanced Land Use Studies, 1975, *Rent assessment and tenant mix in planned shopping centres*, Author, Reading.

Davies R. L., Bennison D. J., 1979, *British town centre shopping schemes: a statistical digest*, Unit for Retail Planning Information, Report U11, Reading.

Dawson J. A., 1982, *Commercial distribution in Europe*, Croom Helm, London.

Dawson J. A., 1983, *Shopping centre development*, Longmans, London.

Dawson J. A., Kirby D. A., 1979, *Small scale retailing in the UK*, Saxon House, Farnborough.

Garner J. F., 1981, *Practical planning law*, Croom Helm, London.

Guy C., 1980, *Retail location and retail planning in Britain*, Gower, Farnborough.

Hillier Parker May and Rowden, 1982, *British shopping developments*, Author, London.

Keeble L., 1959, *Principles and practice of town and country planning*, Estates Gazette, London.

McClelland D. W., 1963, *Costs and competition in retailing*, Macmillan, London.

Ministry of Housing and Local Government, 1963, Town centres: current practice, *Planning Bulletin*, 4.

Stacey N. A. H., Wilson A., 1965, *The changing pattern of distribution*, Pergamon, Oxford.

Unit for Retail Planning Information, 1982, *Hypermarkets and superstores*, Author, Reading.

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SIMULATION AND OPTIMIZATION MODEL OF SPATIAL ORGANIZATION

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INTRODUCTION

Spatial organization is being formed by mutualy interdependent sets of urban settlements, roads, and rural areas. In geometric terms it is a structure formed by the sets of points, lines, and surfaces. Individual structures in turn conjugate into more complex construction-hierarchies.

Due to different nature of elements and their multiple interactions, spatial organization constitutes a very complicated object of research. The degree of complication increases when we try to investigate not only its structure, but also its action and development. Optimal steering of the development creates still more difficult problems.

There exists no satisfactory theory of the dynamics of spatial organization. However, significant contributions have been made, and new efforts are being undertaken. Parr (1981) developed a multistatic framework concerned with the various states of a spatial system and the relations between these states. Other authors applied the process approach. They built models tracing out the spatial-temporal development path of a system. White (1974, 1977) built a simulation model in which retail activities, described by cost equations, and consumers, described by spatial interaction equations, interact to generate a central place system. Allen and Sanglier (1979) presented a dynamic model of central places based on the mutual interaction of the spatial distribution of population and employment opportunities. They drew from the concept of self-organization developed recently by I. Prigogine. Domański and Wierzbicki (1981, 1983) developed a simulation model of service network based also on the concept of self-organization. Beaumont, Clark and Wilson (1981) demonstrated that a simple difference equation model, which exhibits complex bifurcation behavior, can be used to represent change in urban retailing and residential systems. Casti (1983) examined in what sense local dynamics prescribe global spatial patterns, and to what extent a global pattern imposes constraints on local interactions.

Another direction of exploration essential for the solution of our problem represent researches on combined residential-location and transportation models. Examples are Boyce (1978), and Los (1979). These researches inspire the work on optimization of spatial organization.

The purpose of this paper is twofold. Firstly, it presents a dynamic model of spatial organization formed by three mutualy interdependent subsystems: subsystem of cities, subsystem of agricultural areas, and subsystem of transportation. The model

is then tested by means of a computer. Secondly, it formulates and tests a model optimizing spatial organization. For the time being it is simple because the problem of optimization of spatial organization is less examined. Its intention is to encourage discussion and further progress in the field of joint optimization of cities, agriculture, and transportation.

DYNAMICS OF SPATIAL ORGANIZATION

The model of spatial organization presented in this paper is based on the concept of self-organization. According to this concept we assume that spatial system considered is open, differentiated, and that nonlinearities occur in his behavior. The system evolves as the result of mutual interaction of cities, agricultural areas, and transportation. The positive feedback inherent in this interaction brings about changes of spatial organization. The changes manifest themselves in: (a) differentiated quantitative growth or shrinking of individual elements, (b) restructuring of the organization, i.e. in new locational and hierarchical pattern. The evolution of each of three subsystems is subject to deterministic dependencies. The subsystem of agricultural areas, however, is affected also by random events.

We consider a hypothetical spatial system which is moderately urbanized. The agriculture of this region is highly productive. A considerable part of its production is exported to other regions.

The model simulating dynamics of its organization is presented in Appendix 1. The functional relationships determinig the behavior of individual subsystems are as follows. The subsystem of agricultural areas is characterized by their production. the number of rural population and resulting productivity. The number of rural population in the given year depends on the state in previous year, natural increase, and migration. The agricultural production is conditioned by deterministic dependencies and a random component. The former include production in previous year, export/import to/from other regions, local demand, transportation conditions. The random component assumes the form $\sigma = 0.1 \cdot \mathrm{Rnd}$, where Rnd denotes a pseudo-random number from the interval $0 \leqslant \sigma < 1$ with rectangular distribution. We assume expected value to be $E(\sigma) = 0.05$. The rectangular distribution means that the drawing out of each number from the given interval is equally probable. It results from the expected value that the random component explains 5% of the variation of agricultural production. The remaining 95% are determined by deterministic factors. Of course, we can choose also other proportions between deterministic and random components.

The volume of flows is calculated by means of gravity type equation. Flows between cities, between agricultural areas, and transit were summed up for each direction.

The population of cities is determined by its number in previous year, natural increase, and migration. The volume of migrants is influenced by employment opportunities in cities, the quality of environment, the intensity of agriculture in the hinterland of cities, transportation and accessibility. The attractiveness of cities is a function, initially increasing and then decreasing, of city sizes. The outflow of rural population is negatively related to the level of incomes in rural areas.

Let us pass, now, to the interpretation of simulation results (computations were carried out for 50 consecutive units of time). Figure 1 suggests the following conclusions:

(1) urban population increased continuously,
(2) rural population decreased at a low rate,
(3) agricultural productivity per capita of rural population increased considerable.

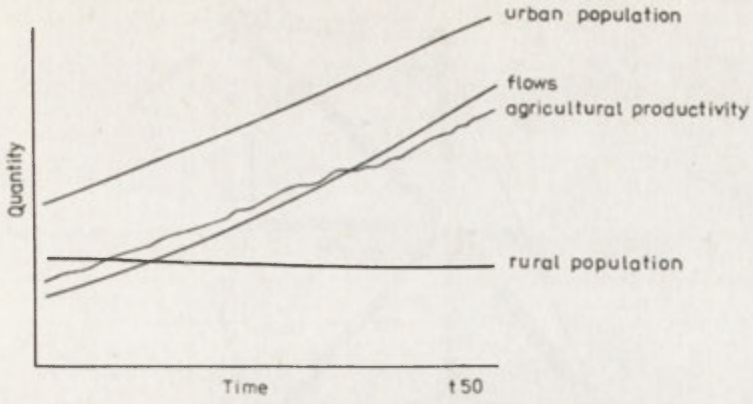

Fig. 1. Dynamics of spatial organization. State variables

(4) flows increased at somewhat higher rate than urban population and agricultural productivity.

The results obtained are persuasive, and correspond with the observations of real processes. They correspond also with the theoretical development path, which can be derived from the concept of self-organization. In particular the change in the relation between cities, agriculture, and transportation indicates that sectoral restructuring of our system took place. Graphical presentation (Figs 3–4) shows that also spatial organization underwent restructuring.

The change in the relation between subsystem of cities and subsystem of transportation seems to be particularly intriguing. So far, we accepted, without reserve, the theorem of spatial sciences that between the two subsystems a close interdependence occurs. The results obtained by means of our model suggest that the interdependence, in the course of development, may change and weaken. In order to get more information for further reasoning we carried out an additional simulation experiment. The relation between subsystem of cities and subsystem of transportation was observed under various assumptions concerning number and size of cities. Five alternatives of spatial distribution of cities were assumed.

Figure 2 presents the results of simulation. It reveals: 1) the diminishing differences in standard deviations of city sizes, 2) the growing number of interactions per

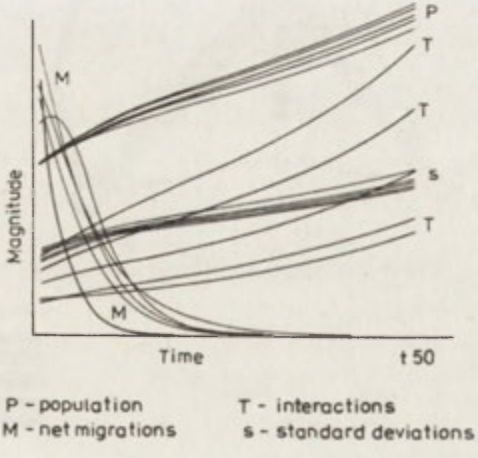

Fig. 2. System: cities – transportation. Results of simulations. Five alternatives

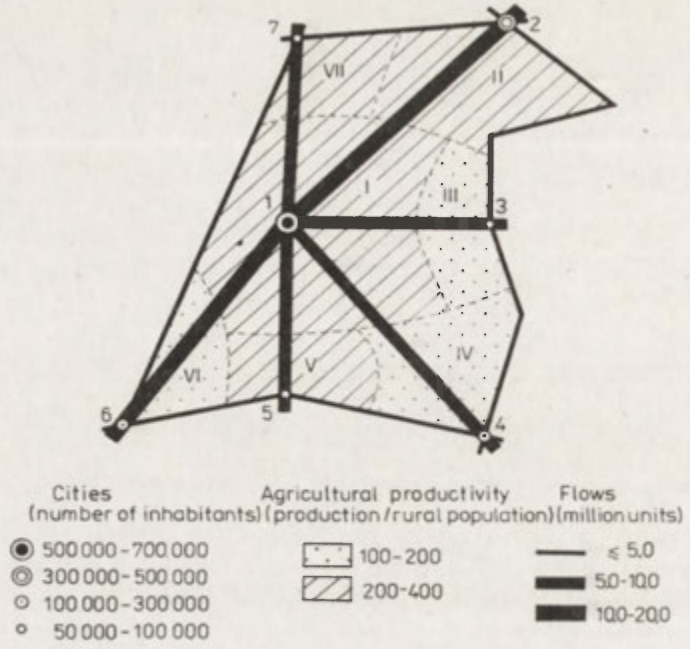

Fig. 3. Spatial organization. Results of simulations. Iteration $t = 10$

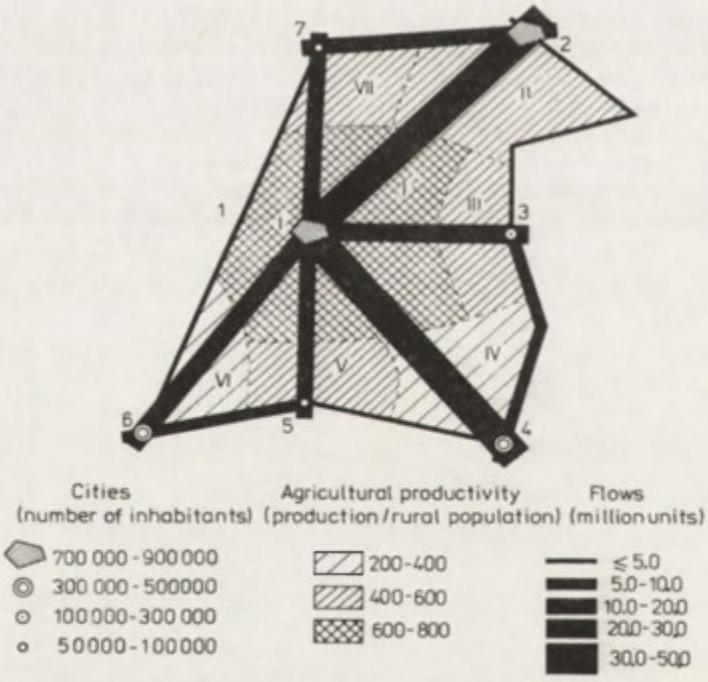

Fig. 4. Spatial organization. Results of simulations. Iteration $t = 50$

capita. On this basis one can state that the subsystem of cities is more stable than the subsystem of flows.

These differences, though not very high, are, however, inspiring. Their disclosure enables us to modify the above mentioned theorem. Even small differences in stability of city subsystem and interaction subsystem create an interestice in the interdependence between them. It can be then broadened through cumulative feedback. Thus, in longer period of time, particularly in the advanced stage of development process, the interdependence may weaken.

Setting up our modification, we are obliged to present at least their tentative rationale in terms of theories applied in regional science. Our reasoning runs as follows.

Spatial organization of city and interaction subsystems is being shaped by various technological and socio-economic processes. Some of these processes overlap, others cross each other. In this ravel of processes, some affect spatial organization stronger, other weaker. It is necessary to disclose the processes, which are the resultant of various forces or dominant forces. We set up a hypothesis that in the advanced stage of long-term processes, that shape both subsystems, compensatory feedbacks prevail over cumulatives ones in the development of city subsystem, and cumulative feedbacks prevail over compensatory ones in the development of interaction subsystem.

We can explain this difference in the following way. Both subsystems are being shaped by the processes of agglomeration. But their sensitivy to agglomeration effects is different: stronger in case of industry and services (economy), and weaker in case of population. Stronger sensitivity of economy leads to its greater spatial differentiation and, consequently, to increasing flows of goods. This property of industry and services occurs if the economies of agglomeration outweigh the diseconomies of transportation.

The mobility of population is higher than that of economy. The migrations, then, are more effective compensatory movements than the relocation of economy. Thus, they can lead, in longer period of time, to the diminishing of spatial disparities and the decrease of deviations of city sizes.

Let us note, however, that both higher mobility of population, as well as more inert economy, though they reveal themselves in different spatial trends, act in the same direction in one respect: they imply more flows in socio-economic systems. Similar relations can be observed also on local level, i.e. in individual cities, particularly in large cities.

One can expect that this trend will not be an unbroken continuum. Great innovations may change the underlying processes, both subsystems may take a new course, and new interrelations between them may be established, not excluding reverse ones.

The evolution of system was revealed also in the change of relations between subregions. Urban population increased at the highest rate in subregions with large cities. Primary city was an exception. It occured due to the diminishing of natural increase and attraction for migrants when the city exceeds its optimal size. In the subregions with small cities both urban and rural population changed in a lesser degree.

Rural population decreased at the highest rate in subregion II, where, simultaneously, the growth of urban population was particularly fast. This subregion was industrialized already at the initial state, and then underwent further industrialization. The changes observed were the effect of three causes: further intensive industrialization, the growth of agricultural productivity which enabled the outflow of rural population, favorable transportation situation (location on the main road of region).

The increase in agricultural productivity was spatially differentiated. The subregions

already advanced in this respect continue to raise up their productivity, but the fastest growth took place in the subregions which vere initially less advanced.

In general, using all measures of the development of subregions, we can state that the subregional differentiation deepend, although, with the exception of transportation, in a small degree. The differentiation in the sphere of rural population diminished even slightly. The span of extreme subregional characteristics in initial and final state is the following:

	Initial state	Final state
Urban population	1 : 10	1 : 13.8
Rural population	1 : 6.8	1 : 6.1
Agricultural productivity	1 : 2.5	1 : 2.6
Flows	1 : 1.8	1 : 3.3

Thus, the mechanism of self-organization gave rise to both sectoral as well as spatial restructuring. The way of restructuring meets the expectations which we assumed at the outset of simulation experiments.

OPTIMIZATION OF SPATIAL ORGANIZATION

Similarly like simulation, optimization will be implemented jointly for three subsystems: cities, agricultural areas, and transportation. The subsystem of cities consists of two sectors: population and economy, the later being represented by employment. The optimization model is put in Appendix 2.

As the result of optimization we obtain two kinds of data:

(1) The state of spatial organization after optimization. These will be figures representing the location of population and economy, the productivity of individual agricultural areas, and the flows in individual directions. No constraints are imposed on actual distribution of population. The figures represent a state which is admissible and desirable on the ground of accepted objective.

(2) The optimal distribution of employees, assuming that they do not change their places of residence. We impose a constraint that the number of active population in individual cities is constant. This condition causes that the results of optimization concerning other subsystems are different than in the first case.

Multiple objective decision methods would be probable the best approach to the solution of our problem. For the moment, however, we will apply more simple method. Namely, we will value the objectives of individual subsystems and combine them in one objective function.

In order to do so we have to define appropriate concepts. The concept of utility of places (for people, industry, and agriculture) and of accessibility to other places seems to be most adequate. It is reasonable to assume that the best spatial organization must maximize the utility of given places and their accessibility to the rest of spatial system.

Having in mind computation possibilities we accept other but related concepts, namely the concepts of bid rent and of transportation costs. The first one is extended on households, industrial enterprises, and farms. By the bid rent of a household we understand its willingness to pay for an appartment in the given city. The bid rent of an industrial enterprise means its willingness to pay for the establishment of one additional place of work in the given city. In the bid rent of a farm, its willingness to pay for the use of one hectar of land in the given area is expressed.[1]

[1] The profit from 1 ton of agricultural products at the place of production was used in computations.

Net bid rents were used in computations. The bid rents representing the utility of places are then reduced by transportation costs, being the inverse of accessibility. Spatial organization is optimal if it maximizes the differences between bid rents and transportation costs.

In the bid rents of households, industrial enterprises, and farms, mutual interdependences between the three subsystems are represented. Thus, the bid rent of a household depends on the job opportunities (industry), and prices of food (agriculture) in the given area; the bid rent of an industrial enterprise – on the resources of labor, the demand of urban population, the supply of agricultural raw materials, the demand of farms; the bid rent of a farm – on the supply and demand of industry, and the demand of urban population.

All three bid rents are assumed constant in the computations. However, their amounts reflect the interdependences mentioned above. Besides, the bid rents of households and industry are sensitive to the economies of scale. The degree of sensitivity of industry is relatively higher.

The relations between bid rents affect the structure of system which is being shaped by the mechanism of self-organization.

The volume of flows of population and agricultural products results from their optimal shifts between cities or subregions. In the case of industry we optimize the shift of work places. Industrial commodity flows is then determined in a different way, namely using gravity type model.

The unit cost of transportation are assumed constant, but their amounts are differentiated and related to the volume of traffic on individual roads. The lowest cost is attached to the roads with moderate intensity of traffic. The traffic on the roads with the heaviest traffic is burdened with the highest cost (congestion). The cost of traffic on the secondary roads is placed between these two extremes (slack capacities).

The productivity of agriculture depends on natural conditions, the demand of urban population, and the level of industrialization (raw materials for food processing industry, production means for agriculture). The dependence on urban population and industry assumes the form of a function. It forces the agricultural subsystem to follow the trend of population and industrial subsystems. The influence of natural conditions is introduced as a constraint, as an upper limit of productivity reflecting barriers imposed by soil and climate.

In addition to the interaction of three subsystems, the functioning and development of system is influenced by the environment. We distinguish two kinds of environment: natural and social. The influence of natural environment is reflected by additional costs borne by industry and urban population (the cost of reduction of pollution, relatively higher cost of recreation etc.). Social environment exerts its influence in the form of governmental regulations. In our model municipal government lays taxes on inhabitants and industry. The taxes increase with the size of cities.

Our system is open. Its functioning and development is affected also by outer world. The outer world is assumed uniform and characterized by the introduction of additional numbers or rows and columns.

The model satisfies the requirement of self-organization principle that the subsystems are interdependent. As already mentioned the interdependence is implied in the relations between bid rents. It occurs also in constraints imposed on the objective function. They state (condition 2) that the number of work places is equal or less than the number of active population, and (condition 7) that the supply of individual cities with agricultural products depends on population and industry of the cities. The transportation results from optimal commuting, and the optimal flows of industrial and agricultural products.

The objective function combining the effectiveness of three different subsystems

is open to discussion. One can raise an objection, whether this form of objective function is admissible. The author was aware of its drawbacks. Nontheless, he decided to apply it, having regard to the fact that: (a) it enables considerable economies in computations. Thanks to it, the model remains linear. Where the occurrence of nonlinearities was obvious, nonlinear functions were linearized using piece-wise linear functions, (b) some essential drawbacks can be removed by the appropriate statement of constraints.

The previous applications of the concept of bid rent allow me to hold the belief that its extension on housing, industrial work places, and agricultural land can be accepted. In this way we solve the problem of valuation of behavior of different subsystems. Notwithstanding, it is conceivable that in the case of great differences in net bid rents, the actions of some subsystems will be not payable and, therefore, eliminated in order to ensure global maximum of the objective function, for the function assumes the hard and fast play of economic forces. This attribute of the function, however, can be kept in reasonable limits. For this purpose we impose the following constraints:

(1) The number of work places cannot fall down below a determined minimum. Thus, the model ensures a determined level of employment (condition 3).

(2) The growth of industry has its upper limit which can be related to the resources of labor and capital (condition 4).

(3) The city sizes have both lower and upper limits related to housing stock. The stock is equal to or greater than the number of households (condition 8 and 9).

(4) The maximal and minimal share of active population commuting to other cities and from other cities to the given city is determined. Thus, the model prevents both the undesired drainage as well as invasion of individual cities (condition 10 and 11). Large cities show higher inflow than outflow of commuters. Small cities — vice versa.

(5) Agricultural productivity is limited from below, so that extremely productive areas cannot ruin less productive areas. The upper limit reflects the existence of natural and socio-economic barriers (condition 5 and 6).

In the form of these constraints, the basic interests of population, industry, and agriculture have been ensured. We left, however, a broad margin for the spatial shifts of socio-economic activities. Within these limits we allow economic forces for hard and fast play in order to improve the effectiveness of system.

The model was tested under various assumptions concerning spatial preferences of population, industrial enterprises, and farms reflected in their bid rents. After initial experiments, two sets of assumptions were accepted. The first set assumes that the system is dominated by concentration processes. Primary city is most attractive, and the attractiveness decreases as the city sizes decrease. This does not apply to small cities located in the vicinity of primary city, on which high value is set. The second set assumes moderate concentration. Medium-size cities are more prefered than the primary city. The small cities in the vicinity of primary city are valued but in lesser degree than in the first case. In both variants, agriculture is highly productive. Considerable part of its production can be exported to other regions.

The model includes 507 variables ($13^2 \times 3$), and 170 constraints.[2]

The results obtained meet our expectations. The optimization implemented under the first set of assumptions (concentration variant, Figs 5–9), result in the following spatial shifts in comparison to initial state.

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[2] Algorithm, programs, and computations have been carried out by Jan Dawidowski, Center for Data Processing, Poznań Academy of Economics.

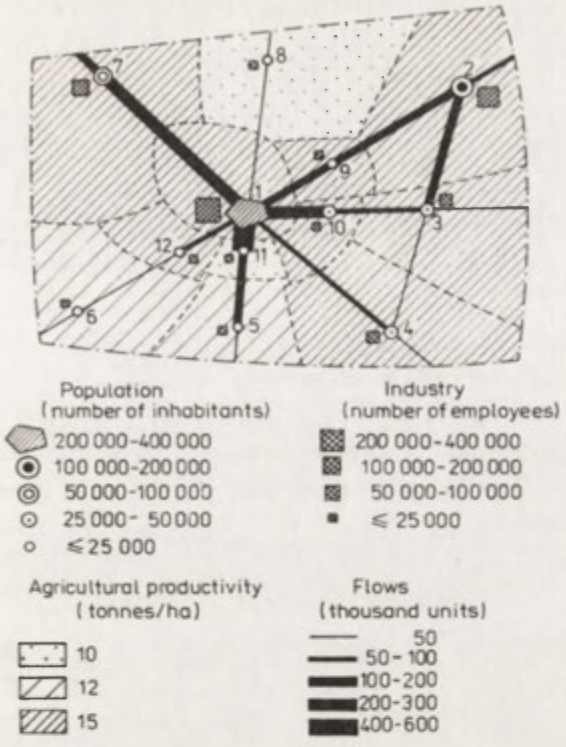

Fig. 5. Optimal spatial organization. Concentration variant

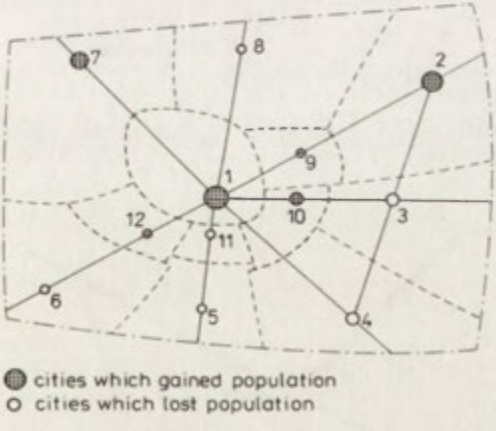

Fig. 6. Optimal spatial shifts of population. Concentration variant

(1) Urban population and industry increased in three largest cities. The increase is observed also in these small cities located in the vicinity of primary city which have favorable conditions for further growth. Such conditions do not occur in city 11, which is already industrialized and suffers from polluted environment. Other small cities, as well as medium-size cities show the decrease of population and industry.

(2) Primary city is both the destination as well as the source of commuting.

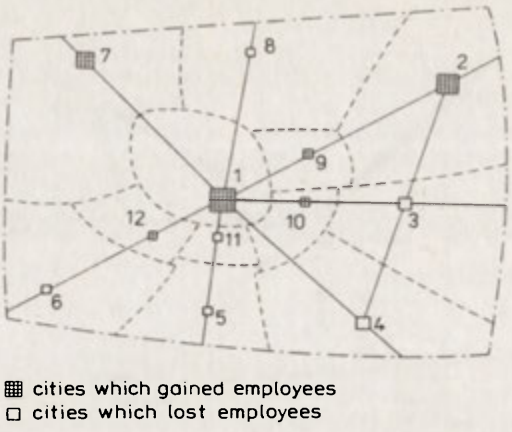

Fig. 7. Optimal spatial shifts of industry. Concentration variant

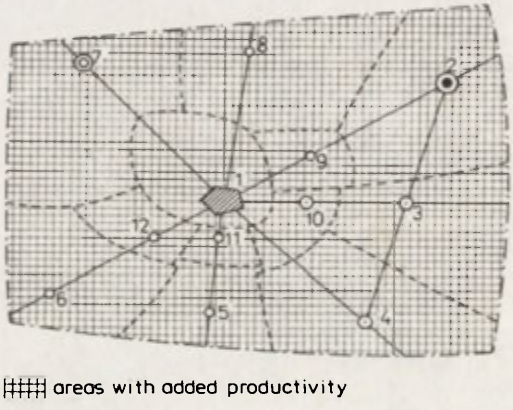

Fig. 8. Optimal spatial shifts of agricultural productivity. Concentration variant

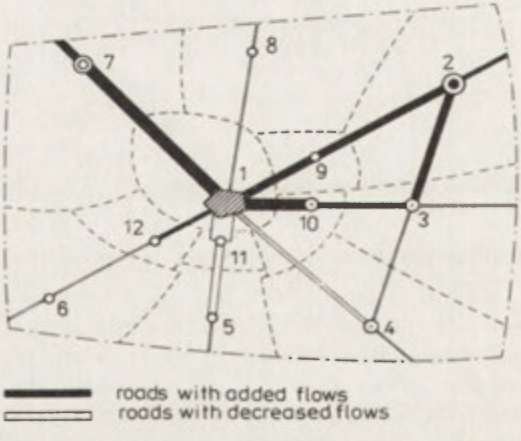

Fig. 9. Optimal spatial shifts of transportation. Concentration variant

The size and dispersion of commuting is rather low, which suggest that the distribution of residential areas and work places coincide to high degree.

(3) The productivity of agriculture increased in all subregions. Due to high demand of agricultural products, it reached the upper limits. The highest level of production occurs in subregions with the largest cities and partly around the primary city.

(4) Industrial commodity flows increased on the main roads, following the trends of industrial production and urban population. The agricultural products show two transport orientations: (a) local flows within individual subregions, (b) export from external zone to other regions. Such a pattern of flows reveals the influence of distance and transportation cost.

These spatial patterns and shifts resulting from the optimization show that the model is sensitive to the main defining parameters, namely to the bid rents. The sensitivity to transportation cost turned out much weaker. As far as commuting is concerned, only in the case of city 3 and 4, high transportation costs reduced the utility of places to such extent, that the active population resigned from commuting and migrated to other cities. Industry and agriculture reacted to transportation cost in the way mentioned above. The constraints imposed by natural and social environment, according to our expectation, reduced urban population and industry in city 11. In the case of other cities they, together with transportation cost, diminished the values resulting from bid rents but did not surpass them. The outside world, defined by accepted assumptions, proved less attractive for urban population and industry than the region considered. This resulted in the shift of population and employees to the region. On the other hand, less productive agriculture in the outside world forced it to import agricultural products from the region.

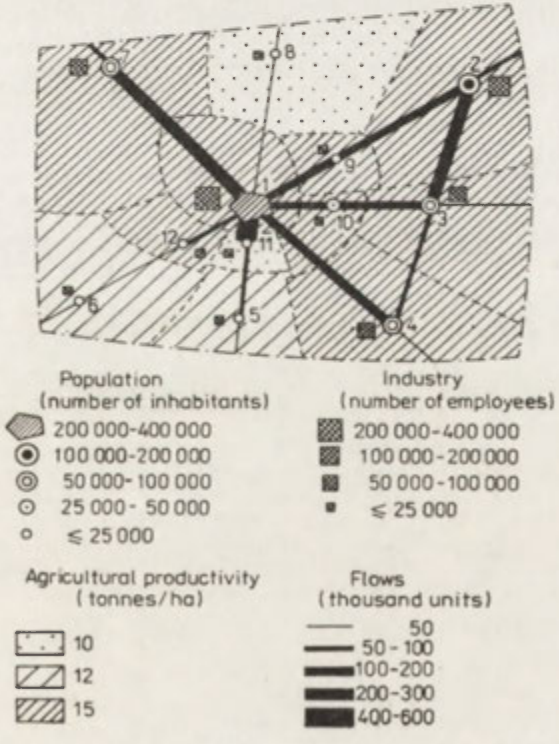

Fig. 10. Optimal spatial organization. Moderate concentration variant

The optimization carried out under the second set of assumptions (moderate concentration variant, Figs 10–14), yielded also expected results. Urban population and industry shifted to medium – size cities, and to some of small cities located around the primary city. The last one lost a small part of its population and somewhat greater part of its industry. This trends of urban population and industry was followed by commuting and industrial commodity flows. Agriculture changed in the same way as in previous variant, and so did the relations with outside world.

In the above two experiments we did not impose constraints on the distribution of active population and allowed population of individual cities to change in accordance with its spatial preferences. Now, we change the approach. Namely, we assume that population of individual cities remains constant, and under this assumption we optimize the spatial organization of the rest of system.

The results obtained are in one respect rather surprising. One could expect that the stability of urban population will give rise to more intensive commuting. Nothing of the sort happened. This suggests that commuting, after it reaches certain level, ceases to be sensitive to further stimuli. Substantial differences occured instead in the spatial distribution of industry. Neither primary city nor medium-size cities increased

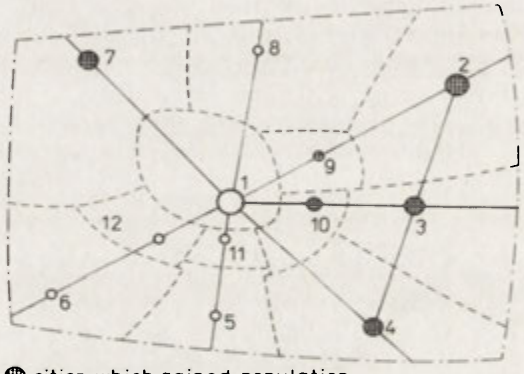

Fig. 11. Optimal spatial shifts of population. Moderate concentration variant

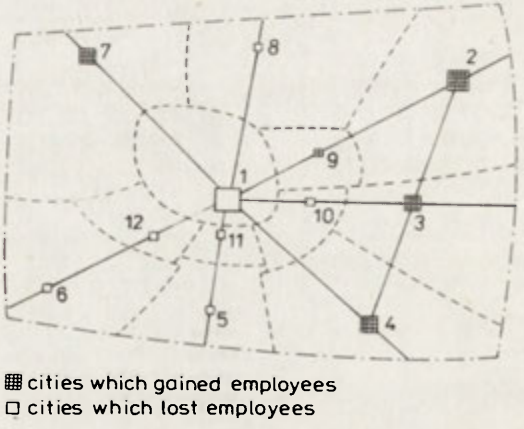

Fig. 12. Optimal spatial shifts of industry. Moderate concentration variant

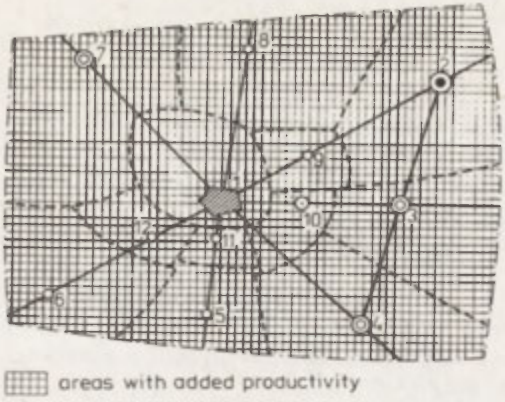

Fig. 13. Optimal spatial shifts of agricultural productivity. Moderate concentration variant

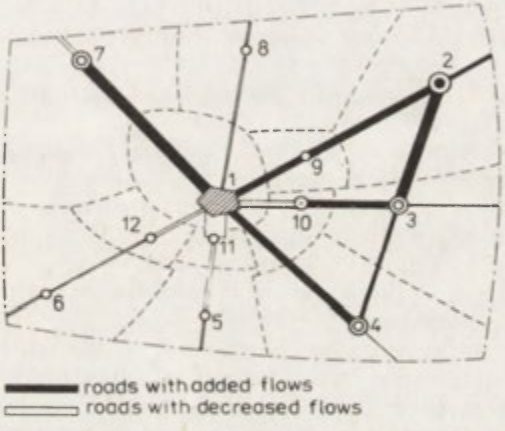

Fig. 14. Optimal spatial shifts of transportation. Moderate concentration variant

to the upper limits. Stable working population did not allow industrial centers to reach the most effective sizes. Meeting this barrier, industry relocated partly to other regions. This result is opposite to that obtained in previous experiments.

The optimization model in its present form is static one. However, we can repeat this optimization procedure, assuming new spatial preferences revealed in previous step. In this way time factor can be introduced and continuous changes can be optimized. A proper dynamic model must include also discrete changes. Therefore, further extension of the model is necessary.

APPENDIX 1. Simulation model

STATE VARIABLES

P_x – population of a city x,
P_r – rural population in a subregion (zone of the attraction of city x),
A'_z – agricultural productivity per capita of rural population in a subregion.

T_y – traffic on a transportation line y,
s – standard deviation of city sizes.

PARAMETERS

d_{xx} – distance between cities x; also the average distance between subregions with cities x,
d_{xy}^{-} – average distance between the central city and the zones gravitating to the transportation lines y converging in this city,
d_{xz}^{-} – average distance between city x and its subregion,
m_x – coefficient of the attractivity of city x for migrants (the function of city sizes),
n_r – coefficient of the outflow of rural population (negatively related to the per capita income of rural population),
r_x – rate of natural increase in a city x,
r_z – rate of natural increase in a subregion,
r_r – rate of natural increase of rural population in a subregion,
z – area of a subregion,
A'_{zo} – agricultural productivity per capita of rural population in a subregion in its initial state,
A'_{eo} – average agricultural productivity per capita of rural population in the region in its initial state,
D_x – spatial accessibility to a city x; also the average distance between the subregion with city x, and the rest of region,
L_z – agricultural land in a subregion,
P_{xo} – population of a city x in its initial state,
P_{zo} – population of a subregion in its initial state,
P_{ro} – rural population of a subregion in its initial state,
Q_x – quality of environment in a city x,
Q_e – average quality of environment in all cities in the region,
Q_r – quality of environment in rural areas of a subregion,
Q_e^r – average quality of environment in rural areas in the region,
γ – average agricultural productivity per hectare in the region,
ε_1 – coefficient of employment in industry in a city,
ε_2 – coefficient of employment in services in a city,
ε_3 – coefficient of employment in investments in a city,
ϑ – coefficient of technological and organizational progress in agriculture ($\vartheta = 1{,}02$ was used in the computations),
π – number of dependents per head of household ($\pi = 2.5$ was used in the computations),
σ $0{,}1 \cdot \mathrm{Rnd}$,
Rnd – pseudorandom number from the interval $0 \leqslant \sigma < 1$ with rectangular distribution. Expected value $E(\sigma) = 0.05$,
Index '0' denotes the initial state or the state in preceding $(t-1)$ iteration.

DENOTATIONS

a_z^r – quotient of rural population and total population of a subregion,
a_e^r – quotient of rural population and total population in the region,
A_z^* – total agricultural production of a subregion obtained from deterministic model,
A_z – total agricultural production of a subregion obtained from the model including random component (σ),

A'_r – agricultural productivity per capita of rural population in the subregions connected with other cities than city x,
A'_e – average agricultural productivity per capita of rural population in the region,
G_{xx} – interactions between cities x, interpreted as flows,
H_z – export (import) of agricultural products from (to) a subregion to (from) other regions,
M_{rr} – migration of rural population between subregions,
M_{rxx} – migration of rural population from a given subregion to all cities,
M_{xx} – migration of urban population between cities,
M_{rrx} – migration of rural population from all subregions to a given city,
P^b_r – rural population of a subregion; biological prognosis,
P^r_r – rural population of the subregions gravitating to a city x, but not contiguous to it,
P^b_x – population of a city x; biological prognosis,
R_z – hypothetical total agricultural production in a subregion under the assumption that its yields reach national level,
T_e – average traffic on transportation lines of the region,
T_{xy} – transport of agricultural products between the central city and this part of its subregion which gravitates to a transportation line y,
T_{xz} – transport of agricultural products between a city x and its subregion,
T_{rx} – transport of agricultural products between a city x (including the central city) and the subregions gravitating but not contiguous to it,
U_y – transit on a transportation line y,
β_x – coefficient of non-agricultural employment in a city,
β_e – average coefficient of non-agricultural employment in the region,
δ_z – population density in a subregion,
δ_e – average population density in the region.

FUNCTIONAL RELATIONSHIPS

A. PRODUCTIVITY OF AGRICULTURE

$$P_r = P^b_r + M_{rr} - M_{rxx}, \tag{1}$$

$$P^b_r = (1+r_r)\,P_{ro}, \tag{2}$$

$$M_{rr} = \frac{(a_z - a_e)\,P^b_r + (Q_r - Q^r_e)\,P^b_r + (A'_{zo} - A'_{eo})\,P^b_r}{D_x}, \tag{3}$$

$$a_z = \frac{P_{ro}}{P_{xo} + P_{zo}}, \tag{4}$$

$$a_e = \frac{\sum P_{ro}}{\sum (P_{xo} + P_{zo})}, \tag{5}$$

$$M_{rxx} = P^b_r \sum \frac{m_x P_{xo} n_r P_{ro}}{d^2_{xx}}, \tag{6}$$

$$A'_e = \frac{\sum A'_z P_{ro}}{\sum P_{ro}}, \tag{7}$$

$$A'_z = \frac{A_z}{P_r}, \tag{8}$$

$$A_z = (1-\sigma)\, A_z^* + \sigma R_z, \tag{9}$$

$$A_z^* = \vartheta\,[A_{zo} P_{ro} + H_z + (\delta_z - \delta_e)\, A'_{zo} P_{ro} + \sum_y (T_{yo} - T_{eo})\, A'_{zo} P_{ro}], \tag{10}$$

$$H_z = (A'_{zo} - A'_{eo})\, A'_{zo} P_{ro}, \tag{11}$$

$$R_z = \gamma L_z, \tag{12}$$

$$\delta_z = \frac{P_{xo} + P_{zo}}{z}, \tag{13}$$

$$\delta_e = \frac{\sum (P_{xo} + P_{zo})}{\sum z}, \tag{14}$$

$$P_z = (1+r_z)\, P_{zo}. \tag{15}$$

B. FLOWS

$$T_e = \frac{\sum T_y d_{xx}}{\sum d_{xx}}, \tag{16}$$

$$T_y = G_{xx} + U_y + T_{xy} + T_{xz} + \sum_r T_{rx}; \tag{17}$$

$\sum_r$ – the sum over all external subregions supplying city x with agricultural products using road y,

$$G_{xx} = \frac{P_{xo} P_{xo}}{d_{xx}^2}, \tag{18}$$

$$U_y = \frac{333}{\min (D_x, D_x)}\, G_{xx}, \tag{19}$$

$$T_{xy} = \frac{\frac{1}{6} P_{xo} \frac{1}{6} P_{ro} A'_{zo}}{d_{xy}^3}, \quad \text{if } x = 1, \tag{20}$$

$$T_{xz} = \frac{\frac{1}{6} P_{xo} \frac{1}{6} P_{ro} A'_{zo}}{d_{xz}^3}, \quad \text{if } x \neq 1, \tag{21}$$

$$T_{rx} = \frac{\frac{1}{6} P_{xo} \frac{1}{6} P'_{ro} A'_{ro}}{d_{xx}^4}. \tag{22}$$

C. POPULATION OF CITIES

$$P_x = P_x^b + \pi M_{xx} + \pi M_{rrx}, \tag{23}$$

$$P_r^b = (1+r_x)\, P_{xo}, \tag{24}$$

$$\beta_x = \varepsilon_1 + \varepsilon_2 + \varepsilon_3, \tag{25}$$

$$\beta_e = \frac{\sum \beta_x P_{xo}}{\sum P_{xo}}, \tag{26}$$

$$M_{xx} = \frac{(\beta_x - \beta_e) P_x^b + (Q_x - Q_e^x) P_x^b + \sum (T_y - T_e) P_x^b + (A'_{xo} - A'_e) P_x^b}{D_x}, \tag{27}$$

$$M_{rrx} = P_x^b \sum \frac{n_r P_{ro} m_x P_{xo}}{d_{xx}^2}. \tag{28}$$

In testing the model, its individual exogenous variables were assigned scaling factors.

APPENDIX 2. Optimization model

DENOTATIONS

a_j^* – optimal productivity of agriculture in a subregion j,
c_{ij} – unit transportation costs on a line ij,
d_{ij} – distance between cities ij,
d_{ij}^L – distance between subregions ij,
u_{ij} – bid rent of an appartment in a city i that a head of household working in a city j is willing to pay; net bid rent, i.e. bid rent minus actual rent, was used in computations,
v_{ij} – external economies obtained by enterprises as the result of a shift of one workplace from a city j to a city i; they are expressed in bid rents that the enterprises are willing to pay for such a shift,
w_{ij} – profit from 1 tonne of agricultural goods produced in a subregion j and sold in a subregion i; another way of expressing preferences can be a net bid rent (bid rent minus production costs) that farmers from a subregion i are willing to pay for the use of 1 hectare of land in a subregion j,
A_{ij} – amount of agricultural goods produced in a subregion j and sold in a city i,
A_{kj} – amount of agricultural goods imported to city k, depending on its population and employment,
B_j, B_o – upper and lower limits of agricultural productivity; the production cannot be continued beyond these limits,
E_j – number of workplaces in a city j in the initial state,
E_{ij} – number of workplaces shifted from a city j to a city i in optimization procedure,
E_{kj} – number of workplaces in a city k, occupied by employees living in a city j,
E_j^* – number of workplaces in a city j after the shifts resulting from optimization procedure,
G_{ij} – interactions between industries located in cities i and j (industrial commodity flows calculated by means of a gravity equation),
H_i – maximal size of city i determined by its housing stock,
H_{oi} – minimal size of city i determined by the assured number of workplaces,
I_k, J_k – coefficient determining the dependence of amount of agriculture products imported to a city k on population and employment of this city,
K_j – ability of enterprises to create new workplaces in a city j,
L_j – area of agricultural land in a subregion j,
M_i – minimal number of workplaces in a city i (social constraint),
N_i, N_{oi} – maximal and minimal percentage of active population of a city i working in other cities,
N_j, N_{oj} – maximal and minimal percentage of employees of a city j commuting from other cities,
P_i, P_j – active population in cities i and j,
P_{ij} – active population living in a city i and working in a city j,

P_{ik} – active population commuting to a city k from cities i,
P_{kj} – active population of a city k moved from a city j,
P – total number of population in the region,
P_i^*, P_j^* – active population in cities i and j after the shifts resulting from optimization procedure,
Q_i – costs of the protection of environment borne by industry of a city i,
R_i – costs borne by population of a city i due to the pollution of environment,
S_i – burdens layed on the population of a city i by the social environment (social institutions),
T_y^* – commuting to work on a road y resulting from the optimal linkage of active population and employment centers,
T_y^* – industrial commodity flows on a road y resulting from the spatial distribution of industry after optimization,
T_y^* – agricultural commodity flows on a road y resulting from the spatial pattern of agriculture after optimization,
Z_i – burdens layed on the industry of a city i by the social environment (social institutions).

Objective function:

$$\text{Max} = \sum_j \Big[\sum_i P_{ij}(u_{ij} - R_i - S_i - c_{ij}d_{ij}) + \sum_i E_{ij}(v_{ij} - Q_i - Z_i - E_j/d_{ij}^2) + \sum_i A_{ij}(w_{ij} - c_{ij}d_{ij}^L)\Big]$$

subject to:

$$\sum_i E_{ij} = E_j, \tag{1}$$

$$\sum_j E_{kj} \leqslant \sum_i P_{ik}, \tag{2}$$

$$\sum_j E_{ij} \geqslant M_i, \tag{3}$$

$$\sum_j E_{ij} \leqslant K_i, \tag{4}$$

$$\sum_i A_{ij} \geqslant B_o L_j, \tag{5}$$

$$\sum_i A_{ij} \leqslant B_j L_j, \tag{6}$$

$$\sum_j A_{kj} \leqslant \sum_j (I_k P_{kj} + J_k E_{kj}), \tag{7}$$

$$\sum P_{ij} \leqslant H_i, \tag{8}$$

$$\sum_j P_{ij} \geqslant H_{oi}, \tag{9}$$

$$\sum_{j \neq i} P_{ij} \leqslant N_i P_i, \tag{10}$$

$$\sum_{i \neq j} P_{ij} \leqslant N_j P_j, \tag{11}$$

$$\sum_{j \neq i} P_{ij} \geqslant N_{oi} P_i, \tag{12}$$

$$\sum_{i \neq j} P_{ij} \geqslant N_{oj} P_j, \tag{13}$$

$$\sum_i \sum_j P_{ij} = P \tag{14}$$

or

$$\sum_j P_{ij} = P_i, \tag{15}$$

$$P_{ij} \geqslant 0, \tag{16}$$

$$E_{ij} \geqslant 0, \tag{17}$$

$$A_{ij} \geqslant 0, \tag{18}$$

Solution:

$$P_i^* = \sum_j P_{ij}, \tag{19}$$

$$P_j^* = \sum_i P_{ij}, \tag{20}$$

$$E_j^* = \sum_i E_{ij}, \tag{21}$$

$$a_j^* = \sum_i A_{ij}/L_j, \tag{22}$$

$$T_{Py}^* = \sum_{ij,y} P_{ij}, \tag{23}$$

$\sum_{ij,y}$ – sum over all persons commuting in directions ij using a road y,

$$T_{Ey}^* - \sum_{ij,y} G_{ij}, \tag{24}$$

$\sum_{ij,y}$ – sum over all industrial products transported in directions ij using a road y,

$$T_{Ay}^* - \sum_{ij,y} A_{ij}, \tag{25}$$

$\sum_{ij,y}$ – sum over all agricultural products transported in directions ij using a road y.

REFERENCES

Allen P. M., Sanglier M., 1979, A dynamic model of growth in a central place system, *Geographical Analysis*, 11, 256–272.

Beaumont J. R., Clarke M., Wilson A. G., 1981, The dynamics of urban spatial structure: some exploratory results using difference equations and bifurcation theory, *Environment and Planning A*, 13, 1473–1483.

Boyce D. E., 1978, Equilibrium solutions to combined urban residential location, modal choice and trip assignment models, in: *Competitions among small regions*, W. Burth, P. Friedrich, eds., Nomos, Baden-Baden, 246–264.

Casti J., 1983, *Emergent novelty and the modeling of spatial processes*. RR-83-27, IIASA, Laxenburg.

Domański R., Wierzbicki A. P., 1981, *A simulation model for developing service centers in a rural settlement network*. WP-81-58, IIASA, Laxenburg.

Domański R., Wierzbicki A. P., 1983, Self-organisation in dynamic settlement systems, *Papers of the Regional Science Association*, 51, 141–160.

Los M., 1979, Combined residential-location and transportation models, *Environment and Planning A*, 11, 1241–1265.

Parr J. B., 1981, Temporal change in a central-place system, *Environment and Planning A*, 13, 97–118.

White R. W., 1974, Sketches of a dynamic central place theory, *Economic Geography*, 50, 219–227.

White R. W., 1977, Dynamic central place theory: results of a simulation approach, *Geographical Analysis*, 9, 226–243.

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DEVELOPMENTS IN LOCATION/ALLOCATION MODELLING

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INTRODUCTION

This paper is concerned with a common and apparently simple geographical question namely: 'how can we choose locations for a number of central facilites such as clinics, public libraries, schools or recreation centres within a region so that the region's population as a whole enjoys the best possible access to the service?' This is usually called the 'central facility location problem' (CFLP). Subsidiary or related questions concern the optimal number of facilities and their size or capacity. The basic problem is therefore to optimize the spatial organisation of a service supplied in central facilities to which users or consumers must go or from which the service is delivered (as in the case of fire protection).

Leonardi (1981) makes a basic distinction between 'user attracting systems' and 'delivery systems'. In the latter case the agency of public authority providing the service also controls the allocation of users to supply points i.e. it controls both 'location' and 'allocation'. In N. America and much of Europe this is generally true of primary and secondary education. 'User attracting systems' are more numerous, however. Here consumers decide individually which facility to use (i.e. 'allocation') but the agency or authority concerned determines the location of supply, as happens with most recreation services and with public libraries. Leonardi's distinction is a useful one, regardless of whether a country's economic system is mainly based on a free market or on central planning.

Though some of the work done in this field originally grew out of questions of depot location by firms in the private sector of the economy, most of the work done on the problem in USA, Britain and Scandinavia over the last fifteen years has been concerned with services in the public sector of western economies. Thus it is usually assumed that one facility is not in direct competition with another offering the same service and that it therefore makes sense to try to co-ordinate or plan the system of supply as a whole to optimize some objectives. The most commonly used objective has been to minimize the travel costs of users but a variety of other goals may be appropriate, for instance maximization of the overall level of use or demand (Hodgart, 1978). Though they are generally formulated with the public sector in mind, these models may be applied in the private sector where outlets or supply points are not in competition with each other, e.g. where a firm has monopoly of supply or is organising its own distribution of depots or warehouses.

In operational terms what really makes the CFLP a problem at all is the way in which the number of possible solutions explodes numerically as the number of facilities and demand points increases. For example if the city of Edinburgh is divided into

square grid cells of 500 metres in size and we want to locate 3 facilities, combinatorial mathematics indicate that there are over 6 million ways of locating the facilities with not more than one in any cell. In terms of its mathematical form the problem seems to belong to a broad class of problems called 'NP complete problems' i.e. it is 'non-deterministic polynomial time complete'. The common characteristic of these problems is that the time required to compute solutions increases steeply with the number of elements, n, and at a greater rate than a polynomial function of n (Kolata, 1980).

In common with other problems of this kind, much of the research effort to date has been concerned with developing efficient algorithms for finding optimal or very good solutions. The ever growing speed and power of computers now makes it possible to tackle larger problems without the cost of computation becoming prohibitive but for most problems of even a moderately large size the time needed for computation is still a very important consideration in deciding whether a problem is readily soluble and which method to use. Nevertheless, it can be argued that this concentration on method has contributed to a neglect of the underlying goals and assumptions. The latter aspects of the problem are the main concern of the present paper.

The problem also involves balancing the costs of access incurred by nearer and more remote users i.e. questions of equity of distribution arise. In the real world these questions are usually resolved politically. One aim of work on the CFLP can be to provide information to all those involved in this political process (including the public) on the costs and benefits of particular sets of locations.

Recent reviews of the field (Leonardi, 1981; Beaumont, 1980b; Hodgart, 1978) attest to the growing variety and flexibility of models used to solve the problem and to substantial improvements in the efficiency and speed of the methods and algorithms used to compute solutions. Nevertheless, most of the work still treats each service in isolation from all other services and activities and so ignores the important links between different services. A further restriction is that existing models and algorithms are almost always essentially static, though it is easy to vary the time horizon of any solution to take a shorter term or longer term view of how many facilities may be built (or closed). For all these reasons, location/allocation models are still somewhat naive. However, by concentrating on the two main elements in the problem, population and accessibility, they may still provide useful insights at both applied and theoretical levels.

INCORPORATION OF SPATIAL INTERACTION MODELS

A further limitation of existing operational models is that they usually assume users always go to the centre which is nearest in travel time, cost or distance. This makes it much easier to solve the problem and it may in a few instances correspond to actual patterns of movement (e.g. travel by children to school in areas of dispersed rural population). Nevertheless, if facility location models are to be useful in applied situations it seems essential that they should take account of the complex and often apparently irrational patterns of choice made by users. Thus such factors as the size and attractiveness of a facility and its convenience for multi-purpose trips (including shopping or journey to work) may be important considerations in defining catchments.

A promising direction for improvement here is the use of spatial interaction models to define catchment areas which overlap to a greater or lesser extent as happens in reality. Since these models can be calibrated using data on the use and travel patterns of consumers to existing facilities, it is possible to ensure a reasonably close match to

reality. This approach has been used by Goodchild and Booth (1980) to examine the locations of two new swimming pools to be built in London, Ontario. Hodgson (1978) has also computed solutions to a problem with overlapping catchments where the facilities are constrained to be equal in size. Hodgart (1981) suggests that it may be possible to solve a range of facility location problems with different objectives and overlapping catchment areas without any size constraint. The works by Hodgson and Hodgart are still experimental in that neither has calibrated his model to real data. Though these papers only deal with a single service, it may be worth noting that a model of the type used by Goodchild indirectly incorporates the effect of other services and activities (including the transport system), through the influence these factors have on travel patterns. Before discussing these developments in more detail, however, it may be useful to discuss some basic asumptions of the CFLP.

FORMS OF THE PROBLEM

At the outset it is essential to ask what effect distance has on patterns of use or demand. Two effects can be distinguished:

(a) The cost of travel in terms of money or time may reduce the amount of use expressed in terms of the number of visits per time period that individuals make of the service. In the more remote areas, the level of demand is reduced by a higher price people have to pay in the form of greater travel cost or time. Since the overall level of demand falls with distance, this can be referred to as 'spatially elastic demand' or 'accessibility sensitive' demand.

(b) Conversely, when demand is 'spatially inelastic', people in more remote areas use the service just as frequently as people who live near a supply point. The level of demand from the population in a particular grid cell may depend on such factors as the age, income and social composition of its residents but it will be independent of the location of the facilities and of the distance people have to travel to them. People will still tend to go to the nearest centre available or one of the nearer ones, so distance will affect choice of centre, as well as the travel costs involved.

Location/allocation models can therefore be divided into two groups according to their assumptions about the effect of distance. As a corollary, when demand is elastic, one appropriate objective is to locate new centres to maximize the overall use or demand generated (Teitz, 1968). When demand is inelastic, we can try to locate centres so that the travel costs of users are minimized.

There is surprisingly little research on whether demand for particular services is spatially elastic or not. Geographers have often demonstrated that facilities have fairly compact catchment areas with the number of trips to a particular centre declining progressively with distance. However, unless all facilities within a region are included or a careful research design is used or data is collected from households, it is usually impossible to say to what extent this decline represents a fall in the level of use as well as the obvious tendency for users to choose another, probably closer, facility. This point is discussed at greater length elsewhere (Leonardi, 1981; Hodgart, 1978).

The existing geographical literature on 'distance decay' (e.g. Olsson, 1965) seems to overlook the distinction between elastic and inelastic demand, though elastic demand is basic to the classical models of Christaller and Lösch. Parameters for distance decay measured without an awareness of the distinction cannot therefore be used in location/allocation models to describe either the degree of elasticity or the extent of a facility's catchment area because they blur (and possibly confuse) the two effects. Clearly work is urgently needed to determine which services have elastic demand and to

estimate the degree of elasticity; Leonardi (1981) lists this as the leading empirical question for future research. McCalden (1983) shows that demand for dental treatment in Edinburgh is nearly always spatially inelastic.

For some services demand is obviously inelastic because these services are really necessities or are required by law. Thus the demand for essential medical services, primary and secondary education and the fire service is almost certainly spatially inelastic in the developed world. There is some evidence, however, that for some recreation services, including swimming, demand is somewhat elastic. In the Third World it is possible that more services exhibit elastic demand even when provided free. Work by Rushton and Mahadev (1982) in a rural district of Karnataka in S. India suggests that utilization rates for primary health care in the region fall appreciably with distance.

It can be argued that for some services we should speak of need rather than demand, since the level of an individual's demand depends on his income, whereas the needs for essential medical services of all individuals may be the same, irrespective of income. In a geographical context, however, we can often argue that by finding significant gaps in the spatial cover provided by a service we are helping the areas with the greatest need, as well as the largest potential for increasing demand.

If demand is elastic, one important consequence is that the overall level of demand increases as more centres are supplied because they will improve access in their vicinity, provided they are sensibly located. If demand is inelastic, strictly speaking, the number of centres supplied has no effect at all on the level of demand. In the former case a new facility will generate some new users as well as reducing the travel costs of some existing users. In the latter case a new facility can only capture users from existing centres, so the impact of a new centre on existing ones will be quite different in the two cases.

GOALS AND METHODS OF SOLUTION

If demand is inelastic and users travel to the nearest facility, to minimize the travel costs of users we

$$\text{minimize } Z = \sum_j \sum_i a_{ij} p_i d_{ij} \tag{1}$$

where p_i is the population of demand point i; d_{ij} is the distance from i to facility j; a_{ij} is 1 if j is the nearest facility to i, but otherwise zero.

If the problem is treated as one of location on a plane, travel costs are usually assumed to be directly proportional to distance. Two common methods of solving the problem are that developed by Törnqvist (Törnqvist et al. 1971) and that originally developed by Cooper (1963) and implemented by Goodchild in the program LAP (Rushton, Goodchild and Ostresh, 1973), the latter being much more efficient in terms of computer time.

Cooper's method works by alternately locating and allocating the m facilities as follows:

1. assign each centre to an arbitraty initial position;
2. allocate each demand point to its nearest centre, defining m Thiessen polygons (*the allocation stage*);
3. relocate each centre to the point of minimum travel cost (i.e. the median location) within its catchment area by the Kuhn-Kuenne method (1962) (*the location stage*);
4. repeat steps (2) and (3) until convergence occurs.

When the location stage is performed, each catchment is treated separately and we can be sure that the point of minimum aggregate distance or travel cost is found within

each catchment. When the allocation stage is next performed each demand point may be reallocated to a new centre if this is closer than its previous centre. Thus both stages can only reduce travel cost and the search usually converges quickly on a good solution. By a few repeated trials from different starting positions, we can often be reasonably sure of finding the global optimum for the problem.

What do we do, however, if demand is elastic? The simplest case is to retain the assumption of Thiessen catchments and allow the number of visits to a centre to decline with distance from a facility within each catchment. If we assume this decline has a negative exponential form then

$$T_{ij} = p_i e^{-bd_{ij}} \tag{2}$$

where T_{ij} is the number of visits from i to facility j during a particular period of time; b defines the degree of elasticity.

The Kuhn-Kuenne method is based on the partial derivates of (1); it finds the median location in one catchment by iterative substition in the following equations

$$X_j = \sum_i \frac{p_i x_i}{d_{ij}} \Big/ \sum_i \frac{p_i}{d_{ij}} \tag{3}$$

$$Y_j = \sum_i \frac{p_i y_i}{d_{ij}} \Big/ \sum_i \frac{p_i}{d_{ij}} \tag{4}$$

where X_j and Y_j are the co-ordinates of the median.

When demand within one catchment area declines in a negative exponential manner, we can employ partial derivatives in a similar manner to search for the location which will maximize the number of trips to the centre. The x co-ordinate of this point will be given by iterative substitution in the equation

$$X_j = \sum_i p_i x_i e^{-bd_{ij}} d_{ij}^{-1} \Big/ \sum_i p_i e^{-bd_{ij}} d_{ij}^{-1} \tag{5}$$

and the y co-ordinate by a symmetrical formula. The greater the value of b, the more steeply elastic the demand, the more often will search converge on a local optimum. Different starting positions can then be used to improve the chance of finding the global maximum.

To locate several centres to maximize use, we can therefore replace equations (3) and (4) in the location stage by equation (5) and its equivalent for Y_j. This ensures that the solution is improved during the location stage. During the allocation stage, demand points can only be reallocated to a new facility if it is nearer. Hence the demand generated from any point will either remain the same or increase. Both stages will therefore progressively improve the solution until convergence occurs. An algorithm called LOCHWISP (Location of Centres Heuristic With Iterative Search on a Plane) has been developed with this method as one of its options, and this has worked quite satisfactorily (Hodgart, 1981). It may be worth emphasizing again at this point that the assumption that everyone goes to the nearest centre plays a key role in the process of optimization. Moreover, since catchment areas do not overlap, the allocation stage is straightforward; it simply involves the substitution of one centre by a nearer one, where relevant.

LOCATION/ALLOCATION WITH OVERLAPPING CATCHMENTS

It can be argued that the CFLP with overlapping catchments can be solved within the basic framework of Cooper's method. First, we need to define how the catchment areas overlap. Suppose the population of a grid cell (i.e. its potential demand) is

split between the surrounding centres according to their relative attractiveness and that this attractiveness falls with distance in a negative exponential manner. The total attraction exerted on demand point i by all centres is then

$$TA = \sum_{j=i}^{m} e^{-\beta d_{ij}} \tag{6}$$

where β is a 'trip dispersion' parameter defining how the attractiveness of a centre falls with distance i.e. it determines the extent of the catchment areas.

The fraction of i's demand going to centre j will then be

$$F_{ij} = e^{-\beta d_{ij}} / \sum_i e^{-\beta d_{ij}}. \tag{7}$$

The actual number of people from i assigned to j when demand is inelastic will therefore be

$$T_{ij}^I = p_i F_{ij}. \tag{8}$$

This is equivalent to using a singly constrained spatial interaction model. The single constraint is simply that the total number of users from a cell cannot exceed its total population. In other words the model ensures that

$$\sum_j T_{ij}^I \leqslant p_i \tag{9}$$

where T_{ij}^I is the number of trips from i to j when demand is inelastic.

If demand is elastic the number of trips from i to j will fall off with distance. If we again use a negative exponential form then

$$T_{ij} = e^{-bd_{ij}} T_{ij}^I \tag{10}$$

where b defines the degree of elasticity.

The extent of overlap is controlled by β. If β has a large value, say 0.5, then there is little overlap and catchments are fairly compact. If β has a much smaller value, say 0.125, then there are extensive areas of overlap, as often occurs within cities.

Consider what happens if we replace the allocation stage in Cooper's algorithm by a spatial interaction model of the type just described. Assume we want to locate two centres within a city to maximize use with elastic demand. Given two initial positions to the east and west of the city centre, we can then define the catchment areas of each centre, using equation (8) and noting what proportion of each cell's demand goes to each centre. We can then look at each centre within its own catchment area which will form a kind of irregularly shaped cone arround it, analogous to the demand cones of Lösch. These cones overlap but in computational terms it is quite easy to treat them separately, when it is necessary to do so in the process of solution.

Accordingly we can move each centre within its own catchment to the point where use of that centre will be maximized, employing (5) and the equivalent for y. Alternatively if we wanted to minimize travel cost we could use (3) and (4). Thus, if either objective is evaluated over the whole system at the end of the location stage then some improvement must have occurred. It may be worth emphasizing that the catchments at this stage are still based on the allocations defined from the initial locations and do not yet take account of the fact that both centres have moved.

With this method the crucial thing is what happens when the allocation stage performed. Consider any demand point, i. At the end of the location stage the first facility may be further away or closer and the second likewise. By the nature of the spatial interaction model used, point i will tend to send more of its population to any facility which has moved closer and less to one which is now farther away. So at the

allocation stage the rearrangement taking place has a *tendency* (but only a tendency) to allocate more people to closer facilities and less to ones which have become more distant. Obviously if more users go to nearer facilities or less go to more distant ones, this will increase demand (and reduce travel cost). Thus the allocation stage should tend to improve the situation obtaining at the end of the location stage for the whole system. If it does, then a location/allocation algorithm for overlapping catchments should work reasonably well.

The preceding account actually glosses over some of the complexities involved. At some points the level of demand actually falls at the allocation stage but it seems these are in the minority. A fuller treatment is found in Hodgart (1982).

The computer program mentioned earlier, LOCHWISP, was adapted to handle overlapping catchment areas with the extent of overlap defined by the type of spatial interaction model described earlier. Experience with various values for b and β was favourable, both with elastic and inelastic demand. Convergence towards better solutions always occurred in trial problems based on the distribution of population in Edinburgh. Of course, when demand was made very elastic, the search often converged on a local optimum rather than a global one. Though these results are encouraging, they are best regarded as still rather provisional.

As noted earlier, Goodchild and Booth (1980) have also computed solutions to a problem with overlapping catchment areas. Their analysis in fact goes further in that they use a more sophisticated spatial interaction model which allows the attractiveness of the facilities to vary and they calibrate the model data on patterns of use. Their analysis, however, is restricted to models with inelastic demand.

Hodgson (1978) solved a series of trial problems with inelastic demand and overlapping catchment areas and used a combinatorial programming method to identify global optima for comparison with results from the Teitz and Bart (1968) heuristic. Facilities were constrained to be equal in capacity. Beaumont (1980a) discussed problems with overlapping service areas and solved a series of trial problems to maximize locational surplus. He provides a thorough analysis of the mathematical structure underlying the problem, but does not separate the effect of b and β and does not therefore specifically treat the problem of maximizing use.

The preceding discussion has treated the problem on a plane. The problem of locating m centres in a network to minimize travel cost with inelastic demand is usually referred to as the p-median problem. A method of solving it, which alternates between relocating centres within their catchments and reallocating users to their nearest centre, was developed by Maranzana (1964). Essentially this method is identical in principle to Cooper's algorithm for a plane. Hillsman (1980) suggests, however, that this method's success in finding good solutions falls rapidly as the number of points increases.

It should be fairly easy to tackle the problems involving overlapping catchments on a network by a method similar to that of Maranzana. If the alternating method searches a plane with some success in improving the solution, then it should probably work just as well in a network. It is more difficult to assess in advance whether a Teitz and Bart type of search would work as well, but there are no obvious reasons for thinking it would not be successful.

COVERING MODELS AND MULTIPLE GOALS

For emergency fire and medical services it is more appropriate to ensure that as many people as possible within an area are 'covered' (i.e. within a certain travel time of distance from a facility) than to minimize travel costs or maximize demand. In addition there are probably many more services where the number of people within

a certain radius of a centre provides a useful measure of the effectiveness of a particular set of service points. This is the basis of the 'maximal covering location problem' (MCLP) which involves maximizing the population covered within a desired distance by locating a specified number of facilities (Church and ReVelle, 1974). A related problem is the 'location set covering problem' which involves determining the minimum number of facilities needed to provide a certain standard of cover. Since covering models involve specifying a certain standard of access, we can view them as a means of incorporating an element of equity into the solution of other location problems.

An interesting paper by Church and ReVelle (1976) shows that the MCLP can be solved by formulating it as a *p*-median problem with the real distances transformed as follows:

$$d'_{ij} = \begin{cases} 0 \text{ if } d_{ij} \leqslant S, \\ 1 \text{ if } d_{ij} > S \end{cases}$$

where S is the specified radius of cover.

Essentially these transformed distances give the objective function a value for travel costs equal to the number of people beyond the radius of cover. Minimizing the value of this function is therefore equivalent to maximizing the population within cover. Thus the MCLP can be seen as a special case of the *p*-median and hence solved by the various algorithms developed to solve the latter problem.

To incorporate some degree of equity in the standard *p*-median problem it may be desirable to ensure that the whole population is within a certain distance (say T km) of the nearest facility. Church and ReVelle (1976) suggest that this can also be achieved by transforming the distances so that

$$d'_{ij} = \begin{cases} d_{ij} \text{ if } d_{ij} \leqslant T, \\ M \text{ if } d_{ij} > T \end{cases}$$

where M is a very large number. This makes assignments to facilities beyond T km prohibitive in cost and so rules out sets of locations in which any demand point, i, has its nearest centre more than T km away when the problem is solved by one of the standard heuristics. This, of course, assumes that the number of facilities is sufficient to meet the mandatory closeness constraint, a fact which can be checked by initial tests based on the location set covering problem. The attraction of this particular development is that it allows the balance between spatial equity and efficiency to be explored (e.g. by varying T) more flexibly than in the regular *p*-median or the MCLP.

Church and ReVelle go on to show that the mandatory closeness constraint can also be incorporated into the MCLP, thereby ensuring that everyone is within T km of a centre while at the same time maximizing the population actually covered within S km. As a result algorithms for solving the *p*-median can be generalised to solve a variety of *p*-median and covering problems. Rushton, Hillsman and various co-authors (Hillsman, 1980) have in fact implemented and extended the ideas of Church and ReVelle in a series of integrated algorithms (ALLOC IV, V and VI). These programs also include some new heuristics developed by Rushton and Hillsman, one of which combines some of the features of the Maranzana and Teitz and Bart algorithms. Hillsman (1980) contains a very useful discussion of the relative advantages of various algorithms for particular problems.

It may be possible to incorporate a mandatory closeness constraint in problems involving overlapping catchments in a network, particularly if it turns out that these can be solved by a Teitz and Bart type of algorithm. It is difficult to forecast in advance how well such an approach would work but it is clear that Church and

ReVelle have opened up various ways of formulating new and more flexible models which may combine the efficiency objective of the *p*-median and use maximizing models with the equity goal of the covering models.

CONCLUSION

The results obtained so far suggest that spatial interaction models can provide a more flexible and realistic treatment of catchment areas in work on the CFLP. I would also like to suggest that more attention should be given to models with elastic demand and to determining which services have elastic and inelastic demand. If we use models with inelastic demand and discrete catchment areas in situations where demand is really fairly elastic and catchments overlap we get a rather misleading idea of

(a) the general impact of new centres on the system;

(b) in particular, the effect new centres have on the catchment areas of existing ones.

In such circumstances the amount of new demand stimulated by the new centres will generally be underestimated and the effect of new centres on the old ones may well be exaggerated.

Hodgson, writing in 1978, noted that a curious schism had developed between research workers in the fields of spatial interaction and facility location. He claimed that interactionbased theorists had avoided the problem of locating a specified number of centres while the location/allocation school avoided interaction theory despite its obvious relevance to their work. Hodgson's own work and that of Beaumont (1980a), Goodchild and Booth (1980) and Leonardi (1981) can be seen as an attempt to bridge this gap.

It is interesting that work on the CFLP has its own geography with Iowa City, Baltimore and Bangalore acting as the main centres for stemming from the *p*-median. Indeed the contents of *Geographical Analysis* over the last decade or so demonstrate the progress made on the problem through the work of Rushton, Goodchild and various co-authors at University of Iowa and through the work of ReVelle, Church and other co-workers based at Johns Hopkins. As a result of concentrating on the *p*-median and related problems, this broad 'school' has so far tended to neglect problems with overlapping catchments and, to a lesser extent, problems with elastic demand.

The few papers which do deal with such topics have tended to appear in *Environment and Planning* and seem to reflect the influence of work on spatial interaction models by Wilson (1974). So far, however, this work has not shown as much concern as the other school with making models operational in fairly realistic situations.

Attempts to bring the contributions of these two broad approaches together, if successful, should lead to models which are more satisfactory and flexible from a theoretical viewpoint and more useful for applied mark. Recent work on access to services in rural areas of India (Tewari, McNulty and Rushton, forthcoming) shows an increasing concern with incorporating goals and constraints which are important to decision makers and users of the service in the real circumstances of the Third World. It is to be hoped that progress in this direction continues.

REFERENCES

Beaumont J. R., 1980a, Spatial interaction models and the location/allocation problem, *Journal of Regional Science*, 20, 37–50.

Beaumont J. R., 1980b, *Location-allocation problems in a plane: a review of some models*. Unpublished discussion paper. School of Geography, University of Leeds.

Church R. L., ReVelle C. S., 1974, The maximal covering location problem, *Papers of the Regional Science Association*, 32, 101–118.

Church R. L., ReVelle C. S., 1976, Theoretical and computational links between the *p*-median, location set covering and the maximal covering location problem, *Geographical Analysis*, 8, 406–415.

Cooper L., 1963, Location-allocation problems, *Operations Research*, 11, 331–343.

Goodchild M. F., Booth P. J., 1980, Location and allocation of recreation facilities: public swimming pools in London, Ontario, *Ontario Geographer*, 15, 35–51.

Hillsman E. L., 1980, *Heuristic solution to location/allocation problems – a user's guide to ALLOC IV, V and VII*. Monograph no. 7, Department of Geography, University of Iowa, Iowa.

Hodgart R. L., 1978, Optimizing access to public services, *Progress in Human Geography*, 2, 17–48.

Hodgart R. L., 1981, *On the optimal geographical organisation of public services with central facilities*. Unpublished Ph.D. thesis, University of Edinburgh.

Hodgart R. L., 1982, *LOCHWISP: a location/allocation algorithm with overlapping catchment areas and a choice of goals*. Paper presented to conference on Improving Access to Rural Services, Bangalore, India.

Hodgson M. J., 1978, Toward more realistic allocation in location/allocation models: an interaction approach, *Environment and Planning A*, 10, 1273–1285.

Kolata G. B., 1980, Solve one and you could solve them all, *New Scientist*, 86, April, 8–10.

Kuhn H. W., Kuenne R. E., 1962, An efficient algorithm for the numerical solution of the generalized Weber problem in spatial economies, *Journal of Regional Science*, 4, 21–34.

Leonardi G., 1981, A unifying framework for public facility location problems, part 1: A critical overview and some unsolved problems, *Environment and Planning A*, 13, 1001–1028; part 2: Some new models and extensions, 1085–1108.

Maranzana F. E., 1964, On the location of supply points to minimize transport costs, *Operational Research Quarterly*, 15, 261–270.

McCalden J. D., 1983, *The spatial behaviour of dental patients in Edinburgh*. Unpublished Ph.D. thesis, University of Edinburgh.

Rushton G., Goodchild M. F., Ostresh L. M., 1973, *Computer programs for location-allocation problems*, Department of Geography, University of Iowa, Iowa.

Rushton G., Mahadev P., 1982, *Locational efficiency of rural health services in an Indian district*. Paper presented at the annual meeting of the AAG, San Antonio, Texas.

Teitz M. B., 1968, Toward a theory of urban public facility location, *Papers of the Regional Science Association*, 21, 35–51.

Teitz M. B., Bart P., 1968, Heuristic methods for estimating the generalized vertex median of a weighted graph, *Operations Research*, 16, 901–1092.

Tewari V. K., McNulty M. L., Rushton G., forthcoming, Improving the geographical accessibility of services in developing countries.

Tornqvist G., Nordbeck S., Rystedt B., Gould P., 1971, Multiple location analysis, *Lund Studies in Geography C, General and Mathematical Geography*, 12, Lund.

Wilson A., 1974, *Urban and regional models in geography and planning*, Wiley, London.

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SOME PROBLEMS OF THE PATTERN OF THE TRANSPORT NETWORKS IN POLAND

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One of the most important problems in studies of a country's spatial, social and economic structure is the analysis of relationships between the level of socio-economic development of areas and their transportation infrastructure, i.e., the state of transport networks in these areas. A badly designed road network causes serious damage (when the network is too dense) because it represents an excessive level of fixed investment. When the network is too sparse it causes unnecessary delays in movement. The current state of the transport network is an outcome of two kinds of processes – political and economic; the network develops gradually, as needs arise, and not as a consequence of one general plan.

The relation between transport and the economy is not that of one-way dependence; instead there exists a relationship of mutual dependence. Nevertheless, one must agree with Lachene (1969) when he claims that economic development shapes the development of transport networks with respect to their quantity and quality, whereas transport projects only create the conditions for economic development of areas, but do not always cause such development. If transport networks contribute to economic development they do so only to a slight extent.

The development of transport networks is characterized by high inertia. Thus, once established, the network is usually a lasting element of the landscape. What changes, frequently to a considerable extent, is the intensity of its exploitation. The intensity of traffic on transport networks is determined by the demand for transport, which, in turn, is related to the level of socio-economic development of a given area.

The distribution of transport networks in Poland has distinctive features. Generally speaking, its density decreases as one progresses from the west to the east, the differences in the development of the infrastructure being very marked. This feature of Poland's transport network is particularly visible in the case of the railway network. The proportion of extreme density of railway lines in units is 1 : 9 (Łomża voivodship – 2.7 km/100 km^2 and Katowice voivodship – 24.1 km/100 km^2), with average railway network density in Poland in 1980 being 8.7 km/100 km^2. The difference between the western part of the country, where the density of railway lines is good, and the eastern part, where railway lines are sparse, is very striking. The present distribution of railway lines in Poland is a result of the varying political and economic circumstances of its development; it must be noted that over 80 per cent of railway lines were constructed before the outbreak of World War I and most present trunk lines were constructed in the first decades of railway history. The present railway network in Poland does not appear fully rational and

TABLE 1. Transport infrastructure in Poland, 1980. Standardized values

Voivodship	Railway network density	Density of surfaced roads	Density of improved roads	Density of network of intercity coaches	Average of *Z*-scores
1	2	3	4	5	6
1. Warsaw	1.36	0.22	0.66	−0.74	0.37
2. Biała Podlaska	−1.14	−1.00	−0.48	−0.57	−0.80
3. Białystok	−0.86	−1.25	−2.41	−1.55	−1.51
4. Bielsko Biała	0.63	1.39	1.55	0.87	1.11
5. Bydgoszcz	0.96	−0.29	0.13	−0.10	0.17
6. Chełm	−1.24	−1.19	−0.57	−0.10	−0.77
7. Ciechanów	−0.74	−0.33	−0.63	−0.10	−0.45
8. Częstochowa	0.16	0.19	−0.02	−0.61	−0.07
9. Elbląg	0.61	−0.19	0.03	0.62	0.27
10. Gdańsk	0.76	−0.63	−0.37	−0.20	−0.11
11. Gorzów Wlkp.	0.18	−0.73	−0.92	−0.98	−0.61
12. Jelenia Góra	1.33	0.12	0.74	1.11	0.82
13. Kalisz	0.18	0.78	0.59	0.64	0.55
14. Katowice	3.81	0.75	1.44	0.88	1.70
15. Kielce	−0.04	1.33	0.32	−0.37	0.31
16. Konin	−0.44	−0.15	0.00	0.45	−0.03
17. Koszalin	−0.06	−0.82	−0.42	−0.46	−0.44
18. Cracow	0.01	4.08	3.02	1.54	2.16
19. Krosno	−1.29	−0.81	−0.53	−1.36	−1.00
20. Legnica	1.36	0.53	1.29	2.52	1.42
21. Leszno	0.86	1.23	1.22	1.88	1.30
22. Lublin	−1.04	−0.33	0.17	0.38	−0.20
23. Łomża	−1.54	−1.09	−1.80	−1.20	−1.41
24. Łódź	0.46	0.40	0.03	−0.57	0.08
25. Nowy Sącz	−0.84	−0.78	−0.57	−0.79	−0.74
26. Olsztyn	−0.41	−0.83	−0.49	−0.44	−0.54
27. Opole	0.81	0.58	1.07	1.63	1.02
28. Ostrołęka	−1.11	−0.83	−1.50	−1.34	−1.19
29. Piła	0.31	−1.23	−0.88	−1.13	−0.73
30. Piotrków Tryb.	−0.86	−0.04	−0.40	−0.30	−0.40
31. Płock	−0.76	0.90	−0.09	−0.05	0.00
32. Poznań	0.93	0.18	0.45	−0.79	0.20
33. Przemyśl	−0.79	−0.37	−0.49	−0.94	−0.65
34. Radom	−0.94	0.10	−0.46	0.03	−0.32
35. Rzeszów	−0.84	1.02	0.64	0.10	0.23
36. Siedlce	−0.89	−0.86	−1.09	−0.91	−0.94
37. Sieradz	−0.89	0.17	−0.15	−0.07	−0.23
38. Skierniewice	−0.09	−0.15	−0.12	−0.52	−0.22
39. Słupsk	−0.69	−1.05	−0.69	−0.34	−0.69
40. Suwałki	−0.96	−1.56	−1.51	−1.46	−1.37
41. Szczecin	0.63	−0.63	−0.35	−0.64	−0.25
42. Tarnobrzeg	−0.11	0.02	−0.57	−0.14	−0.20
43. Tarnów	−1.04	1.87	1.16	1.04	0.76
44. Toruń	0.66	0.40	0.44	0.96	0.61
45. Wałbrzych	1.41	1.33	2.11	2.10	1.74
46. Włocławek	−0.26	0.02	0.61	0.79	0.29
47. Wrocław	0.88	0.81	1.25	2.03	1.24
48. Zamość	0.78	−0.64	−0.19	0.35	0.07
49. Zielona Góra	0.78	−0.63	−0.50	−0.98	−0.33

well-knit; in particular, it is not sufficient to convey the masses of cargo from new and developing mining areas.

The present state of the road network is also not fully suited to current needs. There is a considerable shortage of roads with proper surfaces to connect the most dynamically developing cities and of straight-line connections between the main Polish cities, which affects transportation efficiency. The country's transport situation became more complicated following the change of local government units in 1975, when 49 voivodships were set up in place of the previous 17 and a three-tier administrative division was changed to two-tiers. The reform changed the pattern of demand for transport, which clearly affected cargo and passenger conveyance.

Like the density of the railway network, the density of the road network also decreases eastwards, but the differences between the extremes are not so large. As regards surfaced roads[1], the ratio of the densities of the best and worst areas was 1 : 3. The equivalent ratio for roads with improved surfaces[2], which are used for 90 per cent of all transport, is 1 : 4.

The transport infrastructure in Poland is presented in Table 1. The following four features of the infrastructure have been considered: the railway network, surfaced roads, improved roads and roads used by inter-city coaches. All data have been standardized, which makes possible direct comparisons between different kinds of transport networks. The value of the standardized index was calculated for every voivodship and on the basis of this index, voivodships were arranged in the order of decreasing transport infrastructure (Table 2, Fig. 1). The relatively low position of the

TABLE 2. Voivodships listed in order of decreasing transport infrastructure, 1980

1. Cracow	26. Lublin
2. Wałbrzych	27. Tarnobrzeg
3. Katowice	28. Skierniewice
4. Legnica	29. Sieradz
5. Leszno	30. Szczecin
6. Wrocław	31. Radom
7. Bielsko-Biała	32. Zielona Góra
8. Opole	33. Piotrków Trybunalski
9. Jelenia Góra	34. Koszalin
10. Tarnów	35. Ciechanów
11. Toruń	36. Olsztyn
12. Kalisz	37. Gorzów Wlkp.
13. Warsaw	38. Przemyśl
14. Kielce	39. Słupsk
15. Włocławek	40. Piła
16. Elbląg	41. Nowy Sącz
17. Rzeszów	42. Chełm
18. Poznań	43. Biała Podlaska
19. Bydgoszcz	44. Siedlce
20. Łódź	45. Krosno
21. Zamość	46. Ostrołęka
22. Płock	47. Suwałki
23. Konin	48. Łomża
24. Częstochowa	49. Białystok
25. Gdańsk	

[1] Surfaced roads include macadam and boulder pavement.

[2] Improved roads include concrete, bituminous and sett pavement, and bituminous-concrete slabs.

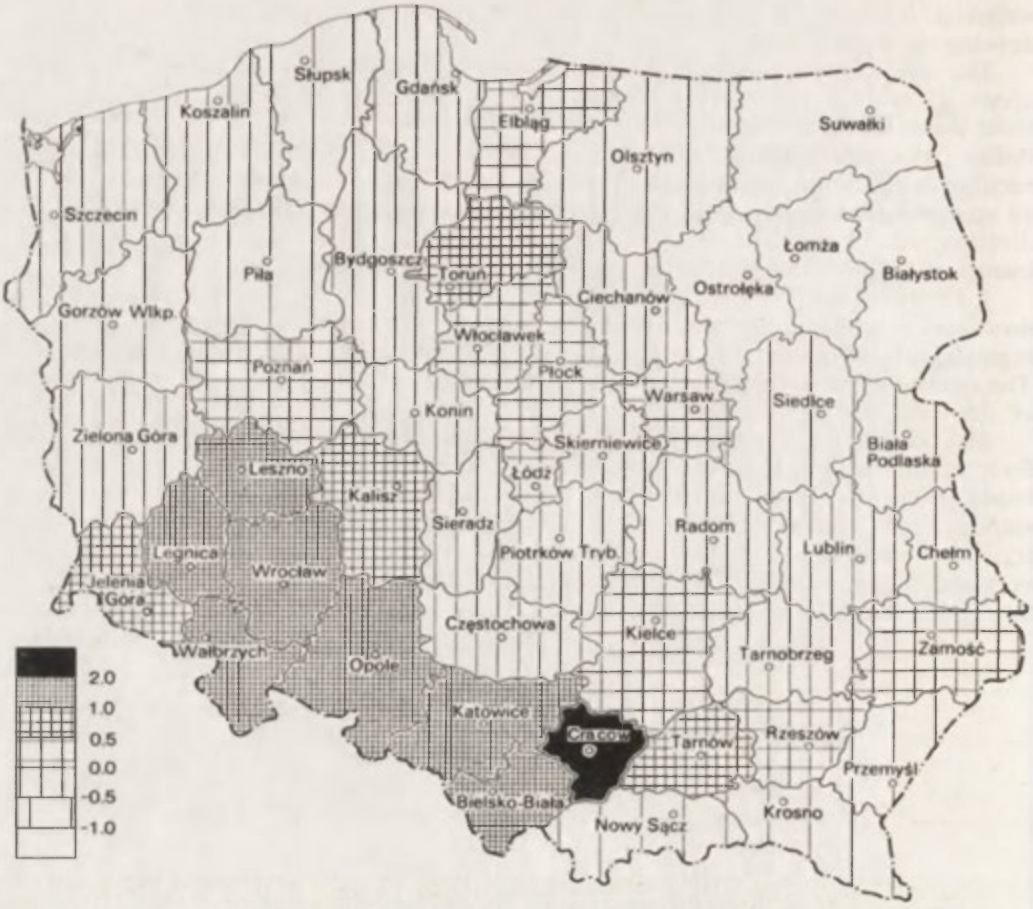

Fig. 1. Transport infrastructure in Poland, 1980. Standardized values

Warsaw, Łódź, Poznań and Gdańsk voivodships requires some comments. This position should be ascribed to a relatively low density of roads covered by inter-city coaches in these voivodships, which is a result of the fact that railway lines there are dense and provide a good service for passengers, particularly for commuters; coach transport in these areas performs merely a supplementary function. The picture would be even more distorted if the coach network were omitted from a description of transport infrastructure in Poland and only the varying density of road network were presented, as there are voivodships in Poland where railway transport does not play any important role and the vast majority of passangers travel by bus or car.

The level of Poland's socio-economic development was described in a similar way to the transport infrastructure, i.e., by the use of the standardized index. Results are presented in Tables 3 and 4. Leading positions in this case belong to voivodships with high population density and high levels of urban and industrial development, where large industrial conurbations are situated (Fig. 2).

The present paper attempts to determine to what extent spatial differentiation of transport infrastructure in Poland is related to spatial differentiation of economic activities. However, the focus of analysis has been restricted to interdependences between road density and the level of the country's socio-economic development.

TABLE 3. Spatial differentiation of socio-economic activities in Poland, 1980. Standardized values

Voivodship	Population density	Level of industrialization	Agricultural development	Social structure development	Average of *Z*-scores
1. Warsaw	2.52	1.04	0.63	2.94	1.78
2. Biała Podlaska	−0.99	−1.32	−0.79	−0.57	−0.92
3. Białystok	0.04	−0.34	−1.03	0.76	−1.14
4. Bielsko-Biała	0.03	0.73	1.02	0.28	0.51
5. Bydgoszcz	0.61	0.47	−0.07	0.26	0.31
6. Chełm	−0.81	−0.63	−0.63	−0.62	−0.67
7. Ciechanów	−0.85	−1.24	−0.32	−0.65	−0.76
8. Częstochowa	−0.01	0.14	0.08	−0.05	0.04
9. Elbląg	−0.05	−0.21	−0.27	−0.39	−0.23
10. Gdańsk	1.30	0.63	0.29	0.88	0.77
11. Gorzów Wlkp.	0.02	0.39	0.08	0.00	0.12
12. Jelenia Góra	0.19	0.96	−0.70	0.59	0.26
13. Kalisz	−0.25	−0.38	1.07	0.13	0.14
14. Katowice	3.76	2.16	0.83	0.40	1.79
15. Kielce	0.06	0.05	−0.39	−0.57	−0.21
16. Konin	−0.65	−0.39	−0.52	−0.50	−0.51
17. Koszalin	0.06	0.16	−0.16	0.25	0.08
18. Cracow	0.93	0.65	0.96	0.83	0.84
19. Krosno	−0.81	−0.06	−0.97	−0.66	−0.62
20. Legnica	0.15	1.82	1.09	0.07	0.78
21. Leszno	−0.50	−0.52	1.40	0.75	0.28
22. Lublin	0.27	−0.10	−0.01	0.35	0.13
23. Łomża	−0.89	−1.36	−0.85	−0.26	−0.84
24. Łódź	0.29	1.23	0.73	1.73	0.99
25. Nowy Sącz	−0.53	−1.48	−0.29	−0.15	−0.61
26. Olsztyn	0.08	0.12	−0.67	−0.09	−0.14
27. Opole	0.20	0.74	0.98	0.45	0.59
28. Ostrołęka	−0.95	−1.20	−0.75	−1.10	−1.00
29. Piła	−0.19	−0.30	−0.12	−0.25	−0.21
30. Piotrków Tryb.	−0.35	−0.03	−0.21	−0.54	−0.28
31. Płock	−0.42	1.29	0.05	−0.40	0.13
32. Poznań	1.00	0.40	1.36	1.46	1.05
33. Przemyśl	−0.78	−1.04	−0.04	−1.04	−0.72
34. Radom	−0.28	−0.50	−0.78	−0.63	−0.55
35. Rzeszów	−0.50	−0.20	0.39	−0.65	−0.24
36. Siedlce	−0.80	−1.45	−0.39	−0.98	−0.90
37. Sieradz	−0.86	−1.06	0.19	−0.46	−0.55
38. Skierniewice	−0.59	−0.74	0.10	−0.51	−0.43
39. Słupsk	−0.25	−0.08	−0.48	0.05	−0.19
40. Suwałki	−0.37	−0.68	−1.08	−0.51	−0.66
41. Szczecin	0.84	1.47	0.51	1.05	0.97
42. Tarnobrzeg	−0.68	0.85	−0.52	−0.94	−0.32
43. Tarnów	−0.62	−0.23	0.00	−1.00	−0.46
44. Toruń	0.17	0.15	−0.04	−0.01	0.07
45. Wałbrzych	0.65	0.66	0.05	0.26	0.40
46. Włocławek	−0.50	−0.68	−0.14	−0.25	−0.39
47. Wrocław	0.95	1.00	0.76	1.31	1.00
48. Zamość	−1.04	−1.27	−0.38	−1.02	−0.93
49. Zielona Góra	0.12	0.53	0.04	0.16	0.21

TABLE 4. Voivodships listed in order of decreasing level of the development of economy, 1980

1. Katowice	26. Słupsk
2. Warsaw	27. Kielce
3. Poznań	28. Piła
4. Wrocław	29. Elbląg
5. Łódź	30. Rzeszów
6. Szczecin	31. Piotrków Trybunalski
7. Cracow	32. Tarnobrzeg
8. Legnica	33. Włocławek
9. Gdańsk	34. Skierniewice
10. Opole	35. Tarnów
11. Bielsko-Biała	36. Konin
12. Wałbrzych	37. Radom
13. Bydgoszcz	38. Sieradz
14. Leszno	39. Nowy Sącz
15. Jelenia Góra	40. Krosno
16. Zielona Góra	41. Suwałki
17. Kalisz	42. Chełm
18. Lublin	43. Przemyśl
19. Płock	44. Ciechanów
20. Gorzów Wlkp.	45. Łomża
21. Koszalin	46. Siedlce
22. Toruń	47. Biała Podlaska
23. Częstochowa	48. Zamość
24. Białystok	49. Ostrołęka
25. Olsztyn	

The reason for considering only the road network is that it is accessible virtually without any limitations for both passenger and freight transportation, whereas the railway network is accessible only at certain points. Besides, the road network may be adapted to changes in the distribution of transport needs much faster than the railway network.

Three time periods — 1960, 1970 and 1980 — were considered in the studies on which the present paper is based. A detailed analysis of the interdependences detected was presented in another paper (Potrykowski, 1983) and only the main conclusions from these studies will be discussed here.

Since the previous three-tier administrative division was replaced with a two-tier system in 1975, the reference units adopted in the study were poviats (317 units) for the old system of divisions and voivodships for the new one; whenever possible, conversion procedures were applied and calculations were repeated for different reference units.

In principle, the study was limited to an investigation of spatial dependences between the road infrastructure and the level of socio-economic development; it is, however, possible to infer certain generalizations regarding temporal dependences between the processes of change of the two systems. It may be assumed that since every process consists of successive states, relations between processes may be defined by investigating spatial relations between the states.

Multiple regression analysis was employed to determine the strength of impact of the independent variables describing the level of socio-economic development on the dependent variable describing the road infrastructure. Results of the analysis showed that

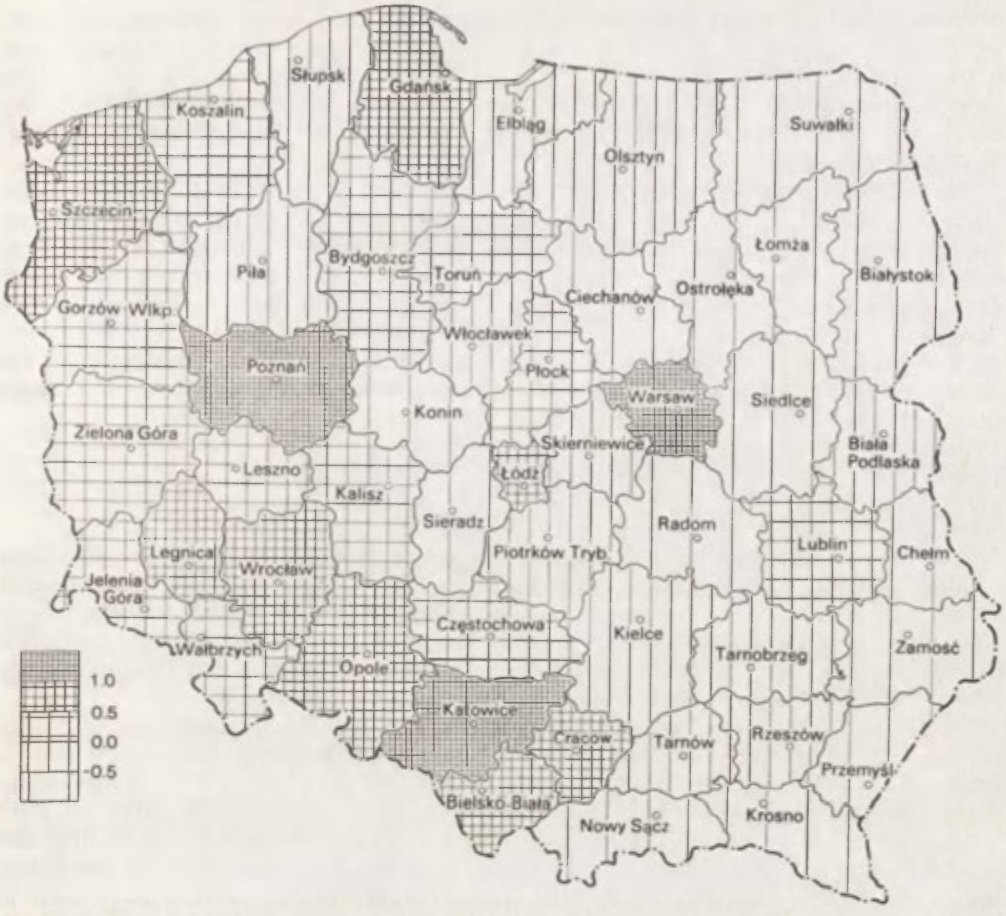

Fig. 2. Spatial differentiation of socio-economic activities in Poland, 1980. Standardized values

the strength of dependences varies with the quality of the roads under investigation. Higher correlation coefficients were obtained for regression equations where the dependent variable was the density of improved roads (and lower for those where the density of surfaced roads was the dependent variable), regardless of the level of aggregation of input data (i.e. poviats or voivodships), with multiple correlation coefficients ranging from 0.7 to 0.9. Values of correlation coefficients for the voivodships (49) were higher than for the poviats (317), which corroborates the observation made by many researchers (e.g. McCarthy et al., 1956) that an increase in the level of data aggregation entails an increase in the value of the correlation coefficients. The results of regression analysis conducted for different time periods show that the structure of dependences changes; this is particularly visible for better quality (improved) roads. In 1960, the strongest impact on the dependent variable was exerted by the degree of industrialization[3] of the units investigated. This was a result of the fact that after the war the road network in Poland was expanded and modernized (mainly by replacing surfaced with improved roads) primarily in areas

[3] Values of the variable describing the level of industrialization were computed with the use of principal components analysis.

with the highest level of economic development, i.e., the most industrialized ones. In the next time period, i.e., 1970, the strongest impact in regression equations was exerted by the independent variable describing the level of agricultural development.[4] This resulted from the fact that the process of intensive agricultural modernization, which started in the late 1960s, called for expansion and modernization of local road networks.

The preceding conclusions, however, involve certain limitations, which are due to the static character of the analysis. The study of spatial dependences assumes that factors active in the past contributed to the density and structure of the road network observable in the area a later year. However, the impact of socio-economic development, i.e., of economic ventures, employment increases, urbanization and agricultural development, on the density of transport networks is not immediate, but appears with a certain time lag. This lagged influence should be considered in the regression model. To achieve this purpose, lag regression may be used. Such a model may be formulated as follows:

$$y_{it} = a + b_1 x_{1,t-d} + b_2 x_{2,t-d} + \ldots + b_n x_{n,t-d} + E$$

where: y_{it} — values of the dependent variable at t time,

x_{t-d} — values of the independent variable with time lag (d = 5 or 10 years).

The variables x_{t-d} are used to explain the pattern of variation of dependent variable at a later time; considered are two time intervales: 5 and 10 years. Such a formulation of the model is based on the assumption that the level of socio-economic development produces a certain volume of demand for transport and thus eventually causes expansion and modernization of the transport network.

A model of this type, where values of variables are certain functions of values of variables at a preceding time is, according to Tinlin (1970), very important in prognostic studies. An interesting application by Cliff and Ord (1971), attempted to determine the number of cars registered in a given area on the basis of data relating to an earlier period. The application of a lag regression type model provided results which were more accurate than results obtained with the use of an alternative model, which did not take a lag into consideration. Similar models were used in studies by Tobler (1970), Curry and Banister (1974), MacKinnon (1974) and Leinbach (1974). In the study under discussion, analysis was performed for the same set of reference units and for the same independent variables as in the analysis of spatial interdependences. Results obtained with the use of the two models were nearly identical. The only difference was with the autoregression model in which one of the independent variables was a variable describing road density at an earlier time (in a manner similar to Leinbach, 1974). This yielded a much higher level of explanation of the phenomena under investigation than models which described spatial dependences for individual time periods. This confirms the observation that the development of the road network in Poland was largely inert, as a consequence of which differences between the units with the highest and the lowest road density grew during the under analysis period. This observation holds particularly for improved roads, for roads were modernized chiefly in the most active economically areas of the country, i.e., in southern regions and in the central part of the country northwards to the Gulf of Gdansk.

The results of the study show that the road network in Poland continues to develop mainly in terms of quantity, that is, socio-economic development and

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[4] Values of the variable describing the level of agricultural development were per hectare yields of four cereals.

increased demand for transport cause increases in road density. It is only in areas with very good road infrastructure, that growing demand for transport causes an increased flow of traffic on existing roads. In such cases, the multiple regression models used here will not suffice and it is necessary to use other kinds of models of multidimensional statistical methods (e.g., a canonical analysis – compare Ratajczak, 1980). However, the analysis did show that the impact of socio-economic factors can be described by models of multidimensional regression analysis in which usually just one of the independent variables exerts a decisive influence on the variation of the dependent variable.

REFERENCES

Cliff A. D., Ord J. K., 1971, A regression approach to univariate spatial forecasting, in: M. Chisholm, A. E. Frey, P. Haggett, eds., *Regional forecasting*, Butterworth and Co., London.

Curry L., Bannister G., 1974, Township population of Ontario, 1971–2000 from time-space covariances, in: L. S. Bourne, R. D. MacKinnon, J. Siegel, J. W. Simmons, Urban features for Central Canada, Toronto.

Lachene R., 1965, Networks and the location of economic activities, *Papers of the Regional Science Association*, 14, 183–196.

Leinbach T. R., 1974, Forecasting transport development: testing the utility of a simple regression approach, *Transportation*, 3, 243–254.

MacKinnon R. D., 1974, Lag regression models of the spatial spread of highway improvements, *Economic Geography*, 50, 368–374.

McCarty H. H., Hook J. C., Knos D. S., 1956, *The measurement of association in industrial geography*, Iowa City.

Potrykowski M., 1983, *Rozwój społeczno-gospodarczy a zagospodarowanie drogowe w Polsce* (Socio-economic development and road network problems in Poland), Studia KPZK PAN, 80, Warszawa.

Ratajczak W., 1980, *Analiza i modele wpływu czynników społeczno-gospodarczych na kształtowanie się sieci transportowej* (Analysis and models of the impact of socio-economic factors on formation of transport network), PAN Oddział w Poznaniu, ser. Geografia, 6, PWN, Warszawa–Poznań.

Tinline R., 1970, Linear operations in diffusion research, in: M. Chisholm, A. E. Frey, P. Haggett, eds., *Regional Forecasting*, Butterworth and Co., London.

Tobler W., 1970, A computer movic simulating urban growth in the Detroit region, *Economic Geography*, 46, 234–240.

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RURAL AREA CLASSIFICATION USING CENSUS DATA

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INTRODUCTION

The geographical distribution and areal characteristics of rural areas have been subject to very little attention. Surprisingly little seems to be known about the characteristics of rural areas; for example, a recent Department of Environment Research Project aims to produce basic statistics for rural areas. Whilst there has been a large recent increase of interest in rural subjects both by academics (see for example Neate (1981) and Government (CRC, 1976) many of the long standing fundamental geographical questions have not yet been answered. The CRC asks 'what is a rural community'? Where, for example, are the rural areas? What are the characteristics of rural population and how are they distributed around Britain? How similar are the characteristics of rural areas to urban areas? Are the symptoms of deprivation which have been identified in urban areas also found in rural areas? Is there a specifically rural form of deprivation and can it be measured using census data? These questions are all basic ones, they are of applied relevance and it is astonishing that seemingly so few systematic attempts have been made to answer them. This paper concentrates on these geographical questions and examines the degree to which they can be investigated using readily available census data.

It is recognised that census data are too narrowly focused to provide an 'ideal' data base for rural studies; for example, there are no measures of service provision or of accessibility or of isolation. It is noted that similar inadequacies in terms of the coverage of variables have not prevented a large number of studies concerned with urban areas. Additionally, census data provides complete geographical coverage of Britain and for many variables it constitutes the only accurate data source. It also provides details at a fine spatial scale at a sub-local authority level, for example, wards and enumeration districts.

The pragmatic argument is therefore, that the only comprehensive data source for rural areas (and indeed urban areas) is provided by the census. The question is therefore, what useful results, if any, can be obtained from census data about the characteristics of rural areas? The aim here is to tackle this question via various multi-variate classifications of census data sets. Quite simply, if rural areas with distinctive features exist then they emerge as clusters in a multi-variate classification. Likewise, if the census characteristics of rural areas are 'different' from urban areas then these differences will result in separate area types emerging. The nature of the rural clusters will give some indication of whether rural areas are different from urban areas and will provide an inductive test of various theories regarding the nature of the rural urban continuum.

From an applied or public policy perspective, these questions have special relevance because the use of cluster analysis is currently regarded by the relevant Government departments as inappropriate for studying rural areas. The justification for this appears to be that the areal units used to report rural census data are unsuitable for studying a dispersed and heterogenous population. Instead they prefer to use maps of various indicator variables, simple univariate area selection rules, and perhaps even a ranking of areas according to their scores on an arbitrary index (as recently used to identify deprived urban areas – Department of Environment, 1982). Basically, there is a preference for old fashioned pre-computer age techniques on the apparent grounds that simple-minded people (i.e. politicians, civil service bureaucrats, ministers etc.) apparently consider nothing else to be acceptable. Do they really find it easier to look at scores of maps than study a single map generated from the results of a multi-variate classification technique? Whilst the pragmatic approach is understandable to some extent, it is also most unsatisfactory of Government departments should not make the best use of both the available census data and the most modern methods of analysis. The preference for only 'quick and dirty' simple-minded techniques can produce very poor results which may, if policies are based on them, result in the inefficient use of public resources.

The purpose of this paper is primarily a methodological one. It seeks to test whether different, meaningful types of rural areas can be identified using census classification techniques.

DEFINITIONS OF RURAL AREAS

The CRC (1976) ask the basic question 'what is a rural community?' (p. 4). The problem is that the generic terms 'rural areas' or 'countryside' have no precise physical interpretation on the ground. It is easy to recognise in general terms different regional and local variations in what seem to be non-urban and hence implicitly rural characteristics (for example, recreation, retirement, mining, agricultural characteristics) but more detailed study is made difficult by the absence of any statistical reporting units that correspond to rural areas. Statistics have only ever been available for those areas, and the towns and villages within them, defined before the 1974 re-organisation of local government, as administrative 'rural districts' (RD's). In 1971, RD's accounted for about twenty per cent of the population of the Britain but some RD's are highly urbanised. The blurring of the distinction between town and country in personal and social terms invariably makes the definition problem more difficult. The typical rural settlement (for example, the village) is no longer particularly distinct.

The original idea of 'rural' and 'urban' as two poles of a dichotomy gave way a long time ago to the concept of a rural-urban continuum (Redfield, 1941; Queen and Carpenter, 1953). This in turn has been replaced by a more complex pattern of superimposed different textures of rural-urban relations (Pahl, 1966). Bailey (1975) takes this further and argues that 'the crux for the sociologist is that the defining parameters of social problems are the same for rural and for urban areas' (pp. 117–118). This implies that common social variables can be identified in both rural and urban areas and that, therefore, they can be tested in a unified manner. It is however, an inherently aspatial view and its geographical validity remains to be tested.

Despite the absence of any sound conceptual basis for a rural-urban dichotomy, attempts are still being made at a working definition for purely pragmatic and applied reasons. The pre-1974 rural district administrative area is a good example. They provided a rough and ready distinction between urban and rural areas, by treating the administrative rural districts as rural and the rest as urban. The post-1974

boundaries fail to provide even a crude distinction. Only a very small number (about 12) of the 370 new county districts were formed from former rural districts. Of course even the pre-1974 rural district definitions were very crude. The definition of towns by administrative boundaries seldom reflected the true nature of urban settlements. The boundaries may lie far beyond the real edge of the urban area or lie well within it. It is somewhat amazing, therefore, to find that OPCS (1981) are still trying to use the pre-1974 Rural District definitions for reporting 1981 Census data for Britain divided into urban and rural populations. It is true they emphasise the need for a more adequate and up-to-date classification but pragmatic issues once again clearly won the day over geographical commonsense.

One alternative to administrative definitions is to use a definition of urban areas in terms of continuously built-up areas; (defined in terms of bricks, mortar and other materials, transportation facilities, and urban open-space); the residual being non-urban and hence rural. Following the 1951 and 1966 Census, attempts have been made to measure and define the built-up area (General Register Office, 1951; Department of Environment, 1966). Indeed, a new attempt is being made after the 1981 Census to classify census eds into four types of area; urban (eds totally within the boundary of developed land or spanning it with more than fifty per cent of their areas within it); peri-urban (eds spanning the boundary with less than fifty per cent of their areas within it but more than fifty per cent of the population within it); peri-rural (eds spanning the boundary with less than fifty per cent of their areas within it and more than fifty per cent of the population outside it); rural (eds totally outside the urban boundary). It is thought that some 7,000 rural settlements (of less than 5,000 population) may be defined using these physical definitions.

These 'bricks and mortar' definitions of urban areas (and therefore by default of rural areas) provide a very poor definition, because of the assumed inaccuracies in the assignment process due to edge effect? The latter can be particularly severe in rural areas where eds were deliberately designed not to match settlement boundaries in order to preserve the confidentiality of census data. Another problem is that this classification lacks a locational component; for example, it is important to know whether a peri-rural ed is on the edge of a large or small urban area. Their origins appear to lie in a past concern for estimating the growth rate of urban areas and the loss of rural land.

A far more sensible definition would not be based on morphology but on functional relationships. A functional definition of towns would include both the built-up area *and* the surrounding areas that have strong functional links of which the administrative definition (either pre- or post-1974) provide no real guidance.

The earliest attempts at functional region definitions (Spence et al., 1976; Hay and Hall, 1980; Spence et al., 1982) defined rural areas as a residual. Since they were not urban, they must be rural. In any case the interest was in urban systems and not in the identification of rural areas or of rural systems. A later study reported in Coombes et al. (1982) provides a set of more consistent and geographically meaningful functional regions that incorporates notions of the urban hierarchy and the daily urban systems. This work is relevant here because there is a 'rural areas' category. A rural area is regarded as a small daily urban system with one or more employment retail centres but with a population of less than 50,000. Some fifty such areas were identified compared with 228 urban regions. These rural areas may have one or small urban centres but with only the weakest links with other urban regions. They are, therefore, regarded as functional regions in their own right and are distinctive by virtue of their size, internal connections, and weak journey to work links with anywhere else.

The principal problem with the Coombes et al. (1982) rural area definitions is that they identify only one particular type of rural area. Many different types

of rural area may well exist elsewhere on the edge of urban centred functional regions; for example, commuting villages, and mining areas. Furthermore, the definitions were based on 1971 local authority building blocks and these units are rather large giving rise to possible edge effects. Nevertheless, these functional regions do provide a particularly useful means of eliminating certain areas from consideration whilst providing an independent functional classification against which different types of rural areas can be compared.

A different approach to defining rural areas is that of Cloke (1977). He suggests that '... attempts should be made not only to pin down the nebulous concept of rurality, but also to measure differences in the degree of rurality' (p. 31). To this end he identified 16 variables. The first component scores on 9 of these variables are divided into four categories (quartiles) which are interpreted as representing extreme rural, intermediate rural, intermediate urban, and extreme non-rural. In a subsequent paper he uses this rural indexation method to study 1961–1971 changes (Cloke, 1978).

One problem here is that the first component which is interpreted as measuring rurality accounts for only 35 per cent of the variance of the original variables, the categorisation process is completely arbitrary; quartiles are not likely to be the most efficient statistical solution to reducing a range of scores into four categories. The criticism of Cloke (1977, 1978) is that the method he used was too simple, the interpretation attributed to the results was too naive, the number of variables examined inadequately represent either the available census data or the nature of rural areas, some of the variables (density of population, distance to nearest urban centre of over 50,000) are either useless or inprecise, and the areal units studied are by no means comparable entities varying greatly in size and heterogeneity. It is basically a means of refining the old Rural District definitions. Some of the technical weaknesses associated with Cloke's work are avoided in a number of national census classifications (Webber, 1977; 1978a, b). Webber used a standard set of 40 variables covering a range of demographic, socio-economic, and housing characteristics. Of particular interest is his classification of 16,704 1971 wards and parishes in Great Britain into 36 and 7 groups using a cluster analysis technique. A similar classification technique was also applied to the 125,000 eds producing 60 and 8 groups. CACI (1980) describe how the two classifications were 'merged' whereby the 125,000 eds were classified into the 36 ward data groups for marketing research purposes. The 36 groups were then re-clustered to yield a 11-fold classification.

Of particular interest here is that these classifications identified a 'rural area' cluster. Webber's (1977) ward and parish classification identified three rural clusters which accounted for 6.16 per cent of Britain's population. These clusters were described 'villages with some non-agricultural employment', 'rural areas with large landholdings' and 'rural areas with small holdings'. The same clusters were also identified in the ed level classification produced by CACI (1980). The problems with this work is that the classifications emphasised the structure of urban areas and the cluster analysis technology was poor (Openshaw et al., 1980). A serious weakness for rural areas is that the classification is based on only a small sample of wards/parishes and eds, with the result that the variability of rural area characteristics may have been underestimated.

Another possible explanation for this apparent failure to adequately differentiate between different types of rural areas may be that such distinctive area types do not exist. However, Cullingford and Openshaw (1982) suggested an alternative hypothesis. The greater levels of heterogeneity of rural areas and the different nature of certain relationships between census variables result in weaker or opposite correlations in rural as distinct from urban areas. For example, no analysis which includes urban areas has shown that there are areas in which owner occupiers live in homes

without amenities or that there are areas in which shared unfurnished households possess cars. Some of these subtle relationships have been swamped by the much more obvious distinction between owner/occupier suburbs and problem council estates. Quite simply multivariate statistical-techniques tend to emphasise average relationships and since urban relationships dominate they are given far more weight than rural ones. Indeed, it seems that with a mix of urban and rural data, the weaker (because of intra area heterogeneity) and sometimes contradictory rural associations are effectively 'filtered out' as random noise. The simplest solution is to classify only those areas thought to be rural but this begs the question as to how such areas might be defined prior to the analysis. Cullingford and Openshaw (1982) report the apparently successful results of an experiment that restricted attention to a sample of eds for the former rural districts in Northern England. The problem here is that a 'rural areas only' analysis merely establishes that some rural areas are worse off than others, but says nothing about whether similar levels of deprivation exist in urban areas. One result is the apparent belief that accessibility and not a decaying physical environment is the primary rural problem. The question is, therefore, whether the same types of rural areas can be identified in a single national level analysis as when rural areas are studied separately, and if they can, do they make any sense?

CLUSTER ANALYSIS RESULTS FOR BRITAIN

The aim here is to try and define different types of rural areas using census data. This would provide both a definition of rural areas and a summary description of their characteristics. This exercise is of interest mainly because it is currently believed to be impossible and unlikely to yield any useful or meaningful results. One problem is that of deciding the spatial scale of study. Previous work with old rural district sized areas (Dunn, Rawson and Roger, 1980) suggested that these units are far too large. In Britain it is necessary to use either wards or census eds to provide the necessary level of spatial resolution. Until recently this caused problems because none of the available cluster analysis packages could handle the 10,231 1981 wards or the 130,000 eds and thus national analysis were impossible without resorting to intrinsically poor methods of classification. These computational problems have now been solved by the development of fast and efficient cluster analysis methods (Openshaw, 1982). The algorithm used here is a non-hierarchical iterative relocation technique. The remaining problems concern the nature of the available areal units (wards are used for voting purposes, eds are arbitrary entities) which bear little or no relationship to rural settlement patterns. However, until the census is based on a more meaningful set of geographical units than all we can do is to use what is provided.

For Britain, 1981 census data are available for both wards and eds. However, the socio-economic variables are produced only for a 10 per cent sample. It is now considered by OPCS that such data are unreliable at an ed level because it is not a true random sample and that the 10 per cent data should not be used for units smaller than wards. Attention is therefore restricted to the 10,231 wards that cover Britain. For classification purposes a set of 64 indicator variables are used (see Appendix 1). These variables provide general coverage of demographic, housing and socio-economic details. Particular care was taken to include variables thought to be useful in rural areas; for example, second homes, holiday accommodation, tied houses, and details of agricultural employment.

Three classifications are briefly examined: all wards, all non-urban core wards, and rural area wards. The latter two subsets are based on the functional region definitions of Coombes et al. (1982).

The simplest approach is to classify all 10,231 wards that exist (specials are

ignored). A number of different types of clusters were examined and a classification of 40 clusters judged to be the best for current purposes. It is noted in passing that cluster analysis is a subjective process, as indeed are many statistical techniques. The aim is to obtain results which are plausible in relation to prior knowledge, see Openshaw (1983) for further discussion. The descriptive labels attributed to the clusters are also subjective and can be greatly refined by the inclusion of additional locational information. Table 1 summarises those clusters from the national ward classification which are considered to be rural.

TABLE 1. National ward classification for 1981: rural clusters

Number of wards	Agriculture %	Brief description of area profile
176	12	overcrowded housing, forestry workers holiday accommodation
39	14	second homes, housing lacking amenities, old people
121	12	owner occupied farms, large houses, holiday accommodation, retired people
35	11	second homes, housing lacking amenities, tied cottages, unemployment
639	10	high status areas on urban fringe
359	21	tenant farmers, high status, good housing
267	26	owner occupied farms, large houses lacking amenities
253	20	agricultural workers, including part-time
70	39	tenant farmers in housing without amenities
58	44	mixed owner occupied and tenant farms with holiday accommodation
67	45	mixed owner occupied and tenant farms in housing without amenities, second homes and holiday accommodation
58	35	tied houses, overcrowded
11	41	forestry and agricultural workers, living in tied houses, overcrowded, lacking amenities, second homes and holiday accommodation

There can be little doubt that a number of very interesting rural clusters are defined. The details obtained here are considerably greater than those evident in the 1971 ward classification of Webber (1977) in which only 3 clusters were found out of 36.

The next stage is to examine two sub-sets of the 1981 ward data, one for all areas other than the core and rings of Coombes et al. (1982) functional regionalisation, the other is based on their 'rural' areas. The former has 6,127 wards in it and the latter 1,172. This analysis is interesting because it brings together for the first time in a national study a functional and a formal classification with the formal classification being used to provide a detailed description of the characteristics of functional areas.

The 6,127 non-urban core wards are classified into 40 clusters, the descriptive labels of which are summarised in Table 2. The 1,172 rural area wards are summarised in similar fashion in Table 3. Here a further 30 cluster classification is described. This is

TABLE 2. Classification of wards in non-urban cores: rural clusters

Number of wards	Agriculture %	Brief description of area profile
238	17	unfurnished tied accommodation
141	32	part-time agricultural employment, tenant farmers in large houses
163	24	agricultural workers, including part-time, houses lack amenities
198	20	owner occupied farms in houses
110	10	second homes and holiday accommodation, retired people
135	33	owner occupied farms, large houses, second homes
22	16	small overcrowded houses, lacking amenities, forestry workers, second homes, unemployment
73	44	owner occupied farms in large houses with no amenities
23	53	tenant farmers
66	15	overcrowded houses, second homes and holiday accommodation, forestry workers
66	32	tied, overcrowded, small houses
11	41	manual agricultural works in overcrowded tied houses, second homes

of interest because the rural areas form a discrete functional region, and the structure of the classification is an indication of the within area detail of this particular type of functional region.

A comparison of all three classifications suggests that broadly similar cluster types are being identified. Precisely how similar they are and the geographical distribution of different area types is left for future study. It is sufficient for present purposes to note that only the broad details of the different types of rural areas that are emerging.

RURAL AREAS IN ITALY

An important and more general question concerns the applicability of the findings to other countries. The clusters will almost certainly be different but is the basic methodology transferable? Additionally, if individual census data were available, would it confirm or deny the areal patterns detected using data for census areas? A preliminary investigation using a sample survey suggests that the majority of rural residents have the same census charateristics as urban residents although their geographical concentration and distribution is quite different (Cullingford and Openshaw, 1982).

One way of answering some of these questions is to analyse Italian census data which are currently the subject of a joint research project between ISTAT-IRPET and Newcastle University. The results of a series of preliminary classifications are briefly reported here.

Two areal classifications are examined. They are based on 1971 data using variables given in Appendix 2, and concern the identification of rural clusters using municipali-

TABLE 3. Classification of wards in functionally defined rural areas: all clusters

Number of wards	Agriculture %	Brief description of area profile
71	4	high female unemployment, manufacturing
84	10	commuter area
42	4	female employment, young families, owner occupied
40	28	agricultural workers, including part-time
90	9	high status commuter area
77	20	unfurnished tied farms
76	4	old-age structure, retirement area
50	6	high unemployment, poor housing
44	8	high status retirement area, holiday accommodation
70	24	owner occupied farms, large houses, lacking amenities
55	12	furnished rented holiday accommodation, old age structure
46	2	poor council housing
74	36	owner occupied farms, large houses, part-time employment
19	10	housing association tenure, retired
36	2	poor council housing, manufacturing, manual workers
7	0	shared rented accommodation, New Commonwealth born
22	5	armed forces, married quarters
17	54	tenant farms, tied unfurnished accommodation
52	21	small overcrowded houses, lacking amenities tied, agriculture and forestry workers
29	33	old age, mixed farms, lacking amenities, second homes
39	47	owner occupied farms without amenities
4	4	military camps, second homes
38	8	overcrowded council housing, manual workers
25	19	poor housing, forestry workers, retirement, holiday accommodation
1	100	forestry work camp.
5	28	high unemployment, poor housing, second homes
4	12	unemployed young familes, poor overcrowded housing
13	10	unemployed, unskilled manual forestry and transport workers, poor housing, second homes
4	28	tied houses, lacking amenities, agricultural workers

ties and eds; they are 8,049 of the former and 78,041 of the latter (small and special eds were ignored). The characteristics of selected rural clusters from a 50 cluster municipality classification are shown in Table 4. The rural clusters from a 60 cluster ed classification are given in Table 5. In both cases it will be seen that a number of different types are defined many of which seem to be in a state of considerable deprivation.

TABLE 4. Classification of Italian municipalities: rural clusters

Number of municipalities	Brief description of area profile
177	self-employed farmers, middle aged and old large houses, extended families, second homes
56	self-employed farmers, middle aged and old, 1–2 rooms, no amenities, second homes
141	self-employed farmers, old age structure, extended families
70	self-employed illiterate farmers, 1–2 rooms, no amenities, no electricity, women economically active
271	old illiterate farmers, no amenities, women economically active
217	self-employed illiterate farmers, some amenities, women economically active
153	manual workers, no amenities, absent head household, young people, women economically active
27	temporary accommodation for illiterate agricultural workers
359	illiterate children, 1–2 rooms, overcrowded no amenities
132	self-employed farmers, educated, amenities
184	self-employed farmers, extended families, amenities, vacant dwellings
82	empty dwellings, mixed young and old

A conclusive answer to the second problem as to whether the characteristics of rural areas are also shared by the individuals who live there has to wait until a national individual level of classification is performed. Preliminary results for the Tuscany region of Italy suggest that there are a few purely rural household clusters but that there is remarkably little relationship between an areal (ed) classification and an individual (household) based one (see Openshaw et al., 1982). It appears that the areal classification is successful at picking out (usually) the most frequent individual profile but often there is no dominant area profile and the attributes amplified by the ed classification are either minority features or those created by merging the features of different household types. Further research is in progress to quantify the extent and severity of this particular problem. Nevertheless, the two

TABLE 5. Classification of Italian eds: rural clusters

Number of eds	Agriculture %	Brief description of area profile
546	57	second homes, no amenities, overcrowded, no electricity, 1–2 rooms, self-employed, old age structure
613	77	overcrowded, no amenities, well water, illiterate, self-employed, second homes, women economically active, young age structure
966	57	old, self-employed, owner occupied farms, vacant dwellings, extended families, second homes, some amenities
1327	63	self-employed, owner occupied farms, old, some amenities
1358	75	overcrowded, illiterate, self-employed owner occupied farms, no amenities, no electricity, women economically active
487	51	tied housing, lacking amenities, vacant dwellings
457	50	second homes, absent head of households, extended families, unemployed young, some amenities
315	60	tied houses, overcrowded, young families, well water
736	47	old age extended families in large houses with amenities
790	66	large tied accommodation with extended families
1988	53	no amenities, illiterate, old age, women economically active, manual worker, self-employed farmers
1351	59	small overcrowded houses, no amenities, illiterate manual workers

classifications are complimentary, they are looking at the same data from two different scales. One way of making them consistent would be to report the number of households within each individual cluster for each ed. This would preserve the geographical perspective inherent in areal data whilst incorporating within area heterogeneity.

CONCLUSIONS

The object of the paper was to provide a simple description of rural areas by means of a multi-variate classification of census data. There is no intention to judge between 'good' and 'bad' areas, indeed different people might have different ideas about which areas are worst. The aim is merely to demonstrate that different types of areas exist and that they can be identified from census data. In a previous study it was thought necessary to analyse rural and urban data sets separately following the discovery that in many earlier studies the subtly different relationship in rural areas tend to be swamped by stronger urban variables (Cullingford and

Openshaw, 1982). However, it seems that the inclusion of specifically rural area variables (not available from the 1971 Census) provide a more sensitive discrimination between different types of rural area even when mixed with urban data. There may even be a simpler explanation. In many previous urban focused studies there have been too few 'rural' variables included so that the relationships between those rural variables that were specified were too weak to survive the 'noise' reducing properties of multi-variate classification.

It is now suggested that the feasibility of using multi-variate classification methods to identify different types of rural areas has been proven. For applied purposes it is important to use a single national level classification in order to give some degree of comparability between the different types of areas. The results of both the British and the Italian analysis have shown that, contrary to previous belief, this can be done; provided all the data are classifed in a comprehensive fashion (not just a sample) and provided sufficient rural variables are included to balance out the more urban ones. The next step is to persuade those concerned with the policy making to start using the results and to ask more precisely focused questions. The scope of what is basically computerised, descriptive regional geography on a national scale is very large indeed. There is considerable potential for both pure and applied research and it is by no means unlikely that the most useful result of applied geography in the 1980's might take the form of some kind of area based classification.

Acknowledgements

The help of Dr. Colin Wymer (Department of Town and Country Planning, Newcastle University), Dr. David Owen (CURDS, Newcastle University), Fabio Sforzi (IRPET) and members of ISTAT, are gratefully acknowledged.

APPENDIX 1: British census variables

1. male unemployment,
2. married women economically active,
3. students aged 16 and over,
4. cars per household,
5. two car households,
6. a measure of fertility – children 0–4 per women 16–44,
7. new Commonwealth born,
8. persons aged 0–4,
9. persons aged 5–15,
10. persons aged 16–24,
11. persons aged 25–44,
12. persons aged 45–64,
13. persons aged 65 and over,
14. married persons,
15. single non-pensioner households,
16. persons per private household,
17. rooms per private household,
18. owner occupied houses,
19. council tenants,
20. housing association tenants,
21. unfurnished renting,
22. furnished renting,

23. households with more than 1.5 person per room (serious overcrowding),
24. households with 1.0–1.5 person per room (overcrowded)
25. rooms per person
26. shared dwellings
27. no inside W.C.
28. no bath
29. seven or more room houses
30. one or two room houses
31. single parent households with dependent children
32. pensioners living alone
33. households lacking all basic amenities
34. second homes
35. holiday accommodation
36. accommodation tied to employment
37. households in non-permanent accommodation
38. accommodation rented with business
39. population not in private households
40. part-time married women workers
41. farmer employers and agricultural managers
42. owner occupied farmers
43. agricultural workers
44. segs 8, 9, 12
45. segs 7, 10, 11
46. work outside district of residence (commuter)
47. part-time agricultural employees
48. segs 1, 2, 3, 4
49. journey to work by car
50. journey to work by train
51. journey to work by bus
52. journey to work on foot
53. journey to work by pedal bike
54. work at home
55. migrant head of household, including retired
56. retired head of household
57. work in forestry and fisheries
58. unemployed female workers
59. armed forces employment
60. total agricultural employment
61. total manufacturing employment
62. total distribution employment
63. total transport employment
64. total employment in other services

Notes:

i all variables expressed as percentages
ii variables 41 to 64 are 10 per cent variables

APPENDIX 2: Italian census variables

1. population managerial
2. population white collar

3. population self-employed
4. population manual worker
5. population working in agriculture
6. population working in industry
7. population working in building
8. population working in distribution
9. population working in services
10. population working in public administration
11. population economically active with high school or university qualification
12. population economically active with middle school qualification
13. population economically active with elementary school qualification
14. population economically active with no educational qualification
15. married women economically active
16. population aged 14–24 and economically active
17. population aged 14–24 and student
18. population aged 14–24 seeking first job
19. population aged 60+, if male, or 55+ if female who are retired
20. population aged 0–5
21. population aged 6–13
22. population aged 14–18
23. population aged 19–24
24. population aged 25–44
25. population aged 45–59
26. population aged 60 or more
27. population temporarily present
28. population of foreign citizenship
29. singe person households
30. single parent households (exactly one adult and one or more children)
31. households with 6 or more persons
32. households with exactly 2 persons (both aged 19–59)
33. households with three or more children
34. households with 6 or more persons (2 of whom are aged 60 or over)
35. households consisting of exactly 2 people aged 60 or over
36. households with 1 or more persons aged 60+ and 3–5 persons in total
37. occupied dwellings with 1 or more secondary households
38. vacant dwellings
39. dwellings for sale or rent
40. dwellings used as second home
41. dwellings vacant for restoration or other reasons
42. occupied dwellings in owner-occupation
43. occupied dwellings in tenure
44. occupied dwellings in free use
45. occupied dwellings with 1–2 rooms
46. occupied dwellings with 6 or more rooms
47. occupied dwellings with 1.5 or more persons per room
48. occupied dwellings with 0.5 or less persons per room
49. occupied dwelings with bathroom and inside W.C.
50. occupied dwellings without bathroom
51. occupied dwellings with no inside W.C.
52. occupied dwellings with shared W.C. (outside)
53. occupied dwellings with no flushing toilet
54. occupied dwellings with shared heating system
55. occupied dwellings with exclusive heating system

56. occupied dwellings with partial heating system
57. occupied dwellings with no heating
58. occupied dwellings with no internal drinking water
59. occupied dwellings with no access to mains drinking water (outside well)
60. occupied dwellings with no electricity
61. non-private (communal) dwellings

Note:

i all variables expressed as percentages.

REFERENCES

Bailey J., 1975, *Social theory for planning*, Routledge and Kegan Paul, London.

CACI Inc., 1980, *ACORN: a new approach to market analysis*, CACI, London.

Cloke P. J., 1977, An index of rurality for England and Wales, *Regional Studies*, 11, 31–46.

Cloke P. J., 1978, Changing patterns of urbanisation in rural areas of England and Wales, 1961–1971, *Regional Studies*, 12, 603–617.

Combes M. G., Dixon J. S., Goddard J. B., Openshaw S., Taylor P. J., 1982, Functional regions for the population census of Great Britain, in: D. T. Herbert, R. J. Johnston, eds., *Geography and the urban environment*, Wiley, London, 63–112.

Countryside Review Committee, 1976, *The countryside – problems and policies*, HMSO, London.

Cullingford D., Openshaw S., 1982, Identifying areas of rural deprivation using social area analysis, *Regional Studies*, 16, 409–418.

Department of Environment, 1971, *Defacto urban areas in England and Wales, 1966*, Regional Plans Directorate, DoE, London.

Department of Environment, 1982, *Urban deprivation: information note 2*, DoE, Inner Cities Directorate, London.

Dunn M. C., Rawson M. J. C., Rogers A. W., 1980, *The derivation of rural housing profiles*, Research Memorandum 76, Centre for Urban and Regional Studies, University of Birmingham.

General Register Office, 1958, *Census 1951, England and Wales: general report*, HMSO, London.

Hay D., Hall P., 1980, *Urban regionalisation of Great Britain 1971*, Department of Geography, University of Reading, European Urban Systems WP 1.

Neate S., 1981, *Rural, deprivation: an annotated bibliography of economic and social problems in rural Britain*, Geo Abstracts, Norwich.

Office of Population Censuses and Surveys, 1981, *Preliminary report for towns: urban and rural populations: England and Wales*, CEN 81 PR (2), HMSO, London.

Openshaw S., 1982, *A portable FORTRAN IV program (SSCCP) for classifying 1981 Census data for areas*, CURDS Report, Newcastle University.

Openshaw S., 1983, Multivariate classification of census data, in: D. Rhind, ed, *Census Users Handbook*, Methuen, London.

Openshaw S., Cullingford D., Gillard A., 1980, A critique of the national classification of OPCS/PRAG, *Town Planning Review*, 51, 421–439.

Openshaw S., Wymer C., Sforzi F., 1982, *A comparison of individual and areal census classification for Tuscany*, Paper presented at Italian Regional Science Conference, Venice.

Pahl R. E., 1966, The rural-urban continuum, *Sociologia Ruralis*, 6, 299–329.

Queen S. A., Carpenter D. B., 1953, *The American City*, McGraw Hill, New York.

Redfield R., 1941, *The folk culture of Yucatan*, University of Chicago Press, Chicago.

Spence N. A., Drewett J., Goddard J. B., 1976, *British cities: urban population and employment trends 1951–1971*, Research Report 10, Department of Environment, London.

Spence N. A., Gillespie A., Goddard J., Kennett S., Pinch S., Williams A., 1982, *British cities: an analysis of urban change*, Pergamon, Oxford.

Webber R. J., 1977, *The national classification of residential neighbourhoods: an introduction to the classification of wards and parishes*, PRAG TP23, Centre for Environmental Studies, London.

Webber R. J., 1978a, *An introduction to the national classification of enumeration districts*, CES, London (mimeo).

Webber R. J., 1978b, Which residential neighbourhoods are alike?, *Population Trends*, 11, 21–26.

THE REGIONAL DEVELOPMENT OF AGRICULTURE

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Policies for the development of agriculture in Britain are relatively recent. Simple policies were introduced only in the 1930s to counter the severe economic depression of the period. The 1939–1945 World War produced severe food shortages and a policy for increased agricultural production became a necessity. Much of Britain's pasture land was ploughed up for the first time in a century or more in a 'ploughing up' campaign and food rationing was introduced. It became obvious that a long term national food policy was needed, and this was formulated during the war years (Scott, 1942) and given political expression in the *Agriculture Act, 1947*. The policy had four main aims.

1. *To reduce Britain's dependence on food imports.* Before the war Britain imported nearly 60 per cent of all her food. Now she imports only 45 per cent, and is 70 per cent self sufficient in crops and produce that can be grown in Britain. These figures, however, conceal substantial variations between different products as shown in Table 1.

2. *To introduce stability into agriculture.* Farming is very dependent on the weather and fluctuations in the market. A bad spell of weather and/or low market prices can be disastrous to farmers. If he is to invest in better farming systems the farmer must have confidence that he will gain an adequate financial return.

TABLE 1. Self sufficiency of British food supplies (percentage)

Goods	1968–70	1977	1979	1982
Wheat	44	59	74	106
Barley	95	96	107	128
Potatoes	91	81	90	85
Sugar	33	37	45	54
Beef	78	86	83	90
Mutton and lamb	41	58	60	64
Pork	100	100	98	101
Bacon and ham	37	43	42	41
Poultry	99	103	100	100
Milk	100	100	100	100
Butter	12	32	42	64
Cheese	44	67	69	71
Eggs	100	101	101	100

Source: Annual Review of Agriculture 1980, Cmnd 7812, HMSO, 1980, and *Annual Review of Agriculture 1983*, Cmnd 8804, HMSO, 1983.

3. *To promote structural reform.* Although British farming was fairly well structured, there were still too many small and inefficient farmers trying to grow the wrong produce. The policy aimed at a more geographically rational pattern of production, especially with regard to milk, the main product of British agriculture.

4. *To aid technological progress and to educate farmers.* At the end of the war the farm horse was still a common sight on farms. Fertilisers and pesticides were still being developed. Crop varieties and livestock types were underdeveloped. Government financed research could and did lead to a revolution in farming technology, allowing crops and livestock to extend to previously uneconomic areas. This research is disseminated by government advisory officers (Helme, 1975).

To achieve these policy aims, the Government gave itself 4 main powers:

(a) *A system of price support.* If the market price fell below a guaranteed price, the Government agreed to pay the difference. For example, if the guaranteed price for wheat was £100 per tonne and the market price was £90, the Government paid the difference, namely, £10 to the farmer.

(b) *Capital grants.* Substantial grants were payable for draining, liming, hedgerow removal, farm buildings and moorland reclamation. These grants had a substantial impact on the regional development of agriculture by allowing it to expand in otherwise unprofitable areas of wetland and moorland. As Figure 1 shows these two fiscal mechanisms dominated government financial support to agriculture in the 1950s and 1960s.

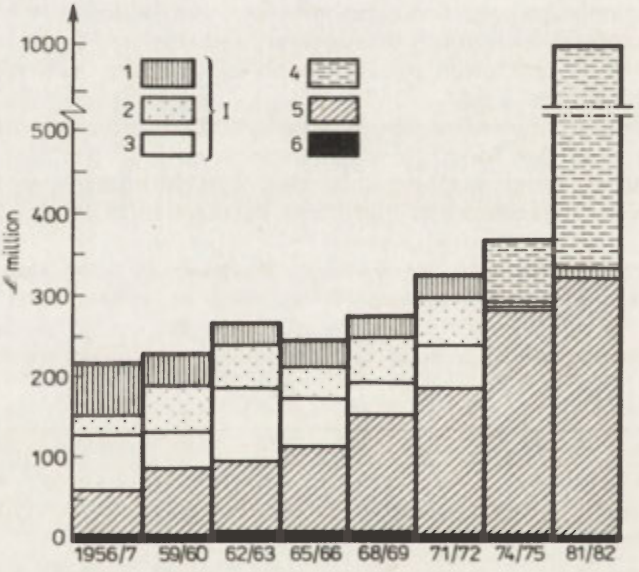

Fig. 1. Exchequer support to agriculture, Great Britain 1956–1982 (after Gilg, 1979). 1 – other commodities, 2 – cereals, 3 – fatstock and wool, 4 – market regulation under CAP, 5 – production grants, 6 – administrative expenses; 1–3 – price guarantees (I)

(c) *Quotas and variable prices.* Quotas on certain products, notably hops and potatoes had the effect of preventing surpluses and concentrating production in established areas. Variable prices, notably for milk, by market, season and location, have had as we shall see, a large effect on the regional distribution of British farming's biggest product.

(d) *Research and development.* Pure and then applied research by Government

research stations has allowed the extension of arable farming into land either too wet (clay vales), or too dry (chalkland) and of pastoral farming into land too cold and wet (moorland). (*Report on...*, 1973). Enormous increases in productivity via machinery, fertilisers, pesticides, and new varieties have led to very large losses in the labour force. The net result has been a different pattern of production and a countryside with far fewer workers.

I have used the past tense up till now, since some of these policies have been altered since Britain joined the European Economic Community (EEC) in 1973. The European Economic Community has a substantial commitment to agriculture in the form of the CAP, Common Agricultural Policy (Marsh, 1973). This has two main aims, price stability, to ensure confidence and so a security of food supplies for Europe's 300 million people, and structural reform, to make farming more efficient and to concentrate production in the most effective places. For example, wheat in moist but sunny areas and dairying in wet and mild places.

TABLE 2. Public expenditure on agriculture, 1975–1983

£ million	1975/1976	1977/1978	1979/1980	1982/1983
(I) Price guarantees and production grants				
(a) Price guarantees (sheep, wool, potatoes)	10.0	7.3	12.4	9.2
(b) Production grants				
Dairy Herd Conversion Scheme	11.8	5.6	0.1	–
Guidance Premiums	0.6	7.4	14.4	5.1
Milk Non-Marketing Premiums	–	2.1	15.4	–
Lime	4.7	0.1	–	–
Calves	61.6	22.8	–	–
Beef cows, pig and oil for horticulture	8.4	13.3	–	–
Total (I)	97.1	58.6	42.3	14.3
(II) Support for capital and other improvements				
Farm and Horticulture Development Scheme	0.8	22.4	84.1	81.8
Farm Capital Grant Scheme	65.9	60.0	77.9	80.4
Other grants	7.0	5.9	8.8	24.1
Total (II)	73.7	88.3	170.8	185.3
(III) Support for agriculture in special areas				
Hill livestock: compensatory allowances	17.1	50.2	94.0	93.1
Other grants	13.0	7.4	16.0	34.2
Total (III)	30.1	57.6	110.0	127.3
(IV) Market Regulation under the CAP				
Cereals	46.2	4.3	40.9	373.8
Beef	113.0	11.4	14.8	52.1
Pigmeat	38.6	0.2	0.5	54.4
Sugar	41.2	86.7	55.1	47.6
Processed products	3.4	13.4	36.4	26.4
Milk products	61.8	141.0	262.0	321.5
Total (IV)*	310.7	225.8	406.1	1006.2
Less receipts from FEOGA (I)–(IV)	295.6	169.2	386.8	713.6

* Total made up from other smaller payments.

Source: *Annual Review of Agriculture 1980*, Cmnd 7812. HMSO. 1980. and *Annual Review of Agriculture 1983*, Cmnd 8804. HMSO. 1983.

Membership of the EEC has altered Britain's farming policy in two ways.

1. *The method of price support*, as shown in Table 2 and Figure 1, where it can be seen that price guarantees have been largely replaced by intervention buying (market regulation under the CAP). Under the invervention system, produce the farmer cannot sell at a reasonable profit can be sold to the Government. Since European prices are fairly high, this had led to large surpluses, notably of milk products, sugar and wine. In this case the policy is not geographically rational. Britain is not self-sufficient in milk products, it has a very good climate for milk production, and yet it must try to cut milk prices in Europe as a whole and agree to measures for reducing milk production, for as Table 3 shows, only one other country, Italy,

TABLE 3. Degree of self sufficiency in butter supply in EEC (percentage)

Areas	1968	1977
EEC	91	111
Benelux	110	105
Denmark	332	308
France	119	110
Germany	104	135
Ireland	198	320
Italy	67	61
Netherlands	298	493
United Kingdom	10	30

Source: Tarrant J. R., Production and disposal of surplus EEC milk products, *Area*, 12, 1980, 247–252.

does not have a self-sufficient supply of butter, and some countries, notably the Netherlands, Ireland and Denmark produce more than three times their domestic needs. However, the French surplus is quantitatively more important and a more geographical solution would be to transfer some milk production from France to Britain, and some wheat production from Britain to France. However, the policy is not yet logical and so Britain continues to produce farm products in places not fully suited to them. National interest still transcends European interest.

2. *Import controls*. Before joining the EEC, Britain imposed few import controls on food from outside, especially wheat from Canada and lamb and butter from New Zealand. Europe is however self-sufficient in most foods and so protects her farmers by imposing import levies on food imports. This had led to a rise in consumer food prices and also in certain livestock foods, notably grain and soya beans for dairying. This is slowly changing the relative profitability of certain products, and will in time lead to an accidental rather than planned redistribution of farming patterns.

It must be clear what has been said so far, that Government policies have led to changed regional patterns of production more by accident than by design. This is because their main concern is with national totals of production (Winifrith, 1962). They have left farmers to decide, where best, certain crops should be grown. But, Britain in spite of its small size has a very varied pattern of soils, climates and agricultural markets, and a number of farm policies have tried to match farmers production patterns to these geographical variations (Edwards and Rogers, 1974).

The biggest geographical variation to be found in Britain is the climate. The crucial factors are the length of the growing season and the annual ranfall. Gregory has shown how the growing season varies from four to twelve months and

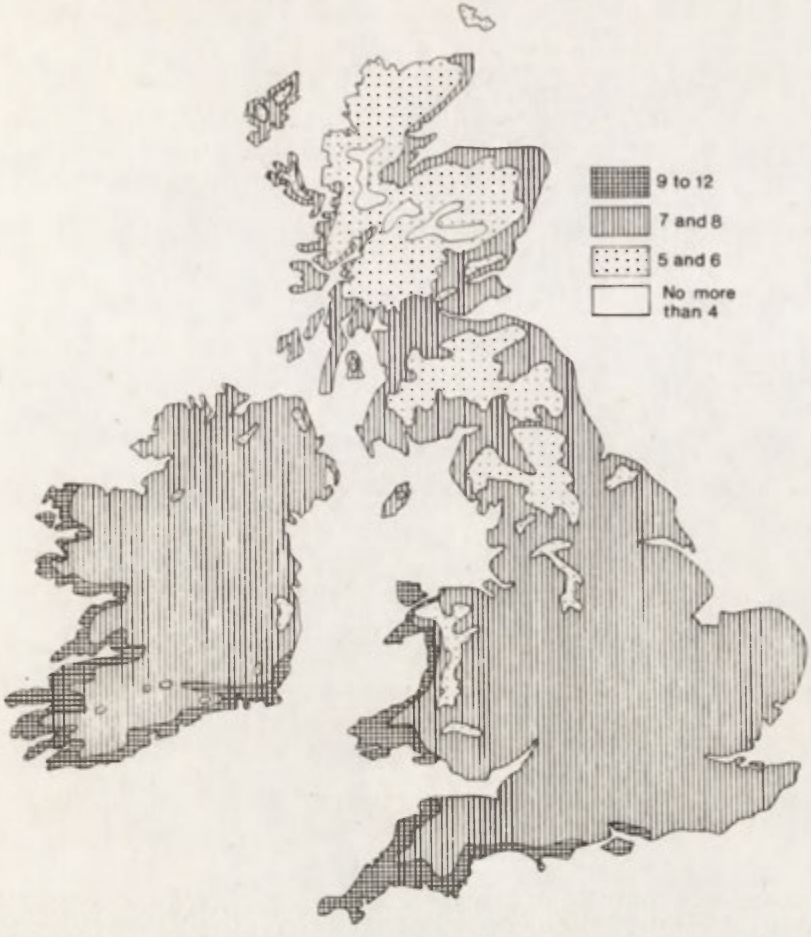

Fig. 2. The length of growing season (after Gregory, 1964). Number of months with a mean temperature of more than 6°C

how rainfall varies from 500 mm to 5,000 mm as shown in Figures 2 and 3. When these factors are combined with relief, four types of climate can be recognised as shown in Figure 4. If climate and relief were the only criteria to be considered this would lead to the following regional pattern of farming:

(a) An arable south east;
(b) A pastoral, horticultural south west;
(c) Mixed farming in the north east;
(d) Livestock rearing in the north west.

However, because of big differences in geology throughout Britain, soils do not always follow the climatic pattern. Three major divergences can be found:

(a) The dry chalk and limestone hills of the chalklands and scarplands, as shown in Figure 5 (Areas 22 and 18);

(b) The wet lowland clay vales between the scarplands and chalklands and the wet glacial tills of East Anglia and the Midlands, as shown in Figure 5 (Areas 17, 20, 23 and 24);

(c) The peat deposits of Fenland and the Somerset levels. (Areas 19 and 26).

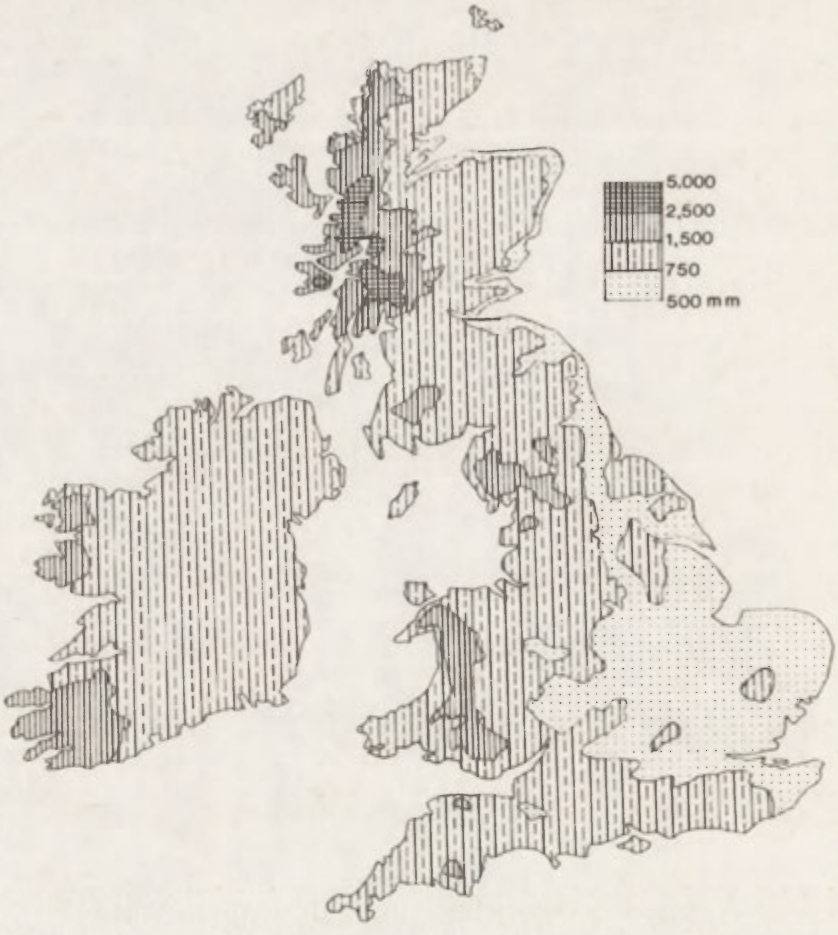

Fig. 3. Mean annual rainfall, 1901–1930 (after Gregory, 1964). Rainfall in millimetres

In addition, to these variations, the location of major towns, markets and processing factories (Tarrant, 1974) also affects the areas in which certain products are produced as shown in Figure 6, where it can be seen that milk manufacturing factories and sugar factories influence and are influenced by the location of milk and sugar beet production. Von Thünen's concentric rings are not found in Britain, except for certain products, notably sugar beet and horticulture.

This brings us to examples of the way in which governments have attempted to modify the importance of climatic, soil and locational factors in the regional development of agriculture. Two prime examples can be cited, milk and the moorlands.

A. Milk. Milk provides about a quarter of all income for Britain's farmers. When the sale of old cows for beef is added in, the figure rises to about a half. Milk is thus the most important product in the farming economy. Most of the demand for milk emanates in the major towns. These are however, by and large, either in the drier east, or colder north. Therefore, we have the demand in one place, but the

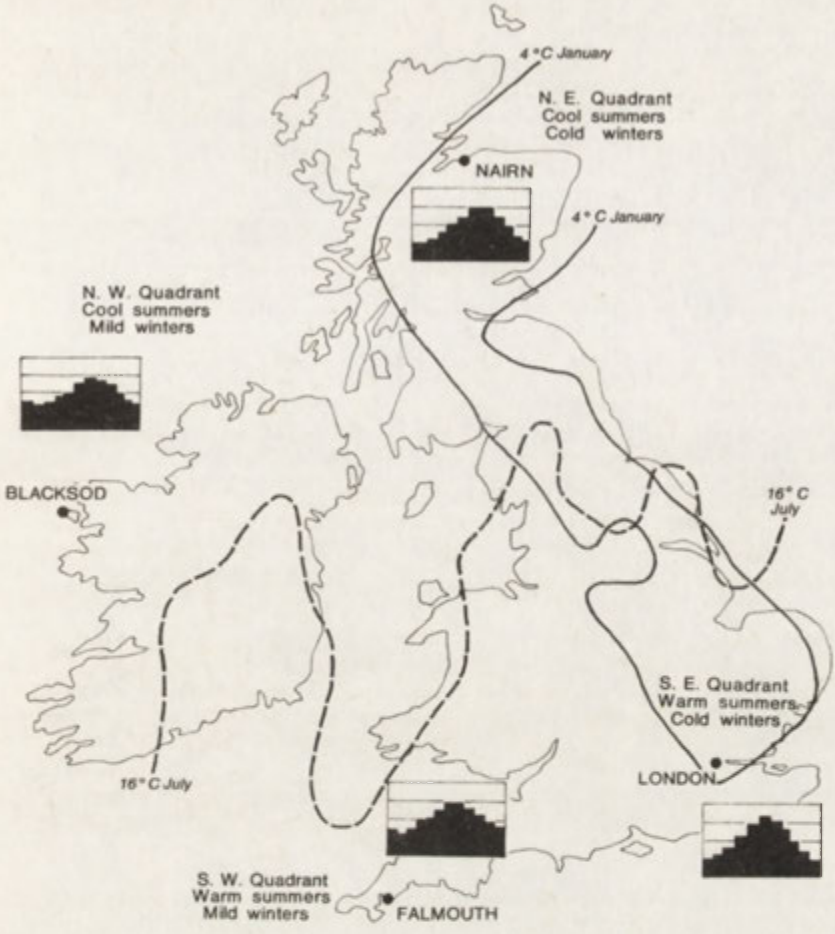

Fig. 4. The four major climatic areas of the British Isles (after Stamp and Beaver, 1963)

best physical areas in another place, the mild and wet south west. To bridge this gap the Government and more specifically the Milk Marketing Board (Baker, 1974) has adopted three measures.

1. *Regional price variations.* Higher in the remoter, but more physically suitable areas. The price is manipulated by subsidized transport costs which reduce the effect of transport costs.

2. *Seasonal price variations.* Higher in the winter to encourage all year round supply, and production in the south west where the growing season is longer as shown in Figure 2.

3. *Lower prices for milk sold for making into cheese or butter.* This is less logical, but is meant to prevent over production in the south west, but the price is not so much lower that factories cannot be regularly supplied.

The net result has been a big shift of milk production away from the urban areas of the east where on grounds of economic transport costs it should be located, to more physically suited areas in the south west, as shown in Figure 7 (Simpson, 1959).

B. The moorlands. About one-third of Britain is classified as upland or

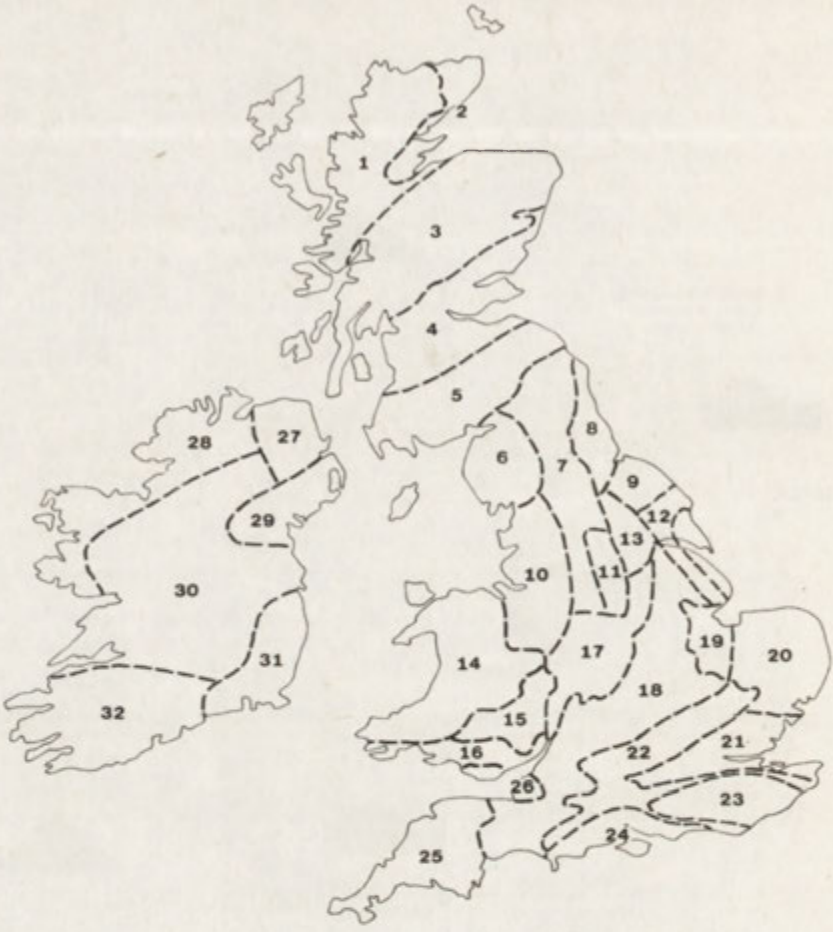

Fig. 5. Major physical regions of the British Isles (after Stamp and Beaver, 1963). 1 NW Highlands, 2 NE Scottland, 3 Central Highlands, 4 Midland Valley, 5 Southern Uplands, 6 Cunbria, 7 Pennines, 8 Northumbria, 9 N. York Moors, 10 Lancastria, 11 Yorks. Coal Field 12 Volds, 13 Vale of York, 14 North and Central Wales, 15 E. Central Wales, 16 S. Wales Coal Field, 17 Midlands, 18 Scarplands, 19 Fenland, 20 East Anglia, 21 London Basin, 22 Chalklands, 23 Weald, 24 Hants, Basin, 25 SW Peninsula, 26 Somerset Levels, 27 Antrim Plateau, 28 NW Ireland, 29 NE Ireland, 30 Central Plain, 31 Wicklow Mts. and Wexford, 32 SW Ireland

moorland, even though it may only be 300 m a.s.l. Once woodland, this area has been degraded by clearance and burning to an impoverished moorland of either heath or grassland. Farming in these areas is very difficult. The climate is very wet as shown in Figure 3 windy and often cold as shown in Figures 2 and 4. The soils are very thin, and nutrients are rapidly washed away by rainfall totals in excess of 1,000 mm a year. In such an environment, financial returns are uncertain, low and hard won.

Yet these areas constitute a third of the country, to leave them unsupported would be a waste of too much land. Therefore, the Government has aided their development in three ways (Tranter, 1977).

1. By giving farmers a flat subsidy for all sheep and cattle in the upland areas,

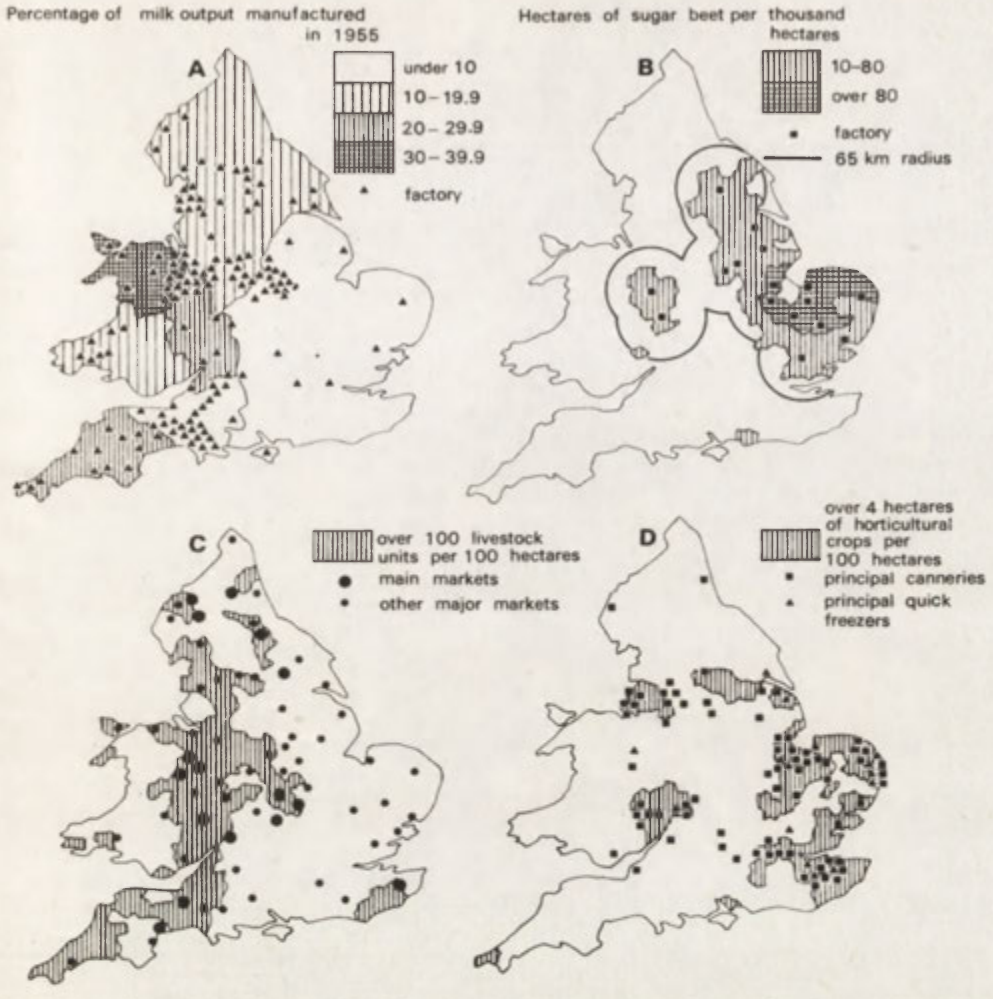

Fig. 6. Location of food processing factories and livestock markets (after Coppock, 1964). A – Milk manufacture; B – Sugar factories; C – Livestock markets; D – Canning and freezing

as shown in Table 2, where it can be seen that hill livestock was given £94 million of support in 1979/1980.

2. By providing generous grants towards improving the moorland and even reclaiming it for pasture land. New techniques allow the moorland to be dramatically improved, since slope is rarely a limiting factor.

3. By planting up forests, or giving grants to private owners to plant up forests, and thereby modify the environment of the area by making it less harsh.

In this way production is assured in areas where otherwise little farming could be profitable. This has the important side effect of keeping the economy of these areas viable and keeping the community alive for tourists to come and stay in, but it causes a landscape change and is not always welcomed by conservation groups or by government agencies dealing with the preservation of the countryside, namely the Countryside Commission and Nature Conservancy Council.

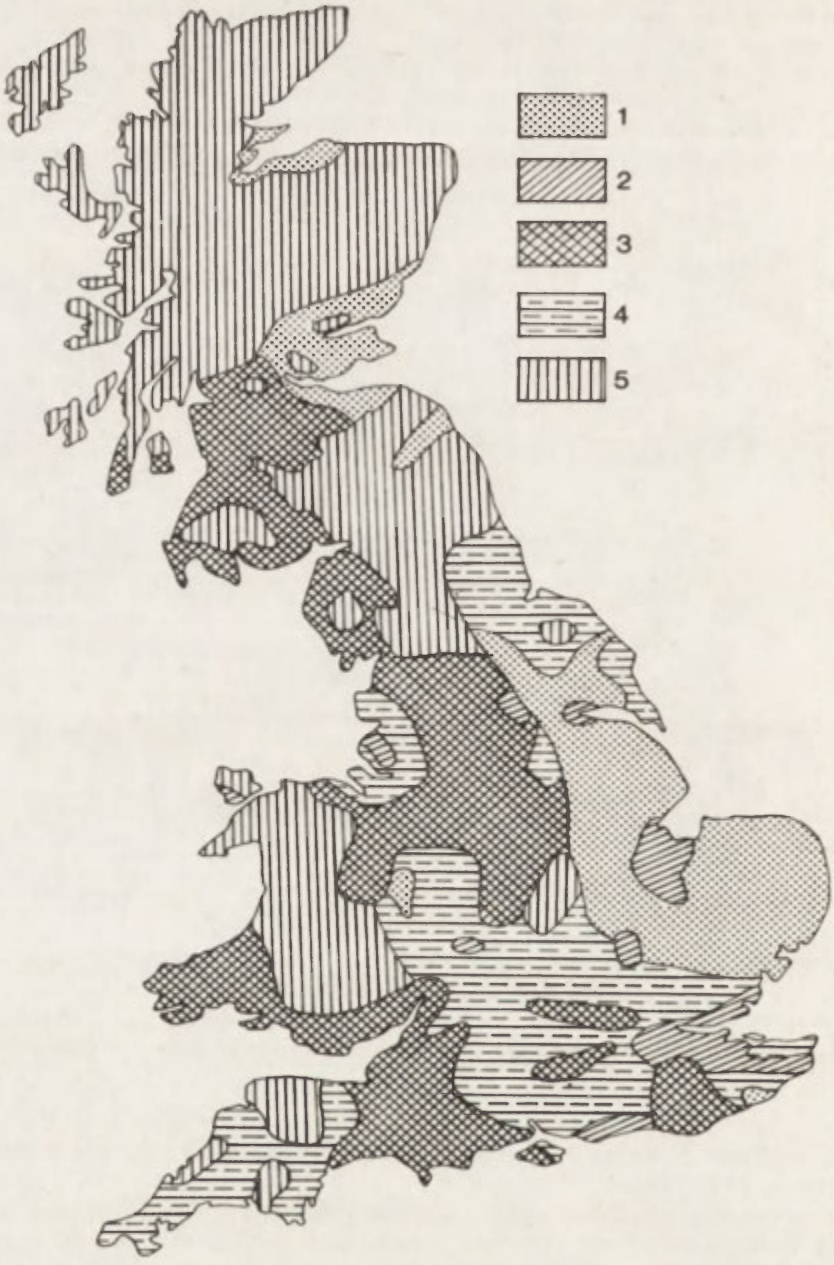

Fig. 7. Farming regions of Britain (after Gilg, 1979). 1 – cropping, 2 – horticulture, 3 – dairying, 4 – mixed, 5 – livestock rearing

In conclusion, Government policies have modified the logical physical pattern of farming to quite a high degree. At the national level crops are grown in the British Isles which might be more profitably imported, and at the regional scale production has either been moved to those areas best suited to it, or been maintained

in areas where it would not normally be economic. On balance the regional development of agriculture has been successful, and reflects the work done by geographers (Coppock, 1974) in pointing out to the Government the advantages that some areas have for certain farming regimes.

REFERENCES

Baker S., 1974, *Milk to market: forty years of milk marketing*, Heinemann, London.

Coppock J. T., 1964, *An agricultural atlas of England and Wales*, Faber, London.

Edwards A., Rogers A., eds., 1974, *Agricultural resources*, Faber, London.

Gilg A. W., 1979, *Countryside planning*, Methuen, London.

Gregory S., 1964, Climate, in: *The British Isles*, eds. Watson J. W. and Sissons J. B., Nelson, London.

Helme W. H., 1975, The agricultural development and advisory service, *Journal of Agricultural Economics*, 26, 53–60.

Marsh J., 1973, The problems facing Britain as a result of CAP, *Journal of Agricultural Economics*, 1, 47–62.

Report on Research and Development, 1973, Ministry of Agriculture, Fisheries and Food, HMSO, London.

Scott J. (Chairman), 1942, *Report of the Committee on land utilization in rural areas*, HMSO, London.

Simpson E. S., 1959, Milk production in England and Wales: a study of the influence of collective marketing, *Geographical Review*, 49, 95–111.

Stamp L. D., Beaver S. H., 1963, *The British Isles*, Longmans, London.

Tarrant J. R., 1974, *Agricultural geography*, David and Charles, Newton Abbott.

Tranter R. B., ed., 1977, *The future of upland Britain*, Centre for Agricultural Strategy, Reading.

Winifrith J., 1962, *The Ministry of Agriculture, Fisheries and Food*, Allen and Unwin, London.

GEOGRAPHIA POLONICA 51, 1985

SOME PROBLEMS OF DISPARITIES IN POLAND'S REGIONAL DEVELOPMENT

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Uneven development is a frequent subject in regional research. On the one hand the very existence of disparties as well as of egalitarian tendencies brings about specific effects apparent in the functioning of the economy, and on the other hand inequality – especially its social aspect – is a striking violation of, generally accepted, ethical norms. Unfortunately, lack of adequate statistics makes it possible to undertake an analysis only of disparities in material living conditions, mainly of differences in incomes. Easy access to services or work is extremely rarely the subject of analysis; even rarer is that of whether people have equal rights to live in a proper human milieu and natural environment, whether they are entitled to be different, to participate in the making of regional decisions, and to control regional policies or other manifestations of self-realization. There are no studies of disparities in the chances of meeting more refined wants, such as faith, love, friendship, solidarity.

The present study deals mainly with the period from 1976 to 1980, that is, the time when a crisis developed in Poland. No comparisons can be made with earlier statistical data since in 1975 Poland's administrative division was radically changed. Moreover, a gigantic rise of prices in 1982 will make it impossible for the time being to carry out comparative studies in which value measures are used. The object of the present work is therefore to evaluate regional policy in the period 1976 to 1980.

This study concentrates on problems connected with economic regional disparities. This is a result of lack other data and of the fact that Poland's spatial economy has not yet been adequately studied in this context. Fuchs and Demko (1979), in their analysis of a number of studies on Poland's regional development carried out in the West, have come to the conclusion that it is not clear whether regional disparities are going up or down in Poland. Attempts to elucidate the evolution of the differentiation of the spatial structure of Poland's economy on the basis of Williamson's classic hypothesis (1965) have also been a failure. Koropeckyj (1972) perceived no tendencies in Poland for inequalities to go up in the early stage of the regional development, and in this he differs from Fuchs and Demko who have observed this regularity. It should be emphasized that Williamson could not find a sufficient number of examples that might unequivocally confirm the hypothesis that in the early phase of development regional disparities in per capita incomes increase. However, in their attempts to apply this hypothesis to Polish conditions Koropeckyj as well as Fuchs and Demko disregard the fact that, while in Williamson's study

polarization effects were found to exceed spread effects in the operation of the market mechanism, Poland's economy functions on other principles.

Although one of the tasks facing the regional policy is to compensate irrational development disparities, this can rarely be achieved. As Williamson maintains, in the 1950s regional disparities in per capita incomes did not go down in countries such as Great Britain, France, Australia and Italy, and they went up in Japan, India and Yugoslavia. Stöhr and Tödtling (1977) indicate that effects of regional policy in this respect are also poor in a later period. In many countries (in a majority of countries, they claim) even disparities in material living conditions were not reduced; they went up in Spain, Italy, France and Belgium. In the case of Great Britain, Cameron (1974) believes that the policy to reduce inequalities is effective, but Moore and Rodes (1974) maintain that irrespective of clearly positive effects disparities are still too high.

It is not easy to make comparative studies between the countries of Western and Eastern Europe. A handicap is i.a. a different method of calculating regional and national incomes. In socialist countries non-material services, distributed rather unequality, are not included in the national income and this may appear to reduce regional disparities there. In spite of this it is believed that, with the exception of the USRR, regional inequalities are not higher in Eastern Europe than in Western Europe (Echols, 1975).

The situation of Poland is quite distinctive. Regional disparities were intensified because of diverse interests of the three invading powers during occupations of almost 150 years, which brought about the formation of 'Poland A', 'B', and 'C'. Specific conditions in which capitalism evolved in Poland in that period, and the fact that this process was held back until the second half of the 19th century favoured the growth of inequalities, further enhanced by the distribution of devastations caused by World Wars I and II. In post-war Poland regional disparities were reduced because Poland C (Eastern Peripheries) had remained outside the country's boundaries and because the Regained Territories, incorporated in Poland A, had been the least developed peripheries in the German State.[1]

The fact that regional disparities in modern Poland have their historical antecedents is corroborated by the pattern of the distribution of many phenomena; their intensity indicates that a discontinuity exists in the areas of the former boundary between the Prussian zone and the Congress Kingdom (the Russian-occupied zone). Those phenomena include such conditions as a high density of railway and road networks; a high share of state farms; a high share of buildings constructed before 1945; a higher percentage of houses with water-supply and WC; a higher value of fixed assets per inhabitant, in particular non-productive assets; a high capital intensity of net production; a high number of households with television sets; a low density of people per room; a high degree of socialization of the economy; strong migration movements; a high proportion of males and of population in pre- and post-productive age; full professional activity; a high commercialization of cereal production; a high percentage of cereals in the area sown; the distribution of sugar-refineries and sugar-beet production, etc.

The distribution of fixed assets is very uneven; it often complies with the former historical boundaries. Out of ten voivodships with the highest gross fixed assets, as many as seven are situated in the former Prussian-occupied zone. Out of ten voivodships with the highest fixed assets in agriculture and transport, also seven are situated in the former Prussian zone. Poland's Western and Northern Territories also possess a similarly high percentage of fixed assets in industry, housing and

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[1] Before World War II per capita income amounted there to 80 per cent of the average income in Germany. There was a heavy migration of population from that land.

health service.[2] It is only the distribution of fixed assets in trade and education that differs from the situation inherited after the period of occupation. To a great extent this is an effect of a conscious regional policy it is also an outcome of the fact that fixed assets in trade and education are accumulated after long years of low investment since, contrary to industrial assets or health service, it is divided among single objects with a lesser unit value. The egalitarian nature of services in these branches of the national economy has brought about most favourable effects, which is also a result of the permanency in the spatial structure of demand for these services. An analysis of changes in the spatial disparities of the gross fixed assets per inhabitant (Kurowski, 1980) proves that the distribution of assets is becoming more equal not only in trade and health service but also in housing and industry. An even distribution of industry in Poland, postulated by many decision-makers and experts, is inconsistent with the general premises of regional policy which tends to achieve specialization and interregional exchange. Sometimes even the postulate to reduce regional differences in industrialization is promoted to the status of the 'law of the location theory' (Opałło and Kawalec, 1980, 33). Such practice was thought by Hamilton (1973) as typical of industrial location in Poland.

Historical disparities in Poland's spatial economy play an important, though dwindling, role. A convenient situation of the Regained Territories along the Odra river and the extended axis joining Silesia (rich in raw materials) through the biggest industrial agglomerations of Warsaw and Łódź[3] with the Baltic, a well-developed infrastructure, and depopulation have made it possible to reorientate Poland's spatial economy in the postwar period.

A slow elimination of basic regional disparities between the former Poland A and B was started thanks to processes induced by both conscious regional policy and spontaneous activity. However, this was more apparent than real, since different kinds of inequalities, not only of spatial (as for example intra-urban disparities, inter-urban disparities between separate towns, or between town and village) but also of a structural character, have survived or even been intensified.

An analysis of the consumption of material goods and non-material services per inhabitant, within the so-called social consumption fund, shows the effectiveness of regional policy. The social consumption fund is divided in line with its objective according to the State's current social policy. It is a fund which can be steered centrally in order to improve the disadvantageous regional structure of consumption. It may be realized either in kind or in money, including such gratuitously rendered non-material services as care of children, health service, cultural services, holiday recreation, tourist services, etc., and also material goods such as free medicines for people who are insured. There is no doubt that this social consumption fund should be divided as evenly as possible, at least at the level of the voivodships, since it offers services which strongly conform to the idea of equal rights (with the exception of specialist education, cultural services of a higher rank, tourist services, highly specialized health services). A regional egalitarianism at the voivodship scale would be highly welcome in this case. This is in accordance with the principles of regional policy and reduces disparities in the satisfaction of society's widely understood needs. However, when we look at Figure 1, which shows consumption of material

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[2] The fact of the existence of these disparities is also corroborated by lack of the voivodships from the former Prussian zone among those where fixed assets in transport and health service are lowest.

[3] However, since Warsaw was completely destroyed, and the transport connections of Łódź are highly ineffective, initially no proper use was made of the geographical situation of te Regained Territories.

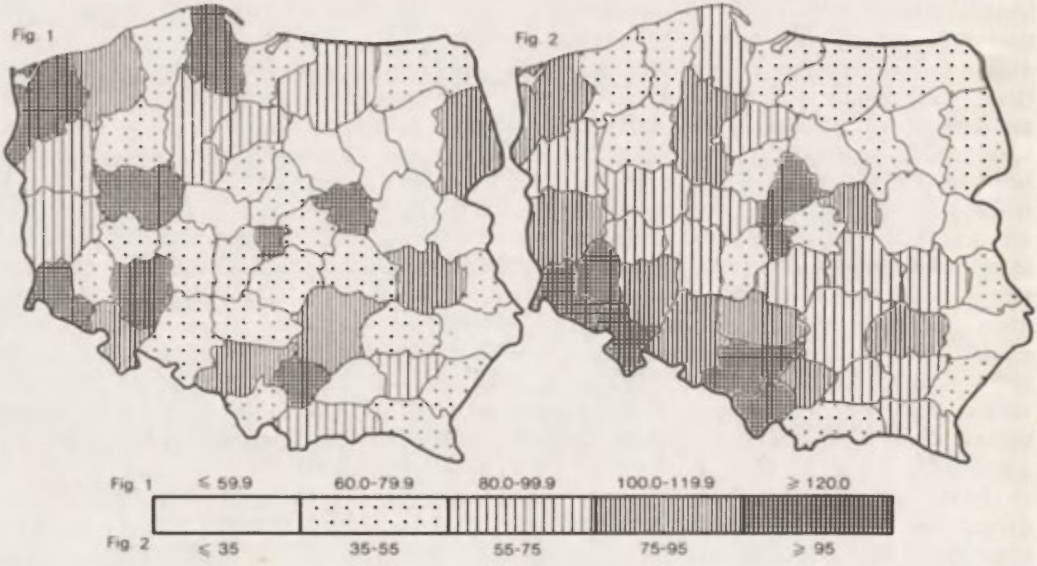

Fig. 1. Consumption of material goods and non-material services from the social fund per inhabitant in 1976 (the national mean = 100)

Fig. 2. Gross production of socialized industry per inhabitant in 1980 (the national mean = 75,000 zlotys)

goods and non-material services from the social fund per inhabitant,[4] we are faced with a number of distressing observations. In Poland, differences in consumption of the social fund in separate voivodships are over twofold. The most neglected voivodships are predominantly situated in the areas which almost 50 years ago were known as 'Poland B'. Since nowadays these regions remain the most neglected, we may conclude that in postwar Poland attempts to implement one of the main objectives of social policy have not met with success and that the discrimination against people inhabiting the peripheral territories has not yet been eliminated. What is even worse, some other parts, possessing a high potential for new industry and containing a new working class, have joined those handicapped areas, since their inhabitants are using the social fund up to only 60–80 per cent of the country's average consumption.

In order to present the structural disparities of the spatial economy in Poland it is necessary to bear in mind that economic growth and social development are generally understood as derivatives of the process of industrialization. In the whole postwar period the trend of the Six-Year-Plan — a strong preference for industry — was followed, and investments continued to be as high as in 1950–1955. The position of industry as a leading branch became even more elevated in the 1970s; in that period huge credits were alloted and investments became particularly high.

The differentiation of gross production of socialized industry per inhabitant in 1980 (Fig. 2) has been quite unaltered over time. This pattern is a reflection of not only the spatial structure of investment in the period immediately preceding that year, but also of that in the whole postwar period. It is a striking regularity that the industrialized areas have obtained very low investments for services, among which

[4] Statistical data on the national income and consumption according to the current administrative division are published for 1976 only.

a particular position is occupied by housing.[5] Figure 3 presents gross production fixed assets per person employed in 1980, i.e. the technical-capital equipment of places of work. The distribution of production fixed assets reflects the historical past of Poland to a slight extent only. Immediately after the war the Western and Northern Territories, together with Upper Silesia, had the richest production infrastructure. However, with the exception of substantial continued production investments in the Poland) have now put those areas where the infrastructure used to be at the highest level in the same situation as the peripheral eastern voivodships. At the same time new industrial areas have emerged in the country's central part (Plock and Konin voivodships), and also now in south-eastern Poland where there is an area with substantial production assets on which in 1938 an attempt was made to organize the so-called Central Industrial District. The distribution of production fixed assets in 1980 is almost identical to that in 1976, though it is characterized by a slightly smaller spatial variation[6] ($V_{1976} = 0{,}260$, $V_{1980} = 0{,}238$).

In 1976–1980 the increment of gross production fixed assets per employed was the highest in those places where their value was also the highest in 1976 (Fig. 4). However, with the exception of substantial continued production investments in the voivodship of Katowice (the 'Huta Katowice' metallurgical works), Legnica (copper

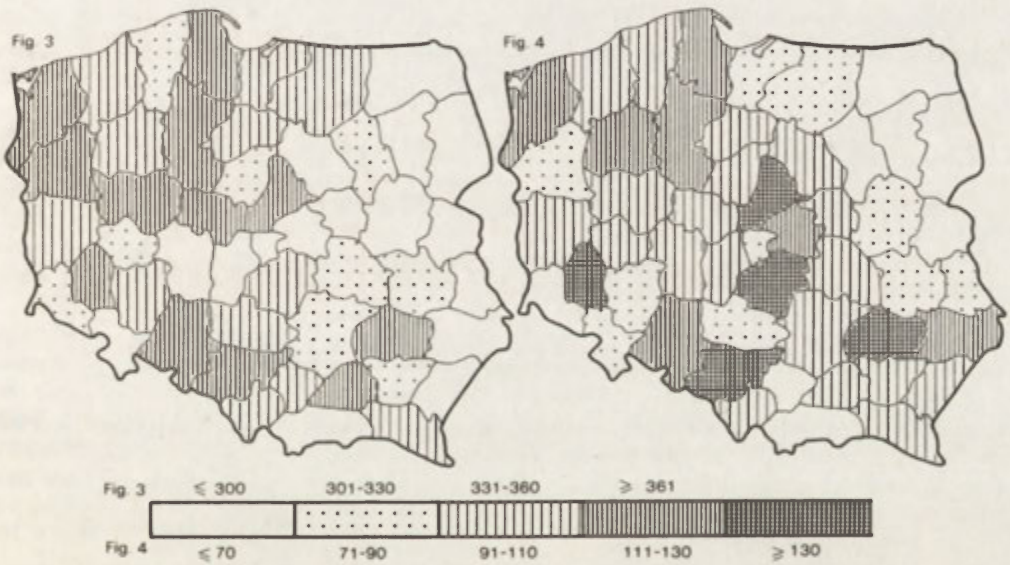

Fig. 3. Gross production fixed assets in the socialized economy per person employed in 1980 (the national mean = 360,000 zlotys)

Fig. 4. The increment of gross production fixed assets in the socialized economy per person employed in 1976–1980 (the national mean = 105,900 zlotys)

[5] This is a long observed regularity in investment policies. The voivodship of Konin is a good example, since in 1966–1970 over 73 per cent of investments were destined for the extractive (brown coal), metallurgical and power industries. At the same time under 5 per cent were allotted for housing there. Nowhere in Poland was more allocated to industry and less to housing.

[6] Measured by a coefficient of variation, i.e. the standard deviation divided by the mean value.

mines and works), Płock (rafinery and petro-chemical works), Piotrków (brown coal mines at Bełchatów), or Tarnobrzeg (power station at Połaniec, cement mill at Ożarów), investments were also made in the period under investigation in other territories but not in the north-eastern part. Irrespective of the mounting economic crisis investments were quite substantial and therefore the modest production potential per employed also increased in many sparsely populated voivodships. Thus, regional disparities in the distribution of production assets per employed were slightly reduced. However, this happened mainly because of the scale of changes in the spatial economy, and to a lesser degree as a result of a rational investment policy.

Differences in the distribution of non-production gross fixed assets per inhabitant in the national economy in 1980 (Fig. 5) were much less serious than those in production fixed assets per employee in the socialized economy. This is not an effect

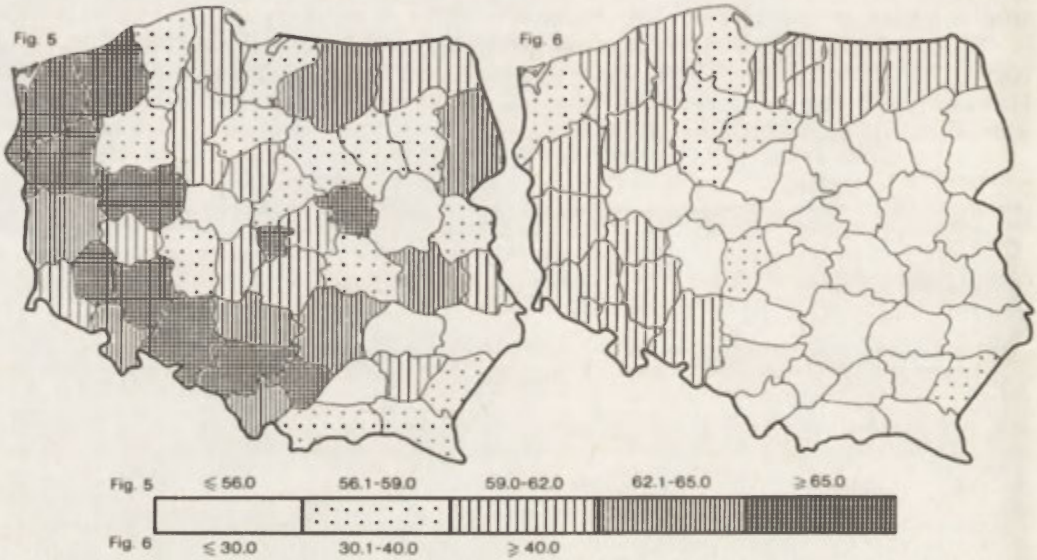

Fig. 5. Non-production gross fixed assets in national economy per person employed in 1980 (the national mean = 65.200 zlotys)

Fig. 6. Degree of depreciation of fixed assets in socialized municipal facilities in 1980 (the national mean = 33.3 per cent)

of the State's social policy of equal rights but because certain criteria are used which can hardly be compared one with another. The concentration of the professionally active population in the urbanized areas and a quite unequal distribution of the degree of socialization of the economy (particularly in agriculture) mean that when both coefficients are taken into consideration it is hardly possible to compare them, though this has been done quite frequently, even by certain highly respected authors (Leszczycki, 1980, 355). The value of non-production fixed assets, allotted to the population, is a measure of its standard of living. It should be remembered that although the principle of equal rights in relation to the value of non-production fixed assets is advantageous, to obtain equal rights is not always desirable because of limited investment means, and also because services rendered on the basis of those means are varied. On the scale of a voivodship we can however assume that equal rights are desirable in principle. Differences in the value of fixed assets in 1980 were slightly lower ($V = 0{,}102$) than in 1976 ($V = 0{,}112$). Yet, irrespective of that a strong

autocorrelation in time took place. Investment outlays for non-production fixed assets in 1976–1980, as in the preceding half-decade, were distributed in a very similar way, since the high value of fixed assets tallied with the distribution of the big urban agglomerations and since these investments were allotted to the western parts. Although high industrial production corresponded with high equipment in non-production fixed assets, this referred only to relative measures (per inhabitant), i.e. differences in both values were results of the concentration of population.

Evidence of the dwindling importance of the Regained Territories with their non-production infrastructure is that even though in 1976 a clear spatial link existed between the value of non-production fixed assets and the degree of their depreciation, disparities in the depreciation of fixed assets were reduced in 1980. However, this happened not because investment outlays had been allocated for the renovation of the assets in the Regained Territories (particularly in south-western Poland: the voivodships of Wałbrzych and Jelenia Góra), but to an equal extent because there was a technical 'death' of the assets there and because funds had been destined to build new plants in the areas where there was greater freedom in choosing locations. If a rational policy had been applied, the assets already functioning would have been modernized, since the construction of new plants makes the investment process more expensive and longer, and reduces its effectiveness mainly because of building and installing operations. Thus in the West, as Kuczyński (1981, 107–108) maintains, 60–80 per cent of the outlays are allotted to reconstruction and modernization.

Although the degree of depreciation of fixed assets has in general been levelled out, very high disparities still exist in the depreciation of fixed assets in municipal facilities (Fig. 6). Differences in the depreciation of the assets coincide almost precisely with the boundaries of the Regained Territories after World War II. This is a classic example of a disparity which has developed lately because of the wrong investment policy causing the infrastructure to be wasted away in an area which used to be a model of a rational management.

When evaluating investment policy regarding non-production fixed assets it is the spatial distribution of the increment in the value of non-production fixed assets per inhabitant (Fig. 7) which should be studied. Although spatial variation of the increment in the value of those assets was slightly greater ($V = 0{,}170$), for the value in 1976 as well as in 1980, which brought about a reduction of spatial disparities in this respect during the five-year period, spatial disparities were replaced by structural ones. Since in 1980 almost 30 per cent of the value of production fixed assets has come from the increment in the half-decade 1976–1980, less than 19 per cent of the value of non-production fixed assets came from the increment in that period.

Lack of significant spatial correlation between those increments is evidence that in certain parts investments were allotted for the development of production, and in others for the development of services. This might be in agreement with the policy of regional specialization if postwar Poland was not very backward in the implementation of investments accompanying production investments. In the 1971–1975 period the investment policy regarding non-production fixed assets was more selective (the spatial variation of investment outlays for those assets $V = 0{,}436$), while in the next five-year period (1976–1980) a more egalitarian policy was adopted ($V = 0{,}222$). The principle of equal rights is desirable, though not always, when the population is to be saturated with assets on the basis of which services are rendered. As regards policy however, the principle of equal rights is undesirable since regional policy is not aimed at the preservation of existing disparities but should create a new structure of socio-economic space. Therefore, both when assessing the processes as well as their state an important role is played by the adopted approach.

The relationship of the value of production fixed assets to non-production fixed

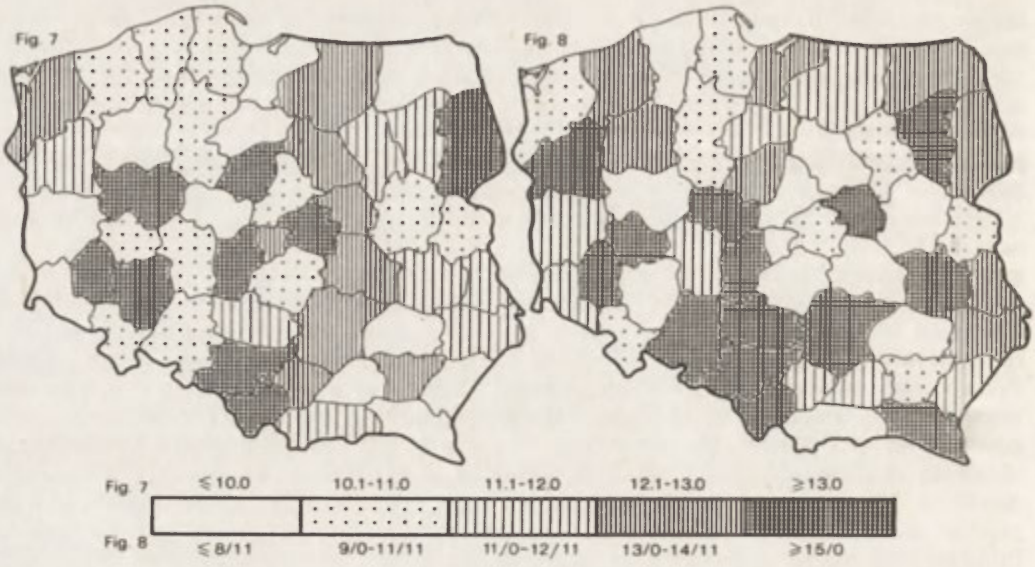

Fig. 7. Increment of non-production gross fixed assets in national economy per inhabitant in 1976–1980 (the national mean = 12,200 zlotys)

Fig. 8. A hypothetical period of waiting for a dwelling by people registered in house-building co-operatives at 1980 rate of construction (in years and months)

assets in separate regions may be of use when an analysis of structural inequalities is made. The spatial variation of this ratio was lower in 1980 ($V = 0{,}221$) than in 1976 ($V = 0{,}257$), which might be an evidence that the proportions had been properly levelled out and that the value of accompanying investments had been increased in relation to production investments (occupying always a leading position). Actually, such is the situation on the inter-regional scale. However, these disparities have changed their scale and now they are much more marked in the intra-regional systems. This is proved by both a higher ratio of production fixed assets to non-production fixed assets in Poland in 1980 ($V = 2{,}14$) in comparison with 1976 ($V = 1{,}77$), as well as by some examples from the separate (particularly industrial) regions, like the voivodship of Katowice (very high investment outlays for the 'Huta Katowice' metallurgical works) and of Legnica. In effect, in 1976 as in 1980, there was no spatial correlation between the values of production and non-production fixed assets.

Relationships between investment outlays in industry and those in house building are particularly striking. In 1976–1980, on the national scale, investment in housing in Poland accounted for 29,7 per cent of industrial investment. The ratio, moreover, differed largely from region to region ($V = 0{,}496$), never exceeding the national mean in the industrial regions and reaching 92,7 per cent in the poorly industrialized areas. The big urban agglomerations, because of their strongly concentrated population and great housing needs, are an exception in this respect. However, in general, this value is inversely proportional to the value of production fixed assets per person employed ($r = 0{,}351$), to the increment of this type of assets in the period under investigation ($r = 0{,}406$),[7] and to gross industrial production per inhabitant ($r = 0.415$).

[7] The correlation coefficient is significant even at the level of $\alpha = 0.005$.

This ratio, which is a measure of underdevelopment, may be used as a precise measure of the regions' industrialization, since regional policy in Poland is paradoxical.

The many years of wrong investment policy brought about a continued increase in the regional disparities concerned with the satisfaction of housing requirements. The registered housing needs, i.e. the number of members and candidates in house-building co-operatives, are so big that current construction of houses should be many times greater, whereas actually it is systematically decreasing with the mounting crisis.[8]

On the basis of the number of dwellings completed in 1980 the expected mean waiting time is 13 years and 7 months, but regional differences are very great ($V = 0{,}452$), (Fig. 8). In the agglomerations of Warsaw and Wroclaw needs are particularly acute. Their satisfaction would take respectively 38 and 25 years.[9] The relative short waiting period in the voivodship of Katowice is due to the increased number of jobs in connection with the construction of Europe's largest iron works.

The unsatisfied housing needs not only represent disparities in regional development (or in this case – under-development) but also generate disparities at another scale – the intra-regional – bringing about the process of underurbanization. In the process of underurbanization the urban development costs are apparently the lowest; actually their burden is transferred on those who have to commute to work in urban centres.

The examples, given above, show that inefficient policies during the tremendous investment jump in Poland in the 1970s brought about not only a national crisis but also created some specific regional problems. Although these have been apparent in the whole postwar period, the scale of transformations in the 1970s stabilized disadvantageous trends in the spatial structure of the economy, made certain regional disparities more acute, and extended the time horizon in which the structure could have been essentially improved if an effective regional policy had been applied. Once again it is evident that the most universal praxeological principle of Matthews (which is a travesty of St. Matthew Bible: 'For whosoever hath to him shall be given, and he shall have more abundance; but whosoever hath not, from him shall be taken away even that he hath' (25, 29)) is still in force in the regional policy of socialist Poland.

REFERENCES

Cameron G. C., 1974, Regional economic policy in the United Kingdom, in: M. Sant, ed., *Regional policy and planning for Europe*, Lexington, Westmead.

Echols J. M., 1975, Politics, budgets and regional equality in communist and capitalist systems, *Comparative Political Studies*, 8, 259–292.

Fuchs R. J., Demko G. J., 1979, Geographic inequality under socialism, *Annals of the Association of American Geographers*, 69, 304–318.

Hamilton F. E. I., 1973, Decision-making and industrial location in Eastern Europe, in: J. Blunden et al., ed., *Regional analysis and development*, Harper and Row, London, 235–248.

[8] In 1976–1980 the average number of dwellings distributed by the house building co-operatives, other enterprises within the public sector, and by State administration was 194,000. In 1980 this number dropped to 161,000, and in 1982 to 129,000. According to the Ministry of Construction's forecasts, based upon available building materials, the figure will be 115,000 in 1983.

[9] Komorowski (1981) maintains that the development of house building owing to the application of the large scale technology, very popular in Poland, will soon meet with a barrier of a low quality of new dwellings and an unknown period of their exploitation, which for seismic Japan has been established as 20 years.

Komorowski S. M., 1981, Przestrzenna organizacja gospodarki polskiej. Próba analizy krytycznej (The spatial organization of Poland's economy. An attempt at a critical analysis), *Biuletyn KPZK PAN*, 117, 7–133.

Koropeckyj I. S., 1972, Equalization of regional development in socialist countries: an empirical study, *Economic Development and Cultural Change*, 21, 68–86.

Kuczyński W., 1981, *Po wielkim skoku* (After a high jump), PWE, Warszawa.

Kurowski S., 1980, Studium na temat rozmieszczenia majątku trwałego w Polsce w latach siedemdziesiątych (A study on the distribution of fixed assets in Poland in the 1970s), *Studia KPZK PAN*, 74, 57–134.

Leszczycki S., 1980, *Geograficzne studium ekonomiczno-planistyczne* (A geographical economic-planistic study), KiW, Warszawa.

Moore B., Rodes J., 1974, The effects of regional economic policy in the United Kingdom, in: M. Sant, ed., op. cit.

Opałło M., Kawalec W., 1980, Z teorii i praktyki lokalizacji przemysłu (On the theory and practice of industrial location), *Studia KPZK PAN*, 74, 25–40.

Stöhr W., Todtling, 1977, Spatial equity – some anti-thesis to current regional development strategy, *Papers of the Regional Science Association*, 38, 33–54.

Williamson J. G., 1965, Regional inequality and the process of national development: a description of the patterns, *Economic Development and Cultural Change*, 13, 4.

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REGIONAL INTEGRATION AND THE BOUNDARY EFFECT IN THE KATOWICE REGION

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Let us begin with the notion of the border region. A border region is one which has been developed across an international border. This would imply a dialectic on the development of the border region. While, on one hand, the precise formalization of a boundary is necessary at the beginning of the process so as to underlie the *border* region, on the other, during time, the border location does develop economies for the actors on the socio-economic scene to underlie the border *region*. These can comprise branch plant development, the expansion and mobility of footloose industries, economic co-operation and the migration of labour.

As has already been stressed, an international boundary is an essential condition for the existence of any border region. After the political unification of the region, it can no longer be said to be a border region. However, the political unification cannot be misinterpreted as an integration, except in purely formal terms. A *de facto* socio-economic integration is a process rather than an event. This used to be propelled by economic integration while the social and socio-psychological structures, as ones more inert, lag behind. The subareas of the region in question, which were separated by the border in the past, join each other rather than inter-relate, which implies a significant boundary effect. Therefore, the region can be said to be a *bare-joint region*. The concept of the bare-joint region is conceived like two pieces of wire in electricity, which are not banded, but bare-joined. The bare-joint region is a stage in the transition from the border region to the integrated region. After integration, the region in question is, obviously, no longer a bare-joint region.

While the concept of the border region emphasizes the integration process between the sub-areas located on each side of the international boundary, the concept of the bare-joint region stresses the friction and inertia in the process of integration between the areas which had already been adapted to the new national framework.

In this paper, the historical development of the Katowice region is outlined. The scope of the paper is to evidence how the regional development involved the transition from a border region through a bare-joint region towards an integrated region.

DIVERSIFICATION AND INTERRELATIONSHIPS

What is now the Katowice region was divided throughout the Middle Ages by an inter-provincial boundary between Silesia and Lesser Poland. Throughout the 19th century, with its industrial revolution and capitalist development, the prospective

region was divided by international boundaries into three parts: (1) Prussian Upper Silesia, which comprised 2/3 of the area in question, (2) the Russian Dąbrowa Basin, and (3) the Austrian West Cracovian District. Although originally forming the underdeveloped peripheries of the three empires, this area, while developing iron, lead and zinc metallurgy, followed by coal mining, was transformed into an important industrial belt which, even though politically divided, developed a network of interrelationships. The regional labour market emerged during the industrial revolution and capitalist development, and that is why the origin and development of the border region can be assigned to the decline of feudalism and the development of capitalism.

In Upper Silesia, coal was included in royalties, while in the Dąbrowa Basin it was submitted to the ground access rule. In consequence, state capital in Upper Silesia contrasted with the rather limited capital of the individual landlords in the Dąbrowa Basin. This resulted in the uneven economic development of the two sub-areas. The higher economic development of Upper Silesia involved the expansion of a labour market with a higher wage rate which was the cause of the drainage of the labour force from across the border. In general, the economic competition from Upper Silesia was rather acute for the local industries in the Dąbrowa Basin and the West Cracovian District (Dlugoborski 1973).

From the mid-19th century onwards, the emergence of a border region in the area under investigation was apparent. This was related to the economic expansion of the three empires, the tendencies of their internal integration and the development of their national markets. This must have implied a growing formalization of the boundary which had been — in the sense that no documents were required to cross it — rather informal until 1870 (Jaros 1977).

The industrial revolution of the 1840s even strengthened the economic superiority of Upper Silesia over the Dąbrowa Basin and the West Cracovian District. This was because of (1) the large amount of easily accessible deposits of hard coal the role of which was increasing due to the rise in the prices of timber and the development of new metallurgical technologies (e.g. coking), and (2) the introduction of a number of organizational and fiscal regulations in Prussia which freed large industrial enterprises from the excessive control of the state (Michalkiewicz 1976a, b). These regulations did not, however, give Upper Silesia any superiority as regards the higher economically developed areas to which they also applied, e.g. Westphalia and the Rhineland.

The development of the national markets was related to the development of the common national price system. The latter was involved by the expansion of the mass transportation resources, i.e. the railway system. International boundaries *per se* no longer formed economic barriers unless the tariff system was applied. The latter meant the expansion of the boundary control system. Therefore, to facilitate the control and make it more successful, a number of local border crossings were closed and the international exchange was concentrated on the main railway crossings. This must have limited local interrelationships in favour of long-distance relations (Dlugoborski 1973).

Because of the liberal Russian and Austrian tariff systems up to the mid-1870s, the local markets of the Dąbrowa Basin and the West Cracovian District were dominated by the Upper Silesian products and in particular by iron and coal. The two sub-areas became peripheries of the Upper Silesian core to which they supplied raw materials and food-stuffs and imported the final products. After the mid-1870s, the industries of the two peripheral sub-areas were able to reduce their underdevelopment in relation to Upper Silesia as regards production volume, industrialization level, the size of the market areas and the efficiency of the local labour force. Therefore, the Upper Silesian entrepreneurs found it necessary to export capital rather than products,

i.e. to invest in the peripheral sub-areas. This, however, even though contributing to the economic development of the sub-areas, strengthened the Upper Silesian economic dominance (Dlugoborski 1973; Kwaśny 1976), since capitalist entrepreneurs invest in regions not to develop them but to profit from them (Hamilton 1983).

The demographic revolution, which begin in Eastern Europe in the mid-19th century, affected human mobility considerably. The abolition of feudal constraints and the growing labour surplus in rural areas have been considered as the push factors while industrialization and urban growth formed the pull factors. In Upper Silesia, two directional categories of migrations were to be identified, i.e. the rural to urban/industrial migration and that from Upper Silesia to the higher industrialized Westphalia and the Rhineland. The latter was a part of the wider demographical phenomenon, referred to in German language literature as the *Ostflucht*, i.e. the outflow from the eastern provinces of Germany. The migration applied to the *de facto* or at least the potential Upper Silesian industrial labour force. The relative labour shortage which was thus produced was met by migrants from Galicia (including the West Cracovian District) and the Kingdom of Poland (including the Dąbrowa Basin). The migrants were attracted by the extensive Upper Silesian labour market, which offered economic opportunity and relatively good job conditions. The labour force growth rate, however, exceeded the job vacancy rate, which resulted in a labour surplus. This development provided an opportunity to the Upper Silesians who had not left for Western Germany, to migrate to the Dąbrowa Basin or to the West Cracovian District where they were welcomed as a higher skilled and more efficient labour force than the local employees (Dlugoborski 1973; Ładogórski 1976).

The industrial expansion in Upper Silesia and the joining of the common German labour market by the province involved the immigration of officials, engineers and supervisors from the core of Germany. The German character of the upper classes of employees influenced the rest of the labour force; in this sense there was apparent the impact of industrialization on the Germanization of the province (Dlugoborski 1966a), which was part of the more general process of cultural liquidation under economic growth (Buchanan 1977). This objective process was underlain by: (1) the growing human mobility which involved the growing usefulness of the official language of the Prussian state; (2) the spatial correlation between the Polish speaking areas and the low level of the economic and cultural development, with the correlation being perceived in causal terms, even though it was an obvious ecological fallacy; (3) the introduction of compulsory education in 1872, taught in the official language of the state. Since there was no Germanization in either Galicia or the Kingdom of Poland, this development contributed to a lingual diversification in the area under investigation. Even though it was not the *cause* of the social conflict between individual regional sub-groups, it appears to have been a *symptom* of those at whom the social stereotypes and aversions were directed.

The migrants from the Russian and Austrian held territories to Upper Silesia were mostly rural, very poor, not industrially skilled, unable to speak German, mostly illiterate, and using different Polish dialects from that of the local populace. These formed an obvious competition on the labour market, and this was especially explicit after 1890 when, according to the stringent Prussian police regulations, they could be expelled from the Prussian state at any time. In consequence, they were compelled to accept even the most disadvantageous working conditions, including illegal employment and even being used in the breaking of local strikes. This must have contributed to a growing antipathy among the local populace towards them. Immigrants were pejoratively referred to by the Upper Silesians as *Hy'landers*; the term originally applied to the Highlanders from Galicia and Austrian Silesia who pioneered the seasonal economic migration to Upper Silesia; this term was then used to include all those from the other side of the border and finally to designate the local

people of the Dąbrowa Basin who had predominated among the migrants to Upper Silesia from the late 19th century onwards (Mrozek 1964; Dlugoborski 1973; Ziemba 1973).

On the other hand, the expansion of the Upper Silesian capital to the Dąbrowa Basin had also caused social tensions. Considerable anti-German sentiments were aroused by: (1) the social-class conflicts between the Polish workers and the German entrepreneurs; (2) the entrepreneurs' loyalism to the tsarist regime; and (3) the strong anti-Polish attitude of the German supervisors and foreman. Those sentiments included anybody *regarded* as German or Germanized, including the Upper Silesians, all the more in that they, as higher skilled and more efficient workers, were more likely to earn higher wages and get on in their careers (Ziemba 1973; Jaros 1977).

In the area under investigation, the industrial revolution and industrial development up to the First World War had contributed to both diversification and inter-relationships. From the industrial expansion, there had emerged the three industrial districts which tended to integrate economically. This development involved the formation of the regional labour market which generated permanent and seasonal migration, commuting to work and journeys for shopping. It was in this way that the border region was formed. The development of the border region involved the erosion of the existing international boundaries through the transfer of people, products and capital; on the other hand, however, the transfer itself and the mechanism of the capitalist labour market involved social processes which made the boundaries explicit spatial barriers dividing cultures, attitudes and sentiments as never before.

UNIFICATION AND DISINTEGRATION

The restitution of Polish statehood in 1918 involved the political unification of the Dąbrowa Basin and the West Cracovian District to which a part of Upper Silesia was joined in 1922. The political appurtenance of Upper Silesia was decided by the Allies after the Plebiscite, which had been somewhat disadvantageous for Poland, and the three anti-German uprisings. The results of the Plebiscite, although sharply contrasted to the ethnic structure of the region, were hardly surprising. The reasons were of both a political and a sociological nature. Into the former, the formal or informal pressure of the German administration, entrepreneurs and para-military troops must be included as well as the unfavourable international situation of Poland (then at war in the east), the overbounded plebiscitary territory in relation to the Polish claims and the granting of the right to vote to those who had been born in the plebiscitary territory in preference to its actual inhabitants. The latter regulation must have been disadvantageous for Poland more for sociological than political reasons. The point is not so that the emigrants were simply Germanized, but rather that they were more ethnically and regionally minded than nationally, which in 19th century Europe was the rule rather than the exception. Thus, the Upper Silesians, although rather uniform as regards social-class background and folklore ethnicity, had traditionally undetermined national sentiments (Mrozek 1964). This was supported by the fact that Upper Silesia, although ethnically Polish, had not been part of the pre-partitioned Poland which would have served as a base for national feelings. The joining of Upper Silesia to the common German labour market in the 19th century involved, the already discussed, emigration to Western Germany which had developed as the routine spatial behaviour of the regional populace. Therefore, for many of those who had participated in the Plebiscite, the question to be answered was not one on the national level, which was felt to be rather sophisticated, but rather on the regional level, i.e. to have the birthplace and the

place of the actual or prospective work and living within the same national labour market and, therefore, also the state.

Joining a part of Upper Silesia to Poland meant the divisioning of the province, including its industrial core, by the new international border. The new political pattern meant the development of the bare-joint region which comprised the Dąbrowa Basin, the West Cracovian District and the part of Upper Silesia within Poland, as well as the disintegration of Upper Silesia along the new Polish-German boundary.

Polish Upper Silesia was the most industrialized part of Poland, with its extensive labour market attracting migrants from other regions. However, during the recession, the migrants were competitors for the local labour force. On the other hand, the establishment of the Polish administration involved the immigration of officials and bureaucrats, mainly from the former Galicia, who were likely to occupy the higher positions in the public and industrial administration since there was scarcely any Polish-educated staff in Silesia. This development gave rise to an increasing aversion to newcomers in general on the part of the Upper Silesians (Ziemba 1973).

The urban growth of Katowice as a new provincial centre meant an extensive increase in secondary education provided in the city, and this fact also attracted students from the West Cracovian District and, in particular, from the Dąbrowa Basin, which, from the late 1920s, was intercommunicated with Upper Silesia by the inter-urban bus and tram services.

In general, however, the pre-1914 boundaries within the bare-joint region were rather noticeable. The former international boundaries were now provincial boundaries, whereas Upper Silesia formed a unique autonomous provincial unit within Poland. The former boundaries continued to serve as spatial barriers (see Table 1). The integration process of the bare-joint region was enfeebled by the strong relationships between Polish and German Upper Silesia, the minor economic development during the recession, Silesian autonomy within Poland, the strong economic position of the German minority in Polish Upper Silesia, and the cultural peculiarity of Upper Silesians, accompanied by psychological barrier along the pre-1914 boundary.

On the other hand, the division of Upper Silesia between Poland and Germany, with the new boundary dividing the already existent industrial district, involved practical difficulties. The Geneva Treaty, in force for 15 years from 1922, attempted to alleviate these; according to this, transit movement of people and commodities as well as technological operations across the border were to remain (see Table 1). This maintained the strong economic and social interconnections between the two

TABLE 1. Infrastructure crossing the spatial barriers in the industrial core of the Katowice region, 1933

Boundaries	Polish/ German in Upper Silesia	Upper Silesia/ Dąbrowa Basin	Upper Silesia/West Cracovian District	Dąbrowa Basin/West Cracovian District
railways	10	2	1	1
narrow gauge freight railways	13	0	0	0
highways	15	4	1	2
tram lines	6	1	0	0
coal mining operations	8	0	0	0
zinc/lead mining operations	4	0	0	0
electric power system	13	2	0	1

Source: author's own calculations based on Hartshorne (1933).

parts of Upper Silesia. With time, however, these links were successively being disrupted, especially after the lapse of the Geneva Treaty in 1937. The 17 years of formal separation during the interwar period, including only slightly over a year of the *de facto* separation from the termination of the agreement, was certainly too brief a period to totally disrupt the interconnections across the border.

In the 1930s, the Upper Silesians were explicitly involved in the Polish-German national tensions. Having traditionally undefined national feelings, they, when pressed to identify themselves in national terms, tended to be split between the two alternatives. Tragically, the split concerned individual families, with individual family members being affiliated to the opposed military formations during the Second World War. Those who had decided to choose Germanhood were willingly used by the Nazi regime as members of the repressive formations in the Dąbrowa Basin and the West Cracovian District during the occupation of Poland, because of their ability to communicate in Polish (Popiołek 1967). This must have contributed to a considerable growth of antipathy and stereotypes among the respective local communities.

TOWARDS INTEGRATION

After the Second World War, the entire region was re-unified within Poland. In 1953, the Upper Silesian Industrial District was established as a planning unit which comprised the conurbation of the 9 cities of Upper Silesia and 4 of the Dąbrowa Basin. In 1975, the three sub-areas under investigation were unified within the Katowice voivodship.

The massive transfer of people during and after the war (which comprised the re-settlement of the German minority, the repatriation from the areas ceded to the Soviet Union, the re-emigration from Western Europe, and the immigration from the pre-war Poland) had all contributed to the social diversification of the region, which, however, in the long run, was aimed at the social unification of the region with the rest of Poland. The arrival of newcomers in Upper Silesia must have involved a confrontation of differing social values and attitudes. Most of the newcomers were unaware of Silesian history and of its social peculiarity. Rather, having a tragic wartime background, they applied the stereotypes which had taught them to be wary of anybody regarded as being German or Germanized. According to the Silesian stereotype, in turn, low ethics were characteristic of the newcomers. The stereotypes were even reinforced by the social-class differences between the Silesian workers and the intelligentsia re-settled from Lvov, as well as by the fact that the new political system was represented in Upper Silesia by officials and officers who were mostly recruited from the Dąbrowa Basin, and these, because of their own wartime background, could not be devoid of the stereotypes involved (Mrozek 1964; Dubiel 1967).

The changed political, economic and social situation contributed to the expansion and diversification of the regional labour market. This presented new opportunities for choosing a job in the region. The mechanism of the reproduction of the socio-economic group of miners through biological succession no longer applied. This development, accompanied by the decreased number of children in workers' families and, in Upper Silesia, the re-settlement of Germans, followed by the growing economic emigration abroad, made it necessary to recruit the labour force for mining outside the region. This, however, implied the immigration of potential employees who were not only unskilled, but also with low work ethics. They were obviously confronted with the qualified miners of local stock. To attract these migrants, the latter were permanently given preference on the regional housing

market. This development antagonized the miners of local stock towards the newcomers since the former felt their own housing needs to be more urgent, since a considerable amount of the housing resources in Upper Silesia were of pre-1914 origin (Mrozek 1964; Barteczek 1977; Frąckiewicz 1982).

From 1957, Upper Silesians were allowed to emigrate to West Germany within the framework of the Re-uniting of Families agreement. Since 1959, this development has been a purely economic emigration. The application of the Re-uniting of Families label to the emigration gave rise to another source of anti-Silesian feelings in the region; firstly, because both the label and the agreement suggested that those who had decided to emigrate were either Germans or were at least Germanized, and, secondly, because those to whom the agreement did not apply felt it was the Silesians who had gained yet another more favourable opportunity in history.

The rapid post-war economic development of the region involved the expansion of the regional labour market which attracted extra-regional migrants. The latter regarded the region as attractive for working, acquiring skills and earning money, but not so – because of the deterioration of the environment and poorly developed social infrastructure – for permanent residence. Therefore, low net migration but a high migratory turnover has been characteristic of the region, which implies the involvement of a large number of people in social relations within the region. The newcomers perceived the region as a whole, and did not analysed the peculiarities of its individual sub-areas. This formed an external factor of the regional integration.

An internal factor of the regional integration was also related to the expansion of the regional labour market. The development of Katowice as a regional and supra-regional centre, and the urban growth in Upper Silesia in general, involved the growth of the tertiary sector with job vacancies attracting the women in the region. In Upper Silesia, however, female economic activity had been traditionally low; this originally stemmed from the monofunctionalism of the regional labour market which, throughout the 19th century, was internalized as a social value (Knobelsdorf 1967). This was not the case in the Dąbrowa Basin in which, because of the generally lower living standard, female economic activity had been a necessity. Therefore, the job vacancies in the tertiary sector attracted, above all, women from the Dąbrowa Basin who could easily commute to Upper Silesia. This intensive commuting across the spatial barrier has involved the intensification of inter-group social contacts and has contributed to integration.

THE BOUNDARY EFFECT

The formal methodology of the examination of the boundary effect was presented elsewhere (Mackay 1958; Domański 1970; Rykiel 1981). In this paper, the three sub-areas of the Katowice region have been examined in terms of the boundary effect between them influencing inter-urban migration and commuting to work. Even though the numerical results (Table 2) could be questionable as strongly dependent on the preassumptions of the model, the relative strength of the individual boundary effects can definitely be accepted.

The relative openness of the Dąbrowa Basin for out-migration can be explained by the urban renewal of the sub-area in the analysed time point. The relative openess of Upper Silesia for out-commuting to work may be, in turn, interpreted in terms of the extension of its local labour market which generates labour mobility.

Another approach to the question of the boundary effect was made by a survey study concerning the local perception of the neighbouring communities. At Mysłowice (a Silesian town located next to the confluence of the streams followed by the pre-1914 international boundaries) primary school pupils, of about 14 years of age,

were asked, withouth prior warning, to name the towns in the Katowice region in which they would not like to live. The following results were obtained:

Sosnowiec (Dąbrowa Basin)	75% of the respondents
Jaworzno (West Cracovian District)	30%
Będzin (Dąbrowa Basin)	10%
Mysłowice (Upper Silesia)	5%
others	15%.

TABLE 2. Boundary effect in the Katowice region. Actual relationships as a percentage of those estimated

Flows	to Upper Silesia	to the Dąbrowa Basin	to the West Cracovian District
Inter-urban migration, 1978, from:			
Upper Silesia	–	4.5	0.7
the Dąbrowa Basin	12.8	–	13.9
the West Cracovian District	1.3	0.9	–
Inter-urban commuting to work, 1973, from:			
Upper Silesia	–	12.6	12.1
the Dąbrowa Basin	1.7	–	6.1
the West Cracovian District	0.4	0.2	–

TABLE 3. The motivations of the spatial dislikes of respondents from Mysłowice, 1981. The percentage of respondents who declared individual motives for their unwillingness to live in the indicated town of the Katowice voivodship. (Colloquialisms and clumsy wording original)

Motivations	%
Non-social	
pollution, smoke	20
poor supply	5
Semi-social	
too much traffic	5
I like nice, little towns	5
I don't like there	20
Explicitly social	
I dislike those people	15
I dislike their accent	15
they're unpleasant to Silesians	5
they laugh at our accent	5
they pick quarrels with the Silesians	20
because of the Hy'landers	15
it's a town of vandals and rascals	5
I hate'em	10

Three groups of the motives for the spatial dislikes could be identified, viz. non-social (15%), semi-social (30%), and explicitly social (50%), with 5% of the answers unmotivated. Detailed motivations were highly emotional (see Table 3) which implies that a strong psychological barrier still exists as one following the pre-1914 boundaries. Curiously, 75% of these evaluations applies to the city of Sosnowiec alone which, as the nearest and largest town of the Dąbrowa Basin, is perceived as the most typical centre of the disliked social attitudes and cultural patterns. A detailed analysis indicated that the perception of the psychological barrier probably depends on the place of residence, but certainly more on the territorial origin of the family. *All* those who had parents from Mysłowice disliked Sosnowiec, as compared with 2/3 of those who had parents from Upper Silesia but outside that town, 3/4 of those who had only a mother from Upper Silesia, and 1/2 of those whose parents were from outside Upper Silesia. The figures indicated that not only do newcomers to the region bring their attitudes with them, which contributes to the unification and, consequently, the social integration of the region, but also that they are able to, and actually do, adopt the local attitudes which, in this particular situation, contribute to the strengthening of the psychological barrier.

The results of the survey reveal a disparity between social integration *within* local communities and that *of* individual communities. The newcomers to a town who integrate with the local citizens by adopting their attitudes and values, contribute to the maintenance of the existent disintegration on the regional scale.

REFERENCES

Barteczek A., 1977, *Integracyjna rola infrastruktury gospodarczej w świetle badań nad Górnośląskim Okręgiem Przemysłowym* (The integrative role of economic infrastructure, as based on the investigation of the Upper Silesian Industrial District), Komitet Przestrzennego Zagospodarowania Kraju PAN, Studia, 59.

Buchanan K., 1977, Economic growth and cultural liquidation, in: R. Peet ed., *Radical geography: alternative viewpoints in contemporary social issues*, Maaroufa Press, Chicago, 125–142.

Długoborski W., 1966, Polityka germanizacyjna i postawa ludności polskiej (The Germanization policy and the attitude of the Polish populace), in: *Historia Śląska*, vol. 2, part 1: 1763–1806, Ossolineum, Wrocław, 388–430.

Długoborski W., 1973, *Więź ekonomiczna między zagłębiami Górnośląskim i Dąbrowskim w epoce kapitalizmu* (The economic relations between the Upper Silesian and Dąbrowa Basins under capitalism), Śląski Instytut Naukowy, Katowice.

Domański R., 1970, *Syntetyczna charakterystyka obszaru* (Synthetic characteristics of an area), PWN, Warszawa.

Dubiel P., 1967. Początki władzy ludowej (The beginnings of the people's power); in: *Zabrze. Zarys rozwoju miasta*, Śląsk, Katowice, 157–166.

Frąckiewicz L., 1982, Problemy społeczne Górnośląskiego Okręgu Przemysłowego (The social problems of the Upper Silesian Industrial District), Komitet Przestrzennego Zagospodarowania Kraju PAN, *Biuletyn*, 118, 128–134.

Hamilton F. E. I., 1983, Industrial systems and regional economies: British industrial research in an international perspective. A paper presented to the 7th Polish-British Geographical Seminar, Jabłonna.

Hartshorne R., 1933, Geographic and political boundaries in Upper Silesia, *Annals of the Association of American Geographers*, 23, 195–228.

Jaros J., 1977, Narodziny miasta i jego dzieje pod obcym panowaniem (The origin of the city and its history under the foreign rule); in: *Sosnowiec. Zarys rozwoju miasta*, PWN, Kraków, 11–65.

Knobelsdorf W., 1967, Przemiany ludnościowe po II wojnie światowej (The demographical changes after the Second World War), in: *Zabrze. Zarys rozwoju miasta*, Śląsk, Katowice, 175–193.

Kwaśny Z., 1976, Komunikacja, handel i kredyt (Communication, trade and credit), in: *Historia Śląska*, vol. 3, part 1: 1850–1890, Ossolineum, Wroclaw, 216–240.

Ładogórski T., 1976, Ludność Śląska na przełomie dwóch epok (The population of Silesia on the turn of two epochs), in: *Historia Śląska*, vol. 3, part 1: 1850–1890, Ossolineum, Wroclaw, 21–61.

Mackay J. R., 1958, The interactance hypothesis and boundaries in Canada: a preliminary study, *Canadian Geographer*, 11, 1–8.

Michalkiewicz S., 1976a, Przemysl ciężki (Heavy industry), in: *Historia Śląska*, vol. 3, part 1: 1850–1890, Ossolineum, Wroclaw, 143–163.

Michalkiewicz S., 1976b, Przewrót techniczny i zmiany w organizacji produkcji (The technological revolution and organizational changes in production), in: *Historia Śląska*, vol. 3, part 1: 1850–1890, Ossolineum, Wroclaw, 125–142.

Mrozek W., 1964, Procesy przemieszania i integracji społecznej ludności województwa katowickiego (The processes of differentiation and social integration in the voivodship of Katowice), in: W. Mrozek, ed., *Przemiany przestrzenne, ludnościowe i społeczne w województwie katowickim*, Śląski Instytut Naukowy, Biuletyn, 43, 87–102.

Popiołek S. O., 1967, Życie polskie (The Polish culture and economy), in: *Zabrze. Zarys rozwoju miasta*, Śląsk, Katowice, 143–156.

Rykiel Z., 1981, The development of regional settlement systems and the role of spatial barriers, *Lurralde. Investigación y Espacio*, 4, 29–38.

Ziemba J., 1973, Po obu stronach Brynicy. Społeczno-polityczne związki Zagłębia Dąbrowskiego z Górnym Śląskiem w okresie kapitalizmu (On both sides of the Brynica stream: the socio-political relations between the Dąbrowa Basin and Upper Silesia under capitalism), Śląski Instytut Naukowy, Katowice.

GEOGRAPHIA POLONICA

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