THE SPATIAL PATTERNS OF BRITISH MIGRATION IN 1991 IN THE CONTEXT OF 1975 – 92 TRENDS

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John Stillwell, Oliver Duke-Williams and Philip Rees

School of Geography
University of Leeds
Leeds LS2 9JT

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ABSTRACT

Migration is measured in the 1991 Census through a question on place of residence one year before. A similar question was asked in the 1981 Census. In between, there were nine years in which no equivalent question was asked nationally. However, an administrative register, the National Health Service Central Register (NHSCR) is used by the Census Office (OPCS) to produce counts of NHS patients re-registering in different Family Health Service Authorities (FHSAs). The NHSCR movement data can be used to establish how unique or typical the migration occurring in the year prior to the Census was in relation to that for the whole decade. This monitoring is important because of the fluctuations in the volume and distribution of migration flows from year to year which are illustrated in the paper.

The second part of this paper describes a database system called TIMMIG, that provides access to the NHSCR time series of inter-FHSA migration from 1975-76 to the current year and a parallel mid-year population estimate series. TIMMIG provides researchers with highly flexible control of output of in-, out- and net migration indicators disaggregated by age and gender for FHSAs or any aggregation thereof.

The third part of the paper describes examples of the valuable information that can be extracted from the database. National time series of migration levels are examined and changing spatial patterns of net and gross migration at different regional scales are identified. In addition, the value of using TIMMIG for local analysis is demonstrated through a more detailed analysis of migration flows within, into and out of Yorkshire and Humberside.

The fourth part of the paper looks in more detail at the two migration data sets for 1990-91. At the time of writing, information on in-migration only is available from the 1991 Census Local Base Statistics. Comparisons are made between the levels of in-migration to FHSA areas recorded in the 1991 Census and in the 1990-91 NHSCR using aggregate data but also using data by quinary age group and gender. Because it is possible to deduce 'student migration' from the 1991 Census, the two data sets are conceptually closer than in 1980-81. The paper reports on the closeness of fit of the two data sets and on where the greatest differences occur.

ACKNOWLEDGEMENTS

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1. INTRODUCTION

The results of the 1991 Census are set to provide migration research with a wealth of information about the characteristics and spatial patterns of internal migrants across the nation in the 12 months prior to 21 April 1991. Some data is currently available from the Local Base Statistics and the Small Area Statistics and this paper utilises in-migrant counts from Table 15 of the LBS in particular. However, the more detailed analysis of the geographical interactions of the country's population will rely on the Special Migration Statistics yet to be 'published' and it remains to be seen whether the Samples of Anonymised Records will be able to contribute much to our understanding of the composition of migration flows below the regional scale.

Despite the problems of underenumeration, the Census is considered to be a source of reliable information and the results are used, for example, for rebasing the estimates of population for subnational areas. However, the value of the migration counts is diminished by virtue of the periodic nature of the Census which allows for only a snapshop of migration behaviour to be taken once a decade. Given this drawback, it is important for migration analysts to be able to monitor changes taking place between Censuses using alternative data sources and to verify the validity of such alternatives by comparative analysis when Census counts are available. One alternative source of continuous time series information on migration, the NHS Central Register of patient re-registrations, has received increased recognition by central and local government authorities as an important database for tracking changes in longer distance migration activity over time. The publication of the Census results presents an opportunity to examine whether the data provided by the two sources is consistent, given the differences in the counts being measured. This analysis is one of the aims of this paper and the results of a preliminary comparison of in-migration rates for Family Health Service Authorities (FHSAs) are presented in Section 4.

It has been argued elsewhere (Stillwell, 1992) that the NHSCR data should be used as the cornerstone of a flexible information system for monitoring migration trends in the UK at different spatial scales. Part of the ESRC-funded project on the 'Analysis of Migration Flows' at the University of Leeds has been to develop such a system and Section 2 of the paper therefore provides some details about a new Unix-based system. Section 3 of the paper contains a series of analyses, for exemplification, that can be undertaken at national, regional and local scales using data obtained from the system. These examples provide a important time series context for the interpretation of Census migration results.

2. TIMMIG: A SYSTEM FOR EXTRACTING AND ORGANISING TIME SERIES MIGRATION INFORMATION FROM THE NHSCR

2.1 Introduction

The NHSCR is a national database whose records are the moves made by individuals between FHSAs. In order to analyse and interpret the data, the records need to be aggregated into meaningful cross tabulations of the flows occurring between FHSAs or aggregations of them, classified by age, gender and time interval. TIMMIG (TIMe series of MIGration data) is the computer software that has been developed to provide selected aggregations of the data via a campus computing network. We envisage the fully developed version of the database and program being made available nationally to the academic community.

The definitional characteristics and shortcomings of the NHSCR data have been described in detail elsewhere in the literature (Ogilvy, 1980; Devis and Mills, 1986; Bulusu, 1991; Stillwell, Boden and Rees, 1992). In this paper, we focus primarily on the nature of the data and the functionality of the TIMMIG program.

2.2 The NHSCR source information

The raw dataset supplied on magnetic tape by the OPCS comprises a series of records giving the origin and destination of each individual re-registration, together with some details about the individual (age, sex, year of birth). The records do not contain information that specifically identifies the person, such as name or NHS identification number. The structure of the record has changed over the time as indicated in Table 1. Most of the changes concern the way in which the origin and destination are identified, with, over time, a greater number of different geographical areas being recognised; some of the changes, however, involve the actual format of the record.

Prior to December 1990, it was assumed that there was a time lag of (on average) three months between a person actually moving house and the move being recorded on the Central Register. This time lag was due to a 'real' delay between a person moving and registering with a new doctor, and in administrative delays in sending the forms to the Register at Southport. As a result, magnetic tapes containing data for a given quarter were assumed to refer to migration events which actually occurred in the *preceding* quarter. For example, a tape containing re-registration data labelled as 'March quarter' (referring to the three months to the end of March) would actually contain data about transfers taking place during the 'December quarter'. Since December 1990, computerisation of the Register has reduced administrative delays, and the average time lag is now estimated to be one month. Consequently, the data on a given tape now contains data about moves occurring during the quarter that the tape is labelled as referring to. That is, the tape for a given quarter contains re-registration data for the last two months of that quarter and the first month of the following quarter. For example, a tape labelled as 'March quarter' will contain records collated during February, March and April; these records are assumed to contain a one month time-lag, and thus refer to moves taking place in January, February and March.

Prior to mid-1983, OPCS supplied the data in files output from their own processing software as follows:

(i) an aggregate origin-destination area array;
(ii) a array of out-migration totals for each area by quinary age group and gender; and
(iii) an array of in-migration totals for each area by quinary age group and gender.

Since mid-1983 when OPCS decided to release individual records (Primary Unit Data), the volume of data has risen significantly - approximately 37 million migration records from

Table 1: Changes in the NHSCR record structure

Period	Form of Record	Number of Zones	Description
1975 quarter 3 to 1983 quarter 2	Table cell	97	Data taken from a series of output tables produced by OPCS. The UK is sub-divided into 97 zones comprised mostly of Family Practicioner Committee areas but with 'Scotland' as a single zone
1983 quarter 3 to 1986 quarter 2	Individual record	111	Primary Unit Data (PUD) made available (ie, a series of individual records) as a 100% sample. The Scottish data are subdivided into 15 Scottish Area Health Boards (AHBs).
1986 quarter 3 to 1990 quarter 3	Individual record	115	'Middlesex', previously one category, is subdivided into five separate areas.
1990 quarter 4 onwards	Individual record	115	The Register data are computerised. This reduces the average time-lag between the patient moving and being re-registered from three months to one month. At the same time the record length is increased to include categories such as date of birth and date of migration.

mid-1983 to mid-1992. To handle this volume of time series data, the following three stage strategy was adopted:

STAGE (1) Create and make accessible an *aggregate migration database* in the form of three aggregated arrays for single years commencing in mid-1975 and running through to mid-92:

> *Origin-Destination-Time (ODT)* array for FHSAs (called Family Practitioner Committees prior to September 1990) has 97 origins and 97 destinations (94 FHSAs in England and Wales plus Northern Ireland, Scotland and the Isle of Man): migrations are aggregated over age and gender;
>
> *Origin-Age-Gender-Time (OAGT)* array of out-migration totals from the 97 FHSAs, disaggregated by five year age groups from 0-4 to 75+ and by gender; and
>
> *Destination-Age-Gender-Time (DAGT)* array of in-migration totals from the 97 FHSAs, disaggregated by five year age groups from 0-4 to 75+ and by gender.

STAGE (2) Create a parallel mid-year *population database* to provide the population denominators in computations of occurrence-exposure migration rates.

This database uses local authority districts (in Great Britain) or OPCS's building blocks (prior to 1983) as the spatial unit. These are the units for which mid-year population estimates are prepared by OPCS and GRO(S) and which can be aggregated to form the populations of the larger units (FPCs/FHSAs in England and Wales; AHBs in Scotland) for which migration data are reported.

STAGE (3) Create an *individual migration database* in compressed form of the individual migrations for the period mid-1983 onwards.

This stage is currently under development and will make it possible to produce single year of age tables or to carry out aggregations not fixed to five year age intervals. It will also introduce the full spatial disaggregation from mid-year 1983 - the addition of AHBs in Scotland - and from mid-1986 - the addition of five FPC/FHSAs that constitute Middlesex.

2.3 The functionality of the TIMMIG system

TIMMIG is designed to allow the user to extract tables of movement and associated population data for selected areas over a chosen time span. The program is operated by means of a command file written by the user. This is a short plain text document which contains a series of instructions for the program to follow.

A successful run of TIMMIG will result in a *table* being written to an output file. A table consists of *layers*, and each layer contains a number of *cells*, which are arranged into *rows* and *columns*, depending on the choices made by the user in the command file. The rows, columns and layers are termed the table's *dimensions*, and may be thought of as analogous to the x, y and z vertices of a cuboid. Assuming that the table is to be printed out, it will be divided up into *pages*, which may contain all or part of a layer (but never parts of different layers). The portion that is printed on each page will have relevant row and column labels and dividing lines. This portion is referred to as a *sub-table*; the term should not be confused with the table as a conceptual whole.

TIMMIG permits users to arrange tables in a flexible manner. Instructions must be given in the command file describing what variable(s) should be tabulated on each table dimension (i.e. row, column, layer). Figure 1 shows the conceptual relationship of the table dimensions by representing a typical table. In this example, the table has a sufficiently large number of rows and columns that a layer will not fit on one printed page. The page numbers shown in parentheses illustrate the manner in which a large table will be distributed over several printed pages. In practice, row and column headings relevant to the portion of the layer will be included on all pages, not just the pages which represent the top and left hand side of the layer as is implied in Figure 1.

An important qualifier to the above description of table layout occurs if the user chooses the table to be printed in export format. This is a method of layout designed to facilitate the export of tables from TIMMIG to other packages. The format has been specifically designed with Microsoft Excel 4.0 in mind, but should be suitable for many other packages. If the standard tabular format was read into a spreadsheet, complications would be introduced because of the vertical stacking of sub-tables. In export format, no restriction is made on the width of output, so that when the file is read into a spreadsheet, it will be in a readily usable form. In effect, the program assumes an infinite page size (permitting any number of rows and columns per page). Most modern spreadsheet software can handle a large number of rows and columns. If problems are encountered then it is probably best to run the program several times, with appropriately altered settings, in order to produce a series of moderately sized tables rather than one very large one.

There are five variables which can be put onto any of the three table dimensions. All three dimensions must have a variable. The variables are: origin, destination, age, gender and time. These can be freely mixed, but obviously can only be included once per table. If a variable is not included on any dimension, then the tabulated cell will be totalled for that variable. For example, if the variables 'origin', 'gender' and 'time' were specified for row, column and layer respectively, then the data in each cell would refer to the flow from a given origin (depending on the row) of persons of a given gender (depending on the column) during a given time period (depending on the layer), to all destinations and for all age groups (because neither of these variables formed a dimension).

If the only arrangement of tables was as defined above, then clearly only three out of the five variables could ever be seen in a table at one time, a situation which is not ideal. However it is possible to display two variables on one dimension. This process is called *collapsing a dimension*, because it allows the user to tabulate data for more categories than would otherwise be possible - a fourth dimension has effectively been collapsed into the table. In the command file, either one or two variables can be chosen for each table dimension. In the output table, data is shown for all conditions of the second variable for each case of the first variable. For example, suppose a table was defined with 'origin' as the first row variable, and 'gender' as the second row variable. The resulting table would

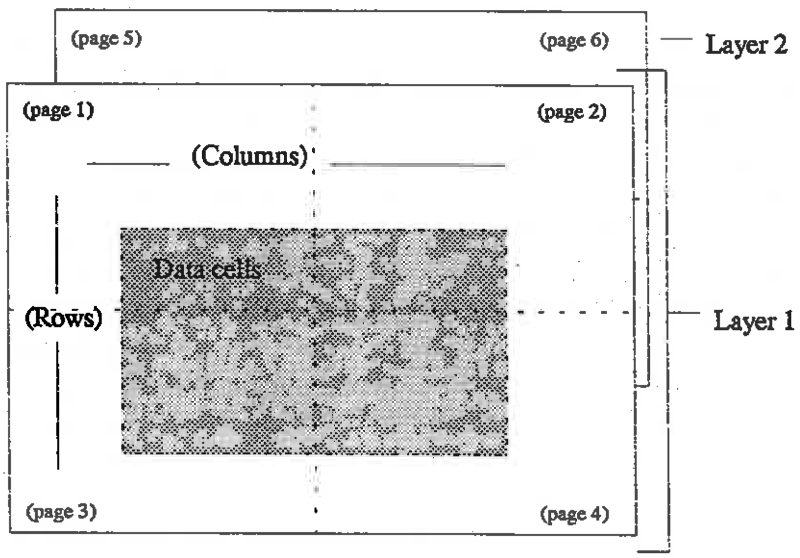


Figure 1: The arrangement of tables in TIMMIG

have a series of rows labelled:

Origin_1 : Male	[col_1]	...	[col_n]
Origin_1 : Female	[col_1]	...	[col_n]
... ...	...	...	...
Origin_n : Male	[col_1]	...	[col_n]
Origin_n : Female	[col_1]	...	[col_n]

As the program permits two variables to be assigned to any dimension, it is obviously possible to display all five variables in one table.

It is possible to include the total of a chosen variable as a dimension. This may be required in order to avoid large outputs. This is done by preceding the variable name in the command file by an ampersand character (e.g. row1=&origin).

As explained above, it is possible to display all possible views of the database (i.e. all the categories can be displayed, in a user-defined arrangement). However, some combinations of variables are deemed to be invalid. There are essentially two types of table which this version of TIMMIG produces: interaction matrices of flows between different areas, and tables of flows to and from given areas by age and gender. The program will not permit tables of the form origin by destination by age and gender to be specified. This is because these queries extract data from existing tables, and the age and gender data in these tables are in the form of national (UK) totals for each FHSA only; the system does not yet contain age-gender specific inter-FHSA flows. The Stage (3) developments of TIMMIG will allow the user to analyse the demographic structure of a flow between two specific areas.

As well as describing how a table will be disaggregated, the definition of variables also serves to create *data filters*; for example, if the origin is defined as Leeds and the destination as Newcastle, then the only data that will be tabulated refers to these regions. All variables will theoretically function as filters as well as table dimensions. For example, if gender is restricted to males only, then only data about male migration will be tabulated, regardless of the table dimensions. However, this functionality is compromised in the initial implementation of TIMMIG. This version draws on previously aggregated tables (the Stage (1) database) which are limited in detail. It is important to remember the relationship between variables, and whether they serve as dimensions or filters in this version of TIMMIG.

There are essentially two types of tables which can be constructed - those with the form [origin by destination] on the one hand, and those with the form [{origin or destination} by {age and/or gender}] on the other. In the former type of table, specific origin and destination zones may be tabulated, but the age and gender settings do not apply. Whatever the definitions of age and gender for this table type, all persons are counted. In the latter type of table however, age and gender may be disaggregated, (and thus used as filter and/or dimension), but there is limited spatial disaggregation. One (only) of the spatial variables must be chosen as a table dimension. There is no difference between origin and destination areas in this case; the category is merely used as a list of zones for which data is to be tabulated. The output will show the interactions between the specific zones (as defined by the list which is chosen as a table dimension) and the whole of the rest of the country. The direction of flow of persons for which data will be extracted in this type of table is determined not by the choice of either 'origin' or 'destination' as a table dimension, but by the choice of 'net', 'in', or 'out migration' as the table statistic.

Figure 2 illustrates the nature of the relationship between the origin and destination groups. Clearly, the more zones that are included in either group, the larger the output tables will be. As Figure 2 implies, interactions between areas within either of the origin or destination groups are not specifically tabulated in the output. If the user wishes to obtain such interactions, then it would be necessary to define both the origin and the destination groups as including the areas of interest. For example, if the districts of West Yorkshire were defined as the origin zone, and the districts of Greater Manchester as the destination zone, then the resulting tables would contain data regarding the flows between districts in either group, but would not contain data about flows between districts within a group. If this information was required as well, it would be necessary to define both groups so as to include the districts of West Yorkshire and Greater Manchester. If both groups are defined as including exactly the same areas, then it is worth noting that the output tables may include a mirror-image of themselves. Figure 3 illustrates the general layout of such tables in TIMMIG output, by showing how a table which includes both origin and destination as table dimensions will contain a line of symmetry. It should be remembered, however, that as created tables are multidimensional, the line of symmetry will not always be so clear.

In order to optimise the amount of data that is extracted, analysis should ideally be performed at the coarsest geographical scale that includes the required data; i.e., using the example mentioned above, if it was decided that the only data that was actually required was that concerning movements between West Yorkshire as a whole and Greater Manchester as a whole, then the data extraction should be made at county level, in order to avoid tabulating all the districts of the two areas. The same relationships between the two groups will exist at this and all scales: defining the county of West Yorkshire as one group and Greater Manchester as the other will produce output showing the total moves between the two counties. If, however, the two counties are included in the definition of both groups, then the output will also show total moves between the districts within the county.

All figures are summed from FHSA interactions, and intra-FHSA moves are not recorded in the NHSCR. Hence if an output table contains the same FHSAs in both groups then the figure for the moves within an FHSA (e.g. Leeds to Leeds) will be shown as zero, despite the fact that, in reality, there are obviously many such moves (in fact, this should be the largest single flow involving Leeds). A consequence of this is that all moves within a larger area (e.g. West Yorkshire to West Yorkshire) will be significantly under-represented. In the case of West Yorkshire, the internal flow would be the sums of flows between Leeds and all other districts, Bradford and all other districts, etc. It may be the case that the user decides that these intra-group flows are not wanted in the output, because they will adversely affect totals. For this reason an option is included in the program to ignore these 'intra-cell' moves.

Finally, when the user has chosen which areas are to be included in the analysis, it is then

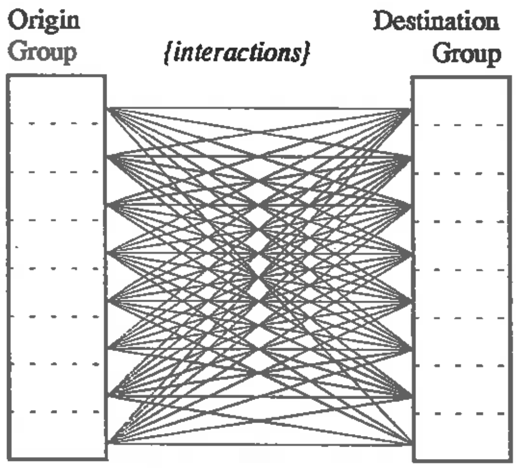


Figure 2: A diagrammatic representation of the relationship between the origin and the destination groups in TIMMIG

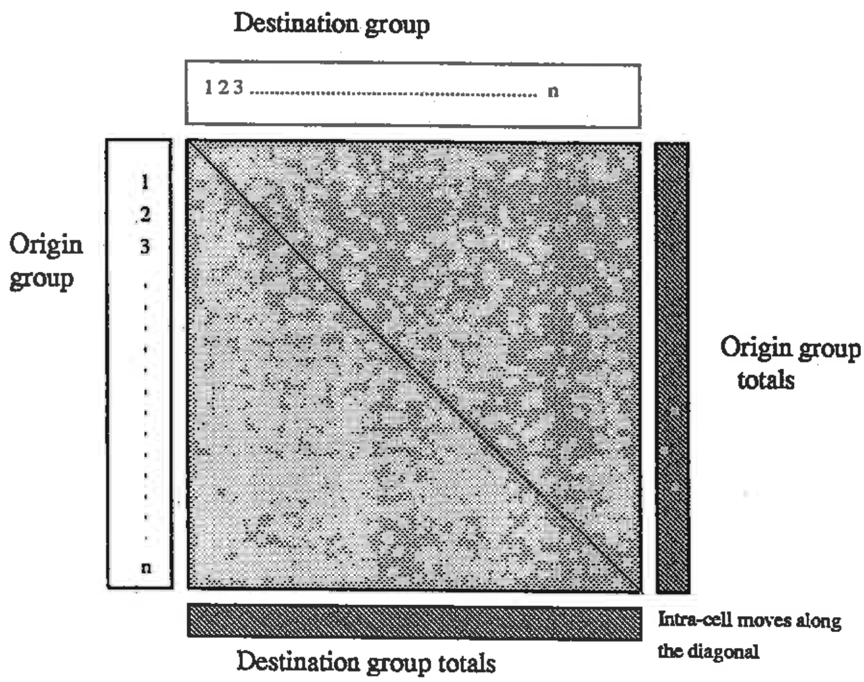


Figure 3: The general layout of interaction matrix tables in TIMMIG

necessary to consider how to structure the table - that is, which variables to assign to each table dimension. There are two important considerations in this: firstly, how easily tables can be read by the user, and secondly, how much space they will take up (in terms of both computer disk space and paper on which the table will be printed). Ideally, the user should plan tables that will contain no more detail than is required, and will maximise the efficiency of how it fits on to a sheet of paper.

2.4 An example of a data extraction

An example of a command file for data extraction from the NHSCR database using TIMMIG is illustrated in Figure 4. Here, net migration data is requested for a user-defined subset of zones for a time series of 10 years commencing in September 1981. The '*scale=userdef1*' command identifies a file called userdef1.agg which contains a list of required areas. The '*intracell=off*' command stops the program from counting moves between those FHSAs in a defined zone. Thus, for example, in the output file presented in Figure 5, the moves between FHSAs within the 'Rest of England' or 'Wales' will not be included. A number of additional examples of commands and output files are contained in the user manual (Duke-Williams and Rees, 1993).

2.5 Accessing and operating TIMMIG

TIMMIG comprises a number of FORTRAN programs which are run as required by UNIX shell scripts. These scripts allow the UNIX job control features to be exploited, allowing multiple users to run the programs at the same time, and allowing users to run jobs as background or foreground tasks. Command line options allow large jobs to be run at night after the user has logged out. The FORTRAN programs also make use of SUN Fortran language extensions which allow co-operative use of (UNIX) system commands; these extensions are used to facilitate file handling and manipulation and to streamline the main program at runtime in order minimise memory/disk usage.

As indicated previously, TIMMIG is run by means of command files which contain a series of instructions. Two modes of operation are currently provided; the command '*Timmig <filename>*' will run the command file specified as a batch job, whereas the command '*Timmig*' is used to enter a menu driven environment where command files can be selected and run. This menu driven environment is being extended to allow interactive editing and construction of command files and other support files.

The system is designed to be as flexible as possible. The tables created have three logical dimensions, and the five dimensions of the data (origin, destination, age, sex, year) can be arranged on the table in any way required by the user, subject to constraints implied by the data detail. A variety of output styles are supported, and a range of optional commands allow output to be modified. The program is written in a flexible modular style allowing efficient upgrading and addition of new features.

Future developments will permit the usage of a database constructed from individual NHSCR records rather than pre-aggregated tables. This will improve the system flexibility

```
start

author=A Geographer
title=An example command file for TIMMIG
printer=narrow
filename=example5.out
output=table

# Temporal parameters...
tstart=1980
quarters=4
tperiods=10

# Spatial parameters...
scale=userdef1
origin=all;
destination=all;

# Arrangement of table...
row1=origin
column1=time
layer1=&destination
statistic=net migration
intracell=off

# Aggregation of age and sex...
age=fiveyear
gender=mf

end
```

Notes:
This example uses the 'intracell=off' option to prevent moves between FHSAs within a defined zone from being counted. The example also makes use of the '&' prefix to force the layer variable (destination) to be tabulated as a total only.

Figure 4: Example of a command file to generate a time series of net migration flows for a user-defined geography

```
******************************************************************************
#####  ###  ##    ##  ##    ##  ###   ###
  #     #   # # # #  # # # #   #   #   #        Version 2.01
  #     #   #  #  #  #  #  #   #   #
  #     #   #     #  #     #   #   #  ##        June 1993
  #    ###  #     #  #     #  ###   ###

Written by: Oliver Duke-Williams
                - School of Geography, University of Leeds
******************************************************************************

Total number of pages:   1

Layout of printed pages in first layer:

             Columns
           1          10
           ------------>
Rows
  17    V   [ Page   1 ]
------------------------------------------------------------------------------

Table structure:
Origins by Time by Tot. Destinations

Statistic:
Net migration
------------------------------------------------------------------------------

------------------------------------------------------------------------------
An example command file for TIMMIG
A Geographer
User:geo6odw        Date:Tue Sep  7 10:26:33 BST 1993        Page:  1
------------------------------------------------------------------------------
```

Tot. Destinations Totals Origins	Time 81q3-82q2	82q3-83q2	83q3-84q2	84q3-85q2	85q3-86q2
Barnsley	-660	-1010	-1044	-1068	-1437
Doncaster	-1320	-520	-1776	-986	-825
Rotherham	-580	-650	-1282	-828	-1057
Sheffield	-280	-1090	-2163	-2109	-3058
Bradford	-950	-1650	-1501	-2881	-2154
Calderdale	-340	-40	-482	336	369
Kirklees	-730	-1100	-594	-1479	-869
Leeds	-2300	-970	-2623	-1903	-2475
Wakefield	-810	-1200	-1319	-960	-1912
Humberside	-780	-710	-1329	-1184	-586
North Yorkshire	3550	3640	5957	5294	4129
Rest of England	4540	13000	24430	16705	23847
Scotland	-310	-6870	-14184	-11354	-15685
Wales	3450	1930	1180	4877	4969
Northern Ireland	-2520	-2590	-3530	-2644	-3677
Isle of Man	40	-170	260	184	421
Totals	0	0	0	0	0

Tot. Destinations Totals Origins	Time 86q3-87q2	87q3-88q2	88q3-89q2	89q3-90q2	Totals
Barnsley	-1043	-688	780	-13	-6183
Doncaster	-1376	135	371	226	-6071
Rotherham	-1108	-580	1014	96	-4975
Sheffield	-2075	-3785	-1900	-819	-17279
Bradford	-3030	-562	304	-1363	-13787
Calderdale	154	-8	521	113	623
Kirklees	-2072	-905	22	-819	-8546
Leeds	-4041	-1152	-2044	-2137	-19645
Wakefield	-119	38	1108	360	-4814
Humberside	-812	3068	3667	1854	3188
North Yorkshire	7388	6593	6588	3458	46597
Rest of England	20618	5034	-9588	-11273	87313
Scotland	-16092	-19548	-10854	7757	-87140
Wales	8993	17528	15991	4858	63776
Northern Ireland	-6438	-6672	-7113	-3712	-38896
Isle of Man	1053	1504	1133	1414	5839
Totals	0	0	0	0	0

Figure 5: Example output from command file illustrated in Figure 4

and allow previously unavailable data to be extracted. This stage of development will also improve the spatial detail of the system, allowing migration trends between Scottish Area Health Boards to be examined.

3. TRENDS IN MIGRATION AT NATIONAL AND LOCAL LEVEL

Much analysis of and commentary on temporal trends in internal migration in the UK in recent years has used NHSCR movement data (Bulusu, 1989; 1990; Stillwell, Boden and Rees, 1990, for example) and a detailed examination of population redistribution patterns was conducted as part of the research undertaken by members of the IBG Limited Life Working Party on 'Migration' (Stillwell, Rees and Boden, 1992). In this section of the paper, we seek to update trends occurring within zonal systems used in previous work in order to exemplify the importance of TIMMIG as an information system for use in effective migration monitoring.

3.1 Variations in the national migration level

The last two decades have seen considerable economic and social fluctuations. Indicators of the economy allow us to measure the depth of recession in the early 1980s compared with the early 1990s, for example, whereas indicators of the housing market allow us to track house prices and sales that may also reflect relative economic prosperity. Since migration activity is a partly a function of opportunities arising in different types of market, changes in the total level of migration taking place in the country are expected although the myriad of explanatory factors impinging upon the decision to migrate for each individual or household is likely to obscure the easy interpretation of aggregate patterns.

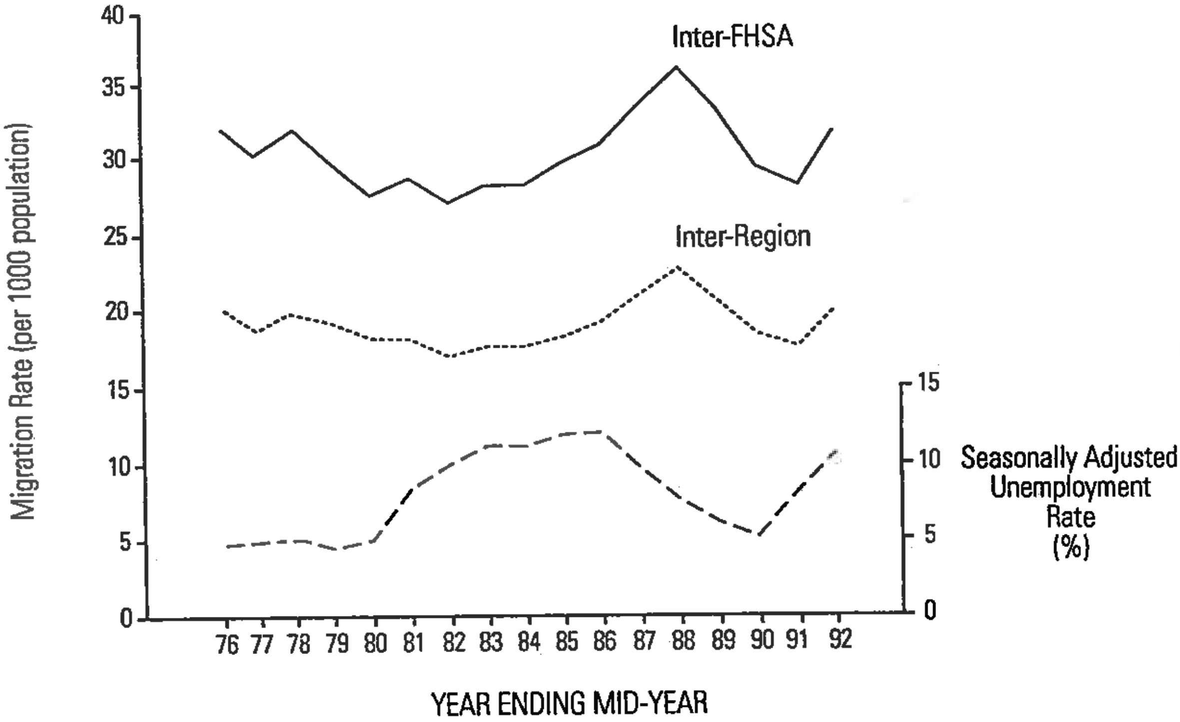
It is apparent from the time series data (Table 2) that national migration propensities fell during the second half of the 1970s, increased progressively from a low in 1981-82 to a peak in 1987-88, declined rapidly to 1990-91 and have picked up again since then. The time series of rates for moves between FHSAs (Figure 6) runs in parallel with the series of inter-region movement rates. Table 2 shows that over 2 million moves took place between FHSAs in 1987-88 compared with 1.6 million in 1981-82 and in 1990-91. Do these time series schedules show any obvious relationship with the key economic indicator of unemployment rate? A consistent time series of seasonally adjusted unemployment rates has been plotted in Figure 6 which captures the rise and fall of unemployment during the 1980s and the subsequent increase associated with the current recession. Given the time lags that are likely to influence the relationship between the two variables, it is plausible to suggest that the lowest migration propensities occurred after a period of appreciable increase in unemployment, whilst the highest migration propensities followed lower unemployment rate increases in the mid-80s and declines after 1986. The second half of the decade was a period of relative prosperity which saw rapid house price increases spreading out from the South East whose economy was booming disproportionately. The return of recession and its spread throughout the rest of the nation within six months of its commencement in the South East in mid-1990 resulted in unemployment rates rising rapidly. This appears to be coincident with a stemming of the rapid decline in migration propensity evident after 1987-88.

Table 2: Yearly movement totals and rates, 1975-92

	Inter-FHSA area		Inter-Region	
Period	Total (000)	Rate (per 1000)	Total (000)	Rate (per 1000)
1975-76	1,931	32.9	1,178	20.1
1976-77	1,789	30.6	1,092	18.7
1977-78	1,879	32.2	1,155	19.8
1978-79	1,762	30.3	1,094	18.8
1979-80	1,633	28.0	1,021	17.5
1980-81	1,691	29.0	1,051	18.0
1981-82	1,595	27.4	987	17.0
1982-83	1,658	28.5	1,033	17.7
1983-84	1,677	28.8	1,041	17.9
1984-85	1,725	29.5	1,069	18.3
1985-86	1,806	31.3	1,127	19.6
1986-87	1,900	33.4	1,187	20.9
1987-88	2,049	36.0	1,300	22.8
1988-89	1,948	34.1	1,235	21.6
1989-90	1,713	29.9	1,081	18.9
1990-91	1,610	28.0	1,003	17.4
1991-92	1,798	31.2	1,121	19.5

Notes:
(i) The FHSA area set includes the 94 FHSA areas in England and Wales, plus Northern Ireland, Isle of Man and Scotland as single units.
(ii) The region set includes Greater London, Rest of the South East plus the Isle of Man and remaining UK regions.
(iii) Rates are computed using mid-year population estimates for the UK.

Sources: NHS Central Register; OPCS, GRO Scotland.



Sources : NHS Central Register;
Seasonally Adjusted Regional Unemployment series (NOMIS)

Figure 6: National migration and unemployment rates, 1976-92

3.2 Age-gender variations over time

Changes taking place in the migration rates of those in age and gender-specific subgroups of the population can be assessed using a time series index where 1980-81 data is used as the base year and takes the value of 100. This enables rates for other years before and after 1980-81 to be compared as a percentage of the base year rate. In Figure 7, appreciable differences are evident in the rate index series for different quinary age groups. Contrast, for example, the relative decline in the rates of migration of the very young over the time interval with the phenomenal increase in migration rates of the very old. Most of the schedules do repeat the cycle shown by the aggregate schedule, but it is clear that there is a pronounced age effect in migration over time. In most ages groups up until age 40-44, rates of migration relative to 1980-81 are marginally higher for women than men. However as age increases, the rise in male migration rates diverges increasingly from the rise in female rates.

3.3 Spatial trends at selected geographical scales

Whilst trends in the composition of migration flows are of concern to planners and service providers, the changing geography of internal migration in the UK can also be monitored at selected spatial scales. This section briefly illustrates some of the trends occurring nationwide at five levels: (i) north and south; (ii) four macro regions, (iii) 11 standard regions (plus Greater London) (iv) 18 metropolitan regions, their region remainders and the remaining standard regions; and (v) FHSAs.

The time series of net migration balances between the North and the South since 1975 (Figure 8) indicates that a fundamental reversal took place in the second half of the 1980s when substantial net gains to the South from the North were succeeded by net gains to the North from the South in 1987-88 and 1990-91. This turnaround aligns with the hypothesis that conditions in the South, particularly relating to the housing market, encouraged more movement away from the South, as indicated by the buoyancy of the index of migration flows from South to North compared to that of flows in the opposite direction (Figure 8). This pattern does not mean that all areas in the South and North were experiencing a reversal of losses and gains. This is clearly untrue since Greater London has always manifest high net migration losses whereas the remainder of the South has recorded high net migration gains. Figure 8 does illustrate the relationship between these losses and gains over time and shows that in 1988-89, whilst Greater London was continuing to lose over 70,000 people, the Rest of the South experienced a significant decline in net in-migrants. At this time, net moves to the regions constituting the 'Industrial Heartland' (North west, Yorkshire and Humberside, West Midlands) became positive and losses to those regions of the 'Periphery' (Northern Ireland, Scotland, Wales and the North) continued to diminish. Analysis of the gross components of net migration (Figure 8) confirms greater fluctuation in the index of Greater London's out-migration rate compared with that of its in-migration rate. In contrast, the in-migration rate indices for the Industrial Heartland and the Periphery show greater rises than the out-migration rate indices.

Figure 9 takes the analysis to the finer scale of region and looks at both in- and out-migration rates. The graphs order the regions by the overall level of in- or out-migration

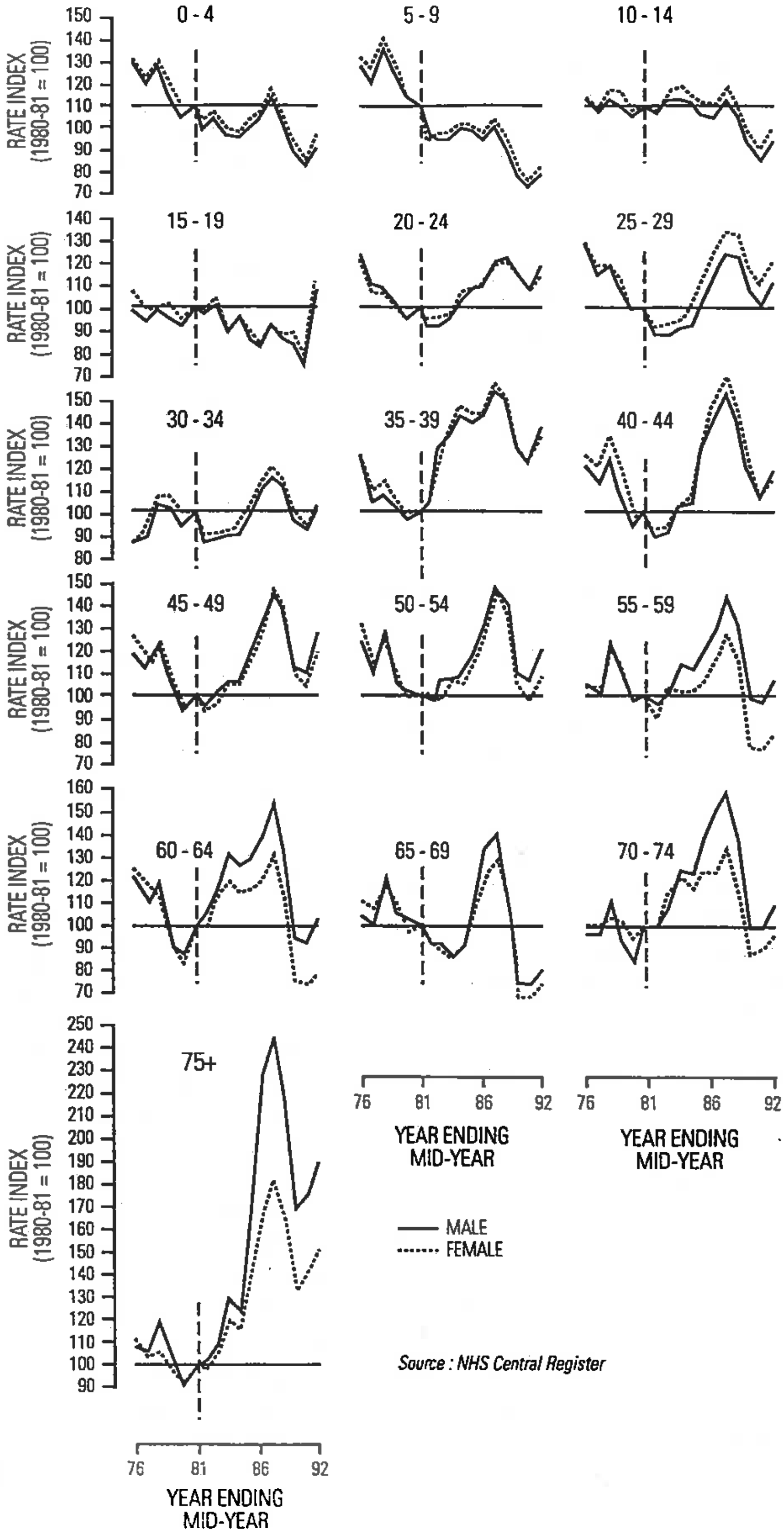


Figure 7: Age- and gender-specific migration rates between FHSAs, time series indices, 1975-76 to 1990-92

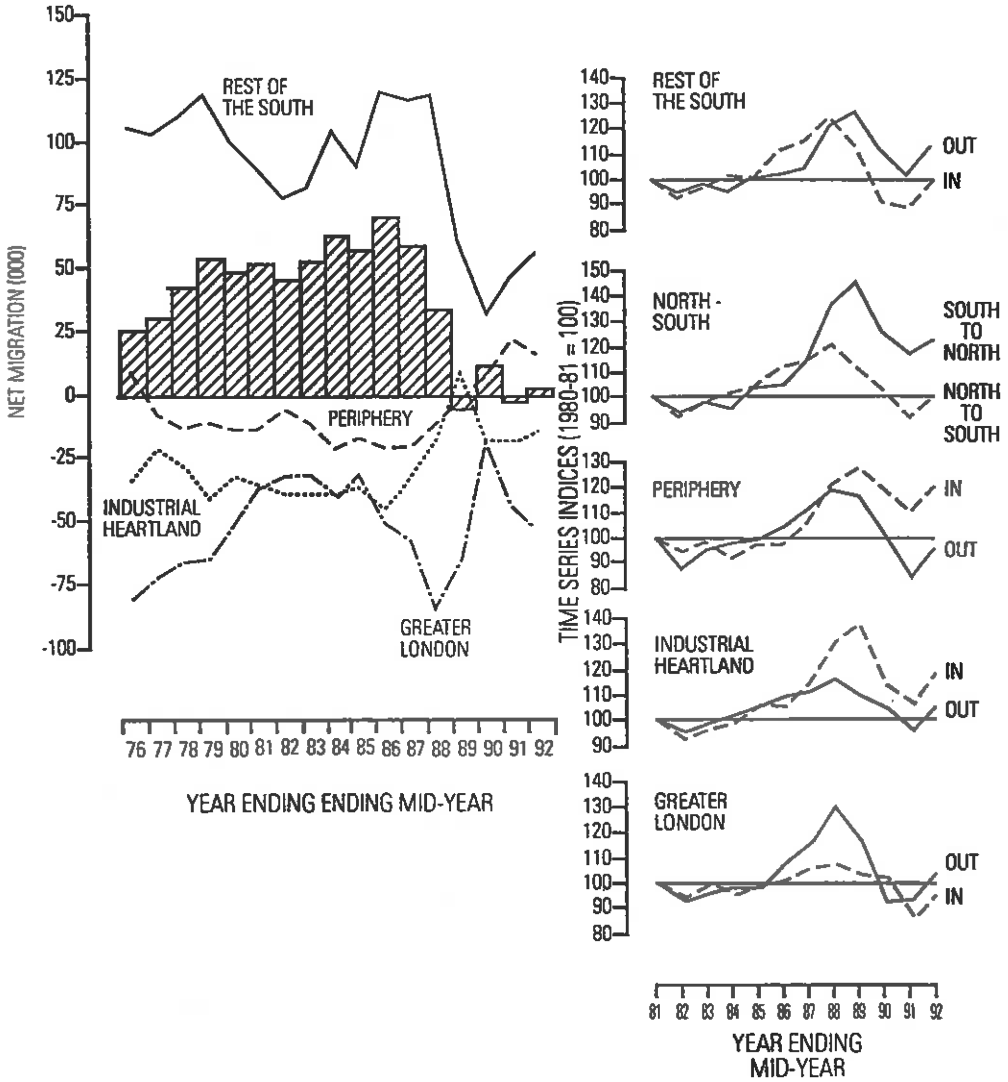


Figure 8: Net migration rates and gross migration indices, macro regions, 1975-92

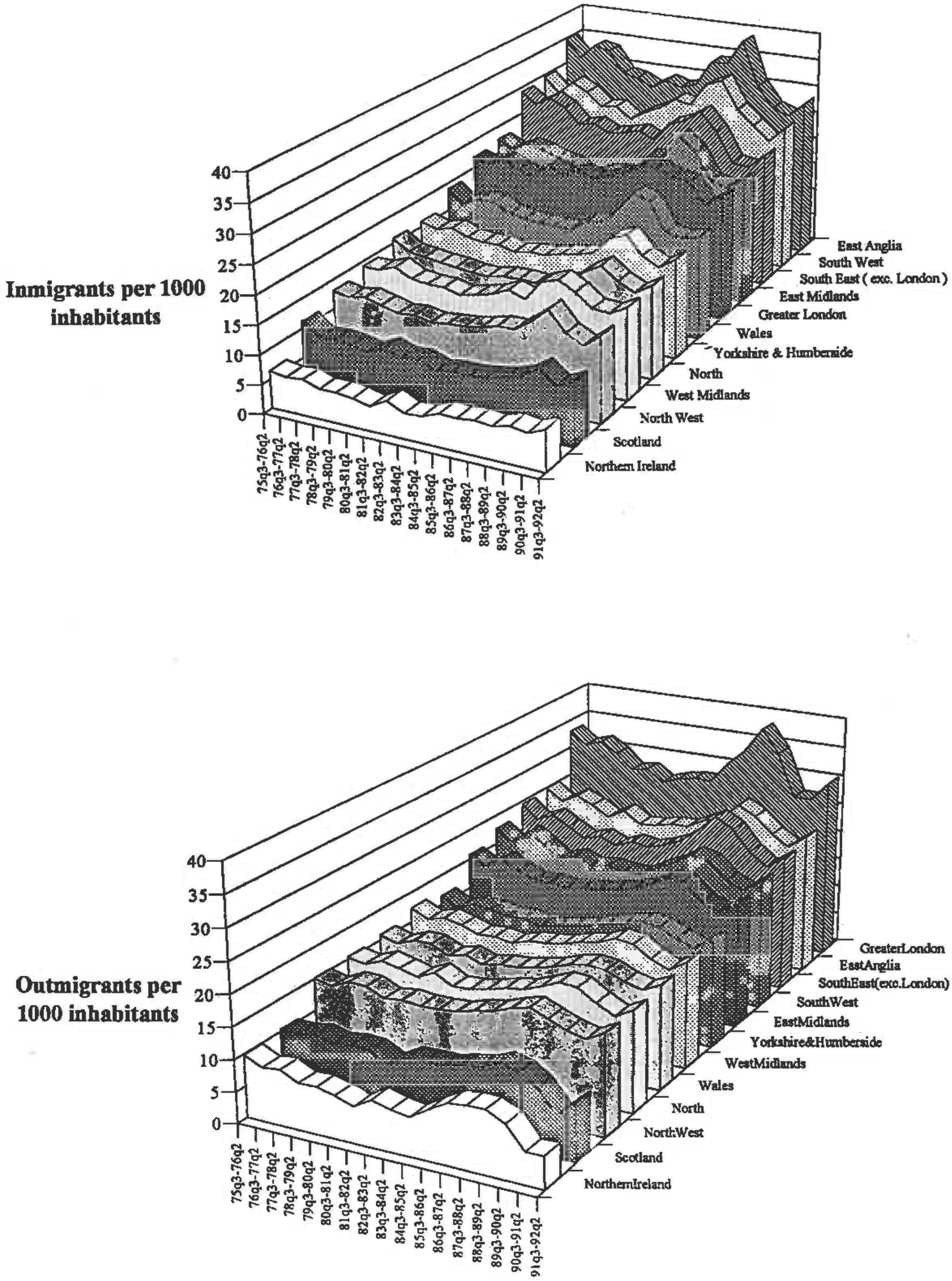


Figure 9: In- and out-migration rates, standard regions, 1975-92

respectively. The close connections between the regions of southern Britain are clear from the fluctuations and high in-migration rates into East Anglia, the South West and the South East (excluding Greater London), the East Midlands and Wales which proceed in tandem and are linked to the out-migration rate fluctuations of Greater London.

The northern English regions have lower in- and out-migration rates and less pronounced fluctuations. Both Yorkshire and Humberside and the West Midlands join in the late 1980s migration boom to a greater extent than the North and the North West. Scotland and Northern Ireland show much lower rates of migration and different timing sequences from other UK regions are also apparent. Outmigration rises slowly in the late 1980s boom from Northern Ireland in response to better opportunities in Great Britain but falls sharply once the recession starts. The level of in-migration to Northern Ireland is relatively low throughout the period since 1975.

These regional figures conceal the well known duality present in all regions between metropolitan cores showing net migration losses and region remainders exhibiting gains of greater or lesser strength. Figure 10 graphs the net and gross migration rates for such units. Metropolitan counties show net losses in most years, with remainders showing gains. The magnitude of these losses and gains varies regionally, from substantial losses from Merseyside, greater Manchester and Greater London to substantial gains in East Anglia and the South West (Greater London's outer sphere of influence). In general, the net migration fluctuations appear more closely tied to the in-migration series with out-migration providing the steadier base level.

At the finest spatial scale possible with the NHSCR data, the FHSA, maps can be used to illustrate the patterns and their fluctuations more effectively. Figure 11 captures the spatial pattern of aggregate net migration in the years around the 1981 Census (1980-82) and the 1991 Census (1990-92). The fundamental pattern of displacement from the big cities and the old industrial belts continues largely unaltered. However, in the more recent period, the net gains in migration are further displaced from London than in 1980-82 (with greater gains in Lincolnshire and North Yorkshire), and the zone of net outmigration in the South East has spread to the counties immediately surrounding Greater London (Berkshire, Hertfordshire, Kent). In addition, a number of counties in northern and midland Britain have moved from being net losers to being net gainers (Durham, Humberside, Nottinghamshire, Staffordshire, Warwickshire, South Glamorgan and West Glamorgan). These shifts from the 1980-82 pattern reflect the changed position of London and the northern regions in the early 1990s. The early nineties recession has had its impact in the property, housing and financial services sectors which had boomed in the middle and late 1980s in the South East, whereas the earlier recession had focused on the restructuring and downsizing of the manufacturing sector in the midlands and northern regions.

Clearly the geographical patterns of net migration are age-specific and the aggregate balances illustrated in Figure 11 conceal significantly different patterns as even the maps in Figure 12 for two broad age groups, those aged 15-24 and those aged over 60, suggest.

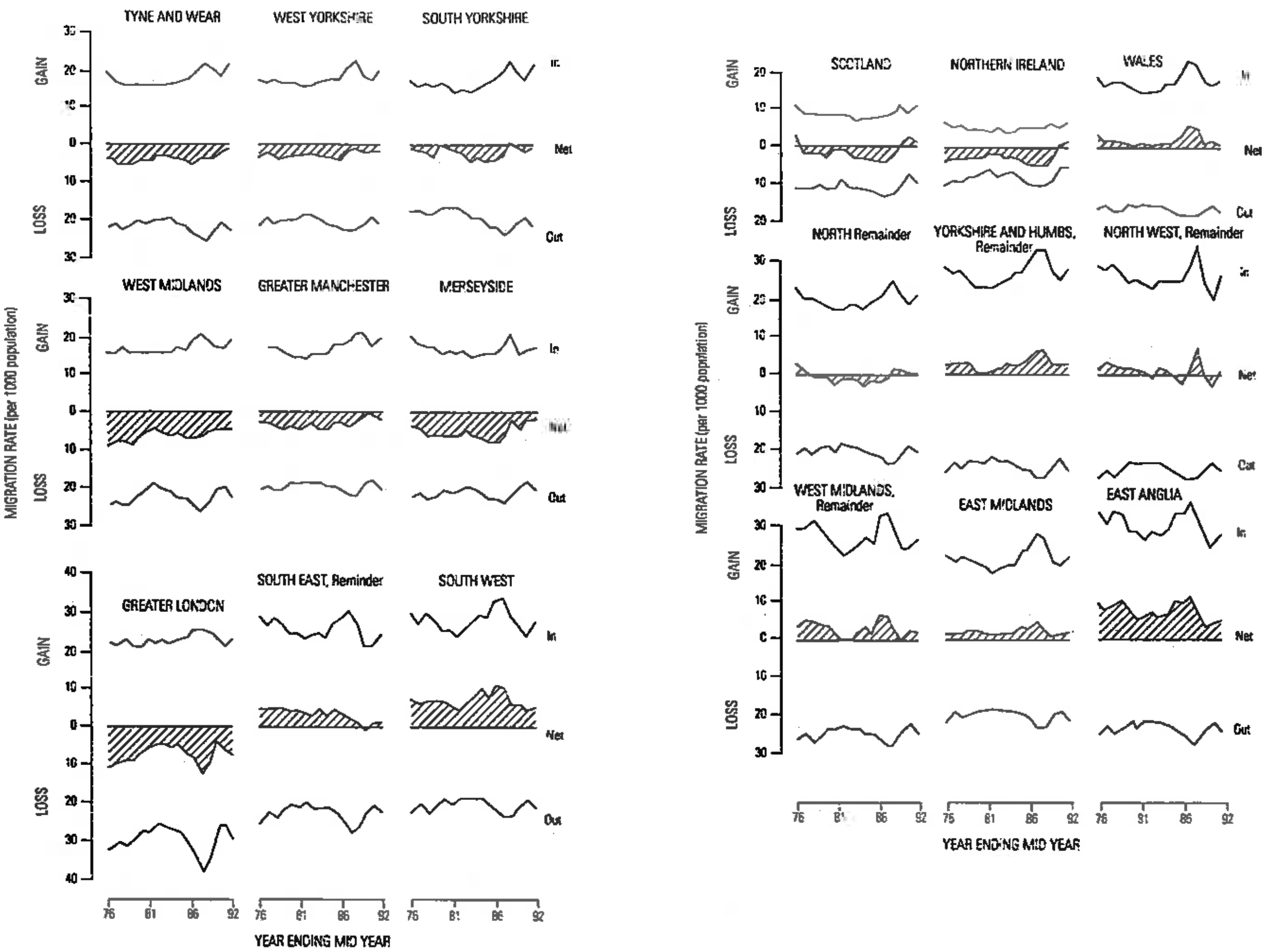


Figure 10: Net and gross migration rates, metropolitan and non-metropolitan regions, 1975-92

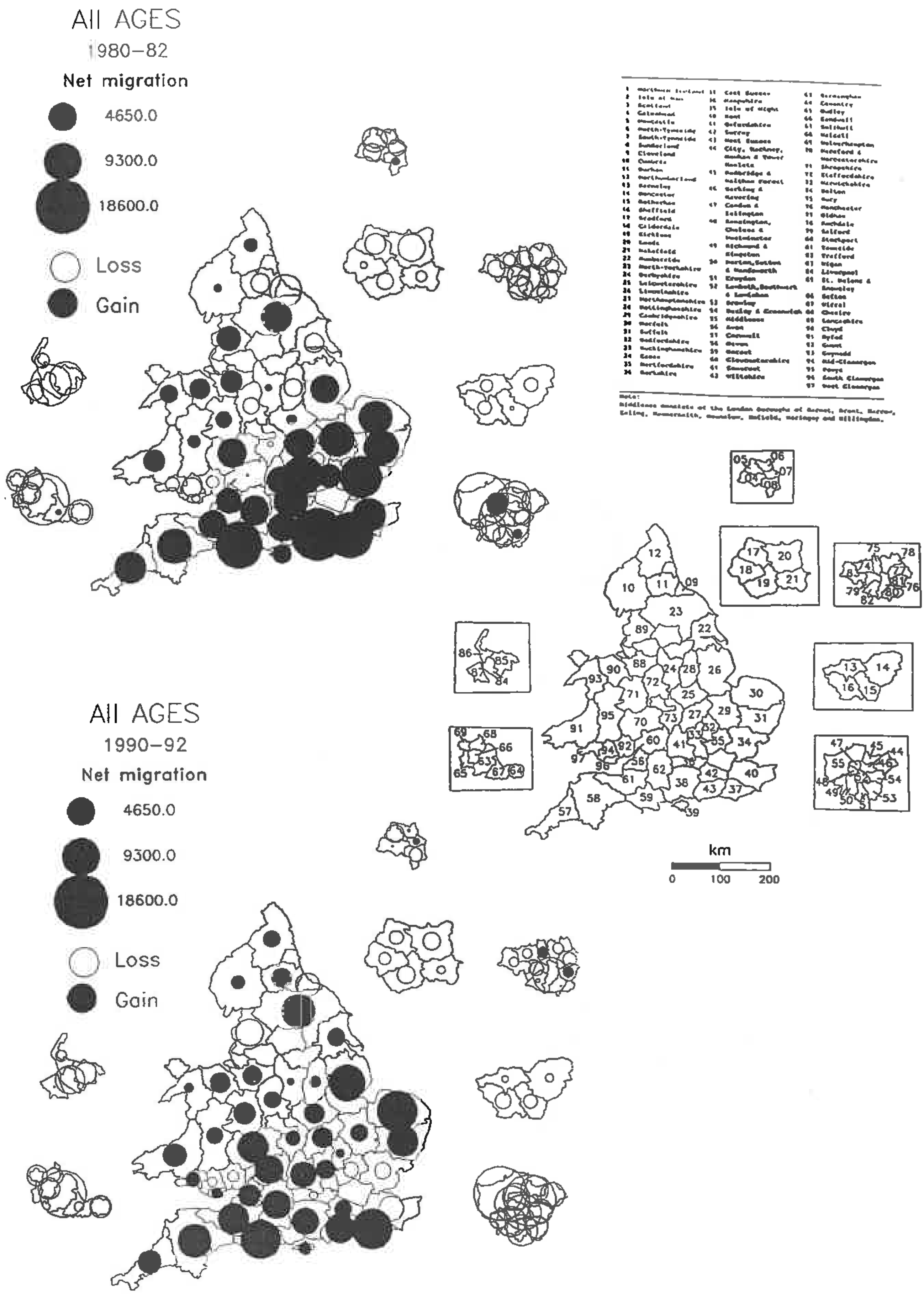


Figure 11: Average annual net migration balances for FHSAs, 1980-82 and 1990-92, all ages

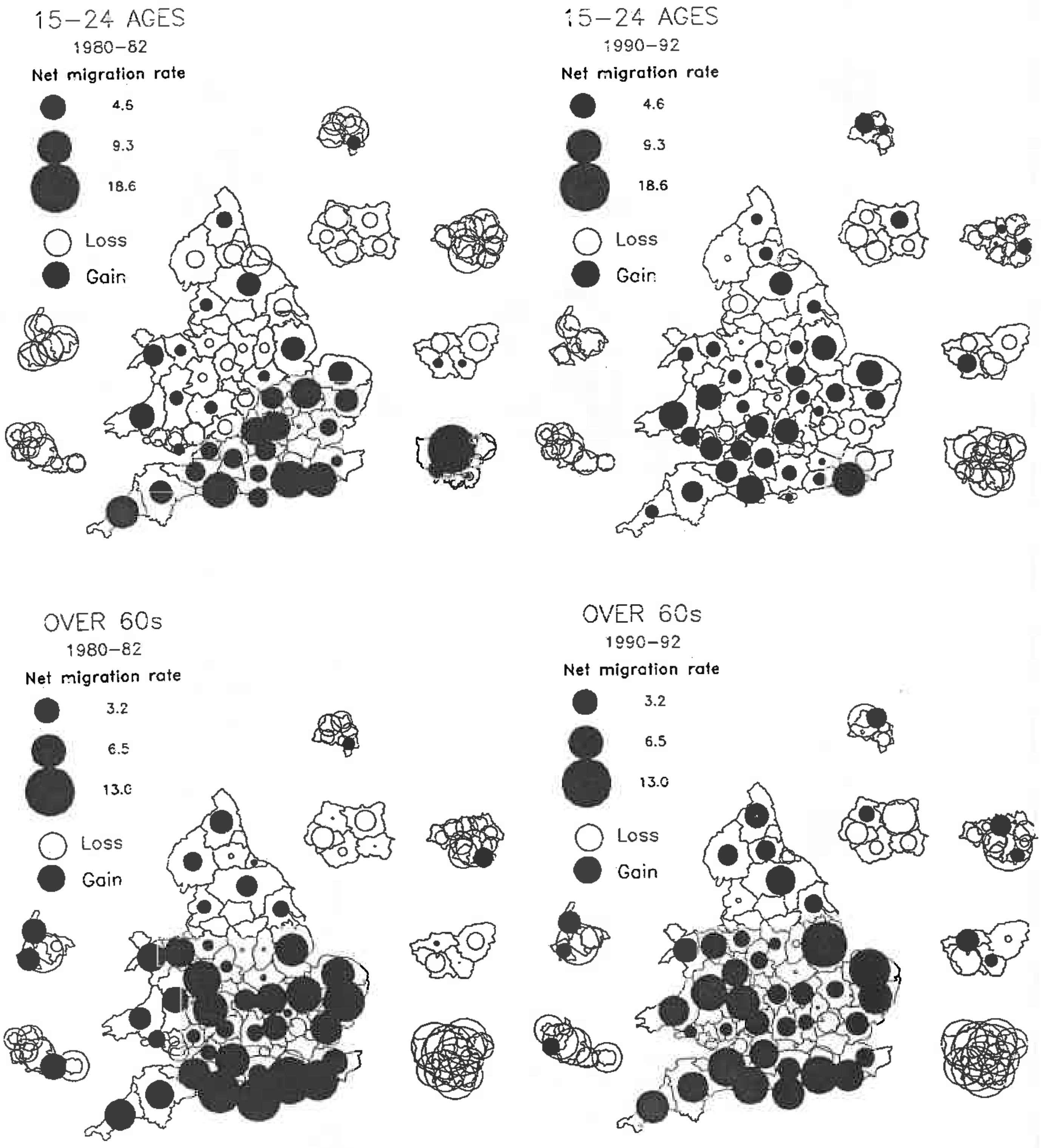


Figure 12: Average annual net migration balances for FHSAs, 1980-82 and 1990-92, age groups 15-24 and over 60

3.4 Migration trends in Yorkshire and Humberside

Whilst the NHSCR data can be used in this way to monitor changes occurring nationwide based on various regional aggregations of FHSAs, several local authorities have begun to use the data for tracking fluctuations in the level, composition and geographical pattern of migration between Censuses in the course of generating their own mid-year population estimates. In a recent study for the nine metropolitan and two shire authorities and the Department of the Environment in Yorkshire and Humberside (Yorkshire and Humberside Regional Research Observatory, 1993), TIMMIG was used to extract the relevant data for this zone subset and to assemble a consistent time series of NHSCR migration flows from mid-1975 to mid-1992 to establish what changes had occurred over time. This analysis provided a context for the selection of some net migration scenarios for use in generating new projections of populations and households in 2001 and 2006.

During the 1980s, and in the context of the changing levels of migration referred to previously at the national level which were reflected in the changes in the migration propensity into, from and between local authorities in Yorkshire and Humberside, the region's net migration balance experienced a dramatic turnaround (Figure 13). In 1986-87, Yorkshire and Humberside lost over 10,000 persons through its migration exchange with the rest of the country; in 1988-89, the region gained over 10,000. This experience was paralleled in the North West whilst the North also achieved a positive balance by 1991-92.

Extended time series of net migration balances for each of the 11 local authority areas in Yorkshire and Humberside are also presented in Figure 13. This set of histograms shows variations in the relative magnitudes of net losses and gains since 1975. Whereas all the metropolitan districts apart from Calderdale lost migrants in net terms between 1982 and 1987, the last five years have seen either reduced losses or losses turning to gains. Calderdale is the exception although population change through net migration appears to be relatively less important in this district. At the county scale, the patterns of net migration over the 1980s indicate a reduction in net losses from the two metropolitan counties, a transformation from net loss to net gain in Humberside and a reduction in net gain by North Yorkshire in the 1990s relative to the late 1980s. In all four counties, the pattern of net migration appears to have been most influenced by the increase in in-migration which occurred in mid-decade and which peaked in 1987-88.

Net migration balances over the decade for each local authority area are summarised in Table 3 where NHSCR net migration balances with the rest of the UK are compared with the Registrar General's estimate of migration as a residual component once natural change has been subtracted. The differences between the two figures for mid-1981 to mid-1991 can be interpreted as a measure of the 'external' net migration balances for each area with the rest of the world outside the UK over the decade plus any other changes or adjustments that have been made.

The mid-1980s was a period which saw the most substantial net exchanges of migration between the region's counties and the rest of the UK, as indicated by the net flows in the schematic framework presented in Figure 14. Within the region, inter-county exchange has been dominated by the net losses from West Yorkshire to North Yorkshire. West Yorkshire has also lost fewer numbers consistently to Humberside whilst South Yorkshire has also lost

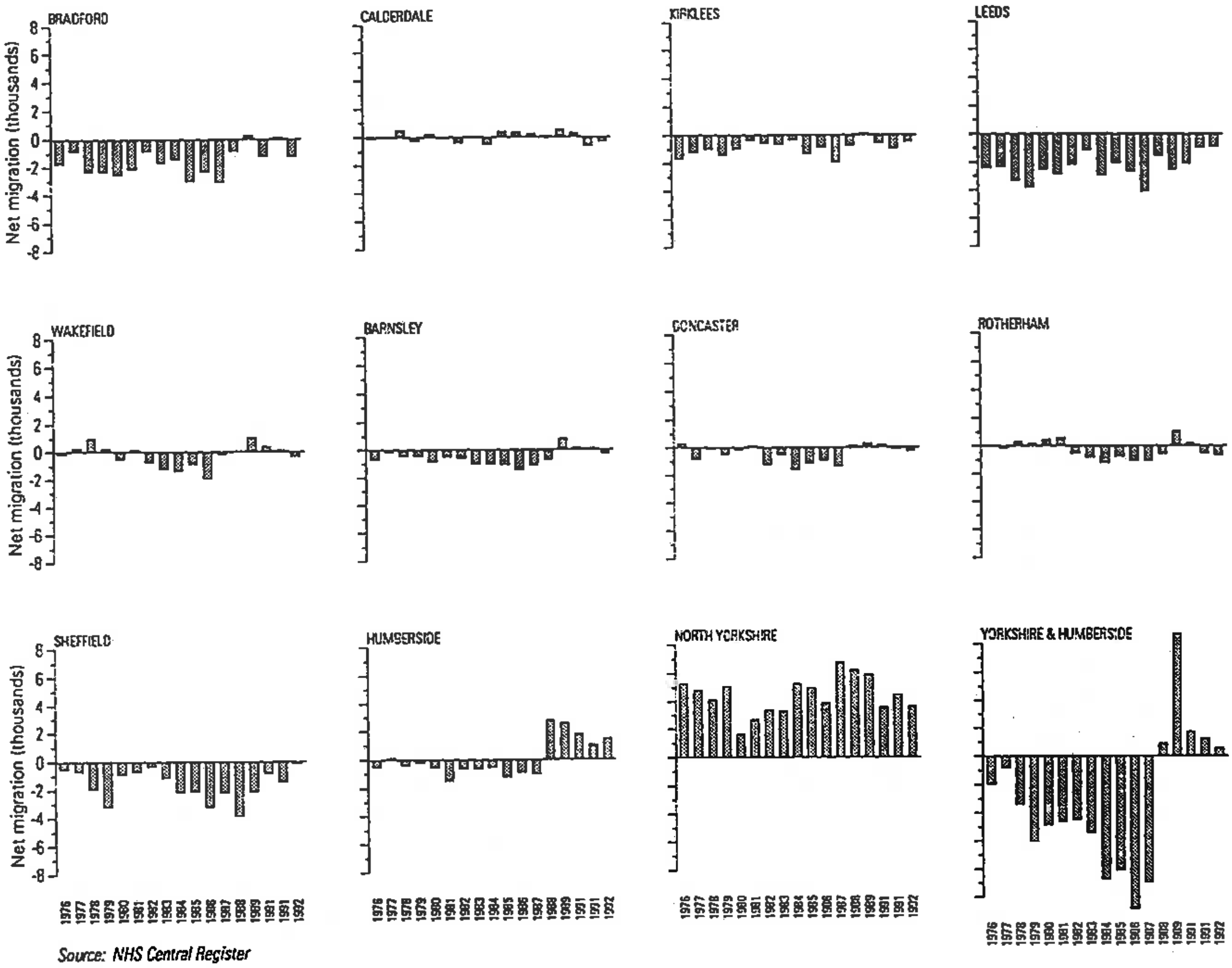
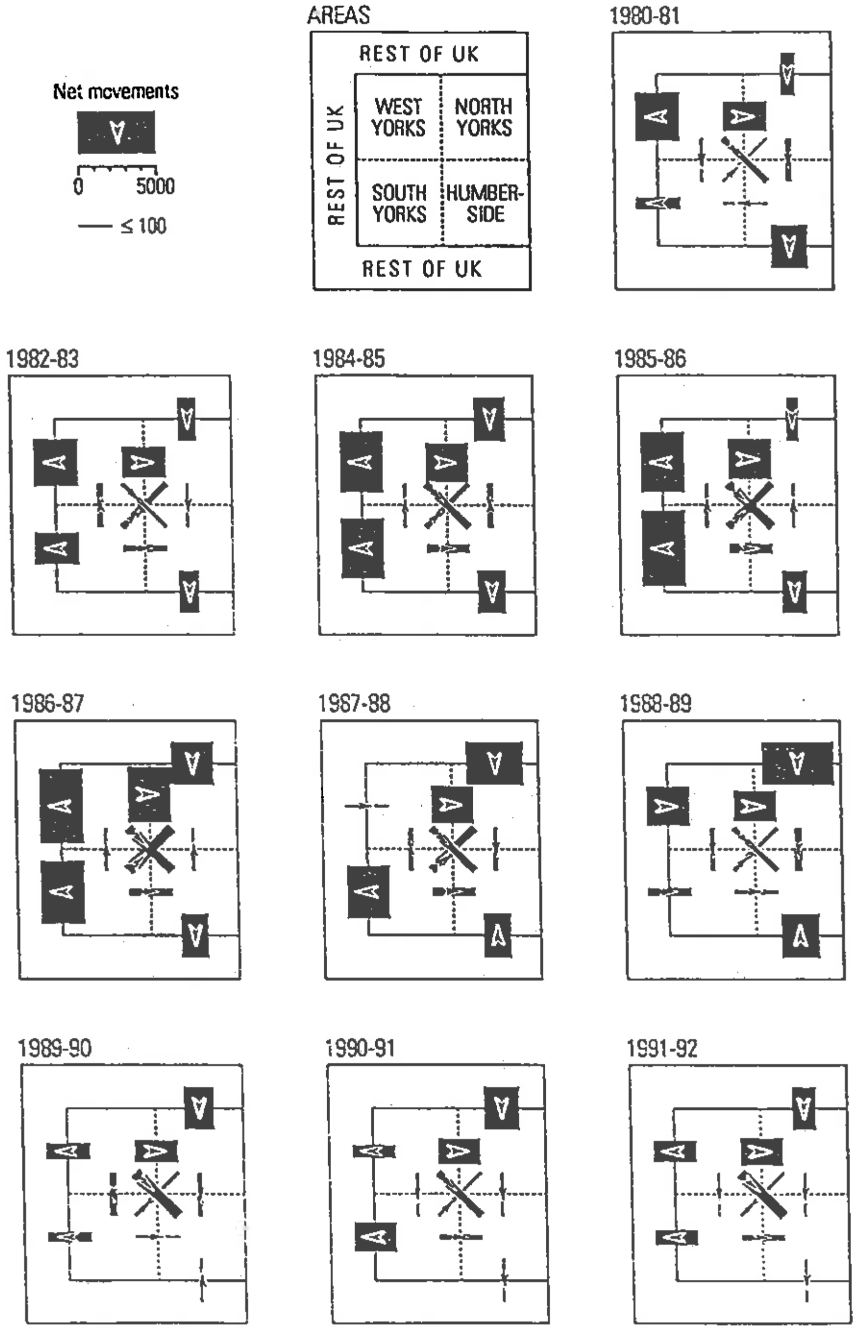


Figure 13: Time series net migration balances for local authority areas in Yorkshire and Humberside, 1975-92

Table 3: Net migration balances by local authority area, Yorkshire and Humberside, 1981-91

	NHSCR data (000)	Residual estimate (000)	Difference (000)
Bradford	-12.9	-15.0	-2.1
Calderdale	0.2	0.2	0.0
Kirklees	-9.1	-3.3	5.8
Leeds	-18.4	-21.0	-2.6
Wakefield	-4.1	-5.0	-0.9
Barnsley	-5.6	-4.6	-1.0
Doncaster	-5.0	-6.3	-1.3
Rotherham	-5.0	-5.8	-0.8
Sheffield	-18.5	-21.3	-2.8
Humberside	4.8	1.9	2.9
North Yorkshire	47.2	50.9	-3.7

Source: Yorkshire & Humberside Regional Research Observatory (1993)



Source: NHS Central Register

Figure 14: Time series directional net migration between counties in Yorkshire and Humberside, 1981-92

consistently to North Yorkshire. The directional patterns of inter-county net movement have not changed very much over time. Greater fluctuation is apparent in the net flows between counties and the rest of the UK. Gains by North Yorkshire increased between 1985 and 1989, whilst losses from West Yorkshire and South Yorkshire were transformed into net gains by 1988-89. Humberside experienced losses to the rest of the UK in the first half of the decade, substantial gains in 1987-88 and 1988-89 and much smaller balances thereafter.

Further insights into the Yorkshire and Humberside migration system can be derived from a more detailed examination of directional net balances for each district (or county) with the remaining districts (or counties) in Yorkshire and Humberside, the local authority areas contiguous with the region, the rest of England and the rest of the UK. TIMMIG enables this data to be extracted easily and Figure 15 illustrates the patterns of net migration in 1990-91. Most of the region's local authority areas do not tend to be involved in major net losses or gains with more than three or four other areas and areas with the largest net balances are the same in 1990-91 as they were in 1980-81 to a large extent. Certain net migration balances are relatively substantial: North Yorkshire's gains from Leeds and to a lesser extent from Cleveland and Lancashire; Bradford's and Wakefield's gains from Leeds; Rotherham's gain from Sheffield; and Sheffield's loss to Derbyshire. Calderdale, Barnsley and Doncaster have experienced relatively small net losses and gains with other areas. In several of the local authority areas, the most noticeable net migration losses or gains are associated with longer distance migration. In 1990-91, North Yorkshire in particular, but also Humberside and Leeds were net gainers from the rest of England.

Two conclusions were drawn from this analysis. Firstly, net migration for local authorities in Yorkshire and Humberside is a volatile component of population change and time series schedules of net migration do not easily lend themselves to time series extrapolation. Secondly, the net migration flows during the last few years provide a distinct contrast to the mid-1980s balances used to generate the 1989-based net migration assumptions which underlie the current 'official' sub-national population projections to 2011 (OPCS, 1991). Existing projections can therefore be adjusted on the basis of differing assumptions about migration trends as indicated in Stillwell, Ramsden, Gore and Beatty (1993).

4. COMPARISON OF NHSCR AND CENSUS IN-MIGRATION DATA FOR 1990-91

In this section of the paper we carry out a preliminary comparison of the patterns revealed by two British sources of information on internal (intra-national) migration. Although the electoral register can be used to provide net migration information for small areas, and the Labour Force Survey for migration between the Irish Republic and the UK (Bulusu, 1991), the Census and the NHS Register remain the principal sources for producing a country-wide view of migration at administrative area level.

4.1 Why carry out such a comparison?

Comparative analyses were carried out for 1980-81 (Devis and Mills, 1986; Boden, Stillwell and Rees, 1987; 1988 and 1992). These identified the key differences between the data

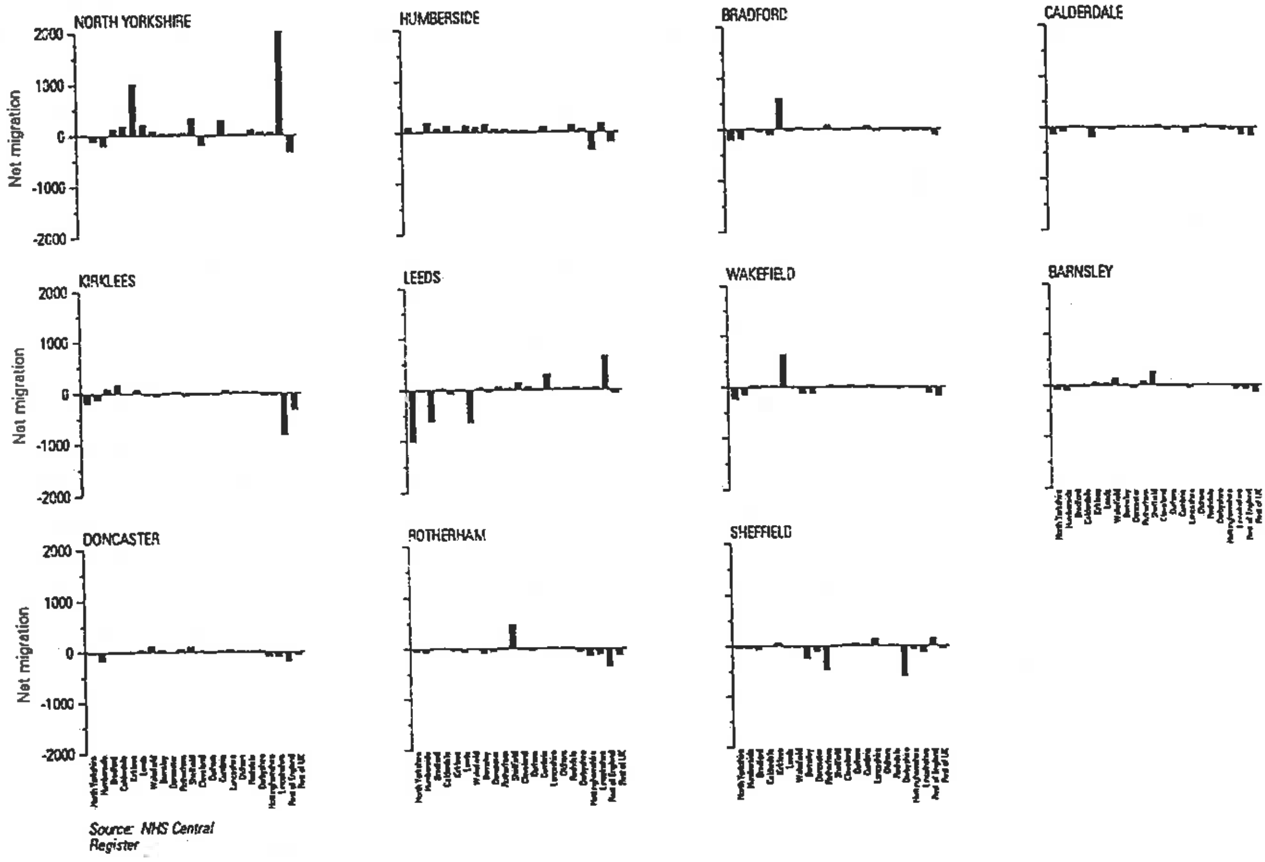


Figure 15: Directional net migration balances for local authority areas in Yorkshire and Humberside with contiguous areas, 1990-91

sources. These were due to different population coverage, different degrees of underenumeration and misreporting and different underlying concepts (see Table 2.4 in Boden, Stillwell and Rees, 1992 for a summary). In general, between 25% and 50% (depending on spatial scale, area and age) more migrations were reported in the NHSCR migration data than migrants were counted in the Census. However, the patterns and structure of movements revealed by the two sources were very close indeed. The conclusion was that it was safe for researchers and for the Census Offices in particular to use NHSCR data in as full a way as possible between Censuses as a means of updating Census based migration rates (Boden, Stillwell and Rees, 1992).

Recent evaluation of OPCS official projections for the counties and metropolitan districts of Yorkshire and Humberside (Yorkshire and Humberside Regional Research Observatory, 1993) has shown that considerable error can occur when 1980-81 Census patterns are assumed to persist into the 1990s. However, the OPCS have not, as yet, appreciated this finding. So it is important to carry out a further comparison of the two sources, in an effort to persuade them that NHSCR pattern data should be used more effectively in producing the official subnational forecasts.

A number of changes have occurred in the way both the two data sources operate. Computerisation of the NHS registers has speeded up the flow of re-registration statistics. More importantly, the 1991 Census provides a means of estimating one of the components previously missing but thought to be partially included in the NHSCR - that of the migration of students from parental to term-time residence. The inclusion of such behaviour as migration flows does raise, however, a number of interesting questions about the nature and counting of resident populations.

It should be stressed that in the comparative analysis we are not comparing either migration measure with "the truth" but rather comparing two partially flawed attempts at measuring the truth about migration.

4.2 In-migration data from the Census

In sections 2 and 3 of the paper, the characteristics of the NHSCR data source were discussed. Here, the key characteristics of the Census migration tables are outlined.

In the 1991 Census, as in the four previous Censuses, residents were asked to report their usual address one year prior to the Census (i.e. on April 21 1990). From the responses to this question, extensive tabulations by origin and destination at a variety of scales are in course of preparation as the Special Migration Statistics or SMS (OPCS, 1993). Unfortunately, the SMS data set will not be available until the start of 1994. In this analysis, therefore, reliance must be placed on the migration statistics available in the Local Base Statistics (particularly those in Table L15) and used by Champion (1993).

The Table L15 statistics are tabulated by destination only, so that the only flow that can be compared directly with the NHSCR information is that of total in-migration from elsewhere in Great Britain to the set of 94 FHSAs for England plus Scotland (95 zones in all). It is important to record that care needed to be exercised in summing LBS variables to form correct in-migration totals for FHSAs. There was no difficulty where the FHSA was coincident with a unit available directly in the county or district tables. So in-migration totals by age and gender could be extracted from the county tables for the shire county FHSAs and from the district tables for the metropolitan district FHSAs. However, where FHSAs were made up of more than one district but were less than county units in size, the aggregation of in-migration was not perfect. So, the Census in-migration counts for the 13 FHSAs of Greater London include migration between London Boroughs within the same FHSA and the in-migration counts for the FHSA of Knowsley and St.Helens in Merseyside include the flows between the two constituent metropolitan districts. In subsequent analysis, we use both a full 95 area data set in analysis and a reduced 82 area data set excluding the problematic FHSAs. These difficulties will be remedied as soon as the SMS data become available.

One minor and one major set of adjustments of the Census in- migration data were carried out to improve comparability with the NHSCR information. The minor adjustments were to the distribution of migration by age. Migration data was redistributed from five year period-cohort ages to five year period-ages following the arguments set out in Boden, Stillwell and Rees (1988), and allowance was made for the missing small infant migrant flow not measured in the Census by inflating the counts in the 1-4 age group. Geometric factors based on the appropriate Lexis (age-time) diagrams were employed.

The major adjustment was to attempt to include an estimate based on counts of students by term-time and home residence reported in LBS Table L10 for the first time. Careful addition of appropriate rows in the table resulted in estimates of students 'imported to' and 'exported from' each area of interest. The logic is described in full in Yorkshire and Humberside Regional Research Observatory (1993). The student inflows by five quinquennial age groups were assumed to be split equally between males and females and the resulting counts added to the regular in-migrant counts. The results reported here are for this combined count of Table L15 in-migrants and Table L10 student inflows. To achieve strict comparability with the 1980-81 comparisons, however, student flows should be excluded so some of the analyses are carried out without student additions to monitor the effect. A full set of inter-area student movements will become available with the publication of LBS Table L100.

In order to compute the in-migration rates, populations at risk (PARs) had to be selected for both types of migration data. Since the main table of Census migration data (Table L15 in the LBS) referred to residents in households, the same population concept was used to assemble the population at risk from Table L35 in the LBS. Strictly speaking, division of Census migrants by the Census population results in an 'admission' rate, whereas the Register migration flow was divided by the average of the 1990 and 1991 mid-year populations yielding an 'occurrence-exposure' rate. But the main difference is that the mid-year estimate derived PAR included non-household population and an allowance, via the 1991 estimate, for underenumeration in the Census. Census underenumeration (of just under 2%) will affect both numerator and denominator in the rate computation of Census migration rates. All of these considerations should not unduly affect a comparison with expected differences of upwards of 25%.

4.3 Statistical relationships between Register and Census migration

Table 4 provides measures of comparison in the form of correlation coefficients between the Register and Census based migration rates for males and females, for 16 age groups and a total, and for two sets of flows: those into all 95 areas and those into only those 82 areas for which a strictly accurate computation of in-migration into the area could be made. In the column labelled (2) are reported correlations for Census in-migrant flows without any student additions for the ages at which students are recorded.

The first point to make is that the correlations are lower than those computed for similar data sets in 1980-81. Boden, Stillwell and Rees (1992) report a correlation of 0.97 for Family Practitioner Committee areas (as the FHSAs were then called) rather than the 0.88 found here for persons using the Census in-migrants plus net student inflows measure and 0.92 when students are excluded. The inclusion/exclusion of students has very variable effects across the ages 10-14 to 20-24. For the 10-14 age group, exclusion yields the best correlations. For ages 15-19, exclusion yields the worst correlations. For ages 20-24, correlations with student exclusion are worse for males and better for females. Overall, excluding students does improve the correlation marginally in the 95 FHSA analysis and markedly in the 82 FHSA set.

So how can the results be interpreted? What is happening is likely to be as follows. The NHSCR data includes some but not all student migration: at some institutions, NHS registration with a university based GP service is obligatory at course registration. At others (and particularly the London colleges), it is not. Students make up the highest proportion of in-migrants in the 15-19 age group. When student net inflows are added to the Census in-migrant counts, more migrations of students are accounted for than are subsumed in the NHSCR. When the other ages are examined, the correlations are all higher than the overall correlation except for the last age. The comparisons for these other ages are not influenced at all by the inclusion of student inflows beyond age 40, and not much between ages 25 and 39. The correlation for females is consistently better than for males for two reasons. The first reason is that the lags in GP re-registration after migration are longer for young males than young females and this leads to many male moves being missed; the second reason is that underenumeration in the Census is concentrated among young males.

When a comparison is made between the all GB analysis (95 areas) and the analysis without the Greater London FHSAs (82 areas), the correlations are higher in the latter except in student ages 20-34. Because these ages make such a contribution to the overall migration rate, the total correlations are lower in the second data set, contrary to expectations.

The effect of including student inflows shows through quite clearly when the regression intercepts and slopes are examined (Table 5). The regression equation being fitted is:

$$NR = a + b\ CR$$

where NR is the in-migration rate based on NHSCR data and CR is the in-migration rate based on Census data, a is the intercept (the value of NR when CR is zero) and b the regression coefficient or slope (the relative change in NR for a unit change in CR). In

Table 4: Correlation coefficients between NHSCR and Census based in-migration rates, 1990-91, by age and gender

	95 FHSAs				82 FHSAs			
Age group	Male (1)	(2)	Female (1)	(2)	Male (1)	(2)	Female (1)	(2)
0-4	0.85		0.88		0.89		0.91	
5-9	0.89		0.90		0.92		0.92	
10-14	0.69	0.76	0.71	0.84	0.73	0.81	0.76	0.91
15-19	0.77	0.40	0.82	0.49	0.81	0.61	0.86	0.65
20-24	0.83	0.74	0.83	0.85	0.79	0.75	0.76	0.80
25-29	0.94	0.94	0.95	0.94	0.92	0.91	0.94	0.94
30-34	0.92	0.92	0.93	0.93	0.90	0.90	0.92	0.93
35-39	0.89	0.89	0.92	0.93	0.95	0.90	0.93	0.94
40-44	0.89		0.93		0.91		0.95	
45-49	0.89		0.93		0.92		0.96	
50-54	0.89		0.92		0.92		0.96	
55-59	0.89		0.92		0.94		0.96	
60-64	0.89		0.92		0.93		0.96	
65-69	0.89		0.92		0.93		0.96	
70-74	0.83		0.92		0.89		0.93	
75+	0.77		0.83		0.81		0.82	
Total	0.87	0.90	0.88	0.92	0.81	0.90	0.82	0.91

Source: author's computation from NHSCR and Census migration data, Crown copyright, supplied by ESRC/JISC Census Programme.

Notes:
(i) 95 FHSAs include all FHSAs in England and Wales together with Scotland as a single zone.
(ii) 82 FHSAs exclude from the 95 above the FHSAs in Greater London and the FHSA of Knowsley and St Helens in the North West.
(iii) Correlation coefficient = Pearson's r, computed using the SPSS package.
(iv) Column (1) reports correlation coefficients for the Census in-migrant flows plus net student in-migrants.
Column (2) reports correlation coefficients for the Census in-migrant flows alone, for those age groups in which students are included.

Table 5: Regression of NHSCR against Census based in-migration rates, 1990-91, by age and gender

	95 FHSAs			82 FHSAs		
Age group	Corr coeff	Intercept	Regr coeff	Corr coeff	Intercept	Regr coeff
0-4	0.88	8.4	0.74	0.90	7.1	0.78
5-9	0.90	6.2	0.94	0.93	5.6	0.98
10-14	0.72	6.0	0.73	0.77	3.4	0.89
15-19	0.81	17.8	0.26	0.85	15.0	0.31
20-24	0.83	39.0	0.35	0.78	41.3	0.31
24-29	0.95	9.8	0.92	0.94	7.1	0.97
30-34	0.93	6.8	0.99	0.92	6.5	0.99
35-39	0.91	5.8	0.95	0.93	4.7	0.99
40-44	0.92	2.4	1.07	0.94	2.2	1.08
45-49	0.93	2.8	1.13	0.95	2.1	1.19
50-54	0.91	2.0	1.22	0.95	2.4	1.15
55-59	0.91	2.8	1.11	0.96	2.7	1.07
60-64	0.93	2.5	1.10	0.97	2.0	1.11
64-69	0.92	1.8	1.10	0.95	1.7	1.15
70-74	0.91	2.5	1.19	0.93	2.1	1.23
75+	0.82	3.9	1.67	0.82	3.8	1.67
Total	0.88	10.5	0.64	0.82	11.6	0.59

Source: author's computation from NHSCR and Census migration data, Crown copyright, supplied by ESRC/JISC Census Programme

Notes: (i) Dependent variable = NHSCR in-migration rate
(ii) Independent variable = Census in-migration rate
(iii) Correlation and regression coefficients computed using SPSS

1980-81, the in-migration intercept for FPC areas was 2.7 while the slope was 1.25. For the student affected ages, 15-19 and 20-24, the intercepts are very high and the slopes very low compared with both other ages and the 1980-81 results.

Table 6 shows the effect that adding student inflows have to measured migration rates. The table selects FHSAs with in-migration rates of over 100 (per thousand or 10%) at both ages 15-19 and ages 20-24. These FHSAs correspond with the locations of the UK's largest universities.

4.4 Age-gender comparisons

The statistical relationships are measured over areas. If the flows are summed over all areas for each age-gender group separately and all area rates computed, the results can be graphed (Figure 16). The top and middle graphs compare the NHSCR and Census in-migration rates for males and females respectively, while the second and bottom graphs plot the NHSCR/Census ratios against age. Census in-migration rates fall below the NHSCR rates except between ages 15 and 29, when they considerably exceed the latter. The ratios in favour of NHSCR rates increase as the student ages are left behind, but the absolute differences between the two sets are fairly constant.

4.5 Spatial comparisons

Figure 17 displays the spatial patterns of the 1990-91 in-migration for (i) NHSCR based rates, (ii) Census based rates excluding students, (iii) Census based rates including students and (iv) student inflows (the balance of student 'imports' less 'exports' for an area). The first three maps give spatial expression to the correlations reported in Table 5: broadly similar across the country but with a range of differences at individual FHSA scale. From the point of view of interpretation and use in projections, it is the comparison of the net balance of in- and out-migration which is crucial, but such a comparison has to await publication of the SMS and Regional Migration reports.

The fourth in the sequence of maps is a new result, made possible by the publication of student statistics in the 1991 Census LBS. It should be thoroughly familiar to any UCCA/PCAS applicant. the map demonstrates the great contemporary importance of counterflows to metropolitan areas. The aggregate statistics (Section 3) revealed a pattern of metropolitan migration loss. This is, in part, compensated for by the inflows of people entering a particular activity (higher education) in a narrow range af ages. The Census provides a better measure and picture of this inflow than the NHSCR where age-specific data only are available.

4.6 Commentary

What conclusions should be drawn from these comparisons? Four points can be emphasised.

(1) The comparisons have identified the importance of student migration at the peak migration ages.

Table 6: Areas for which 1991 Census in-migration plus student transfer rates are high, 1990-91, ages 15-19 and 20-24, persons.

Area	Aged 15-19			Aged 20-24		
	NHSCR	Census	Ratio	NHSCR	Census	Ratio
Avon	54	115	.53	92	152	.66
Berkshire	42	123	.41	99	137	.83
Cambridgeshire	53	137	.44	92	220	.54
Dorset	50	109	.53	89	107	.92
East Sussex	51	117	.52	110	148	.83
Oxfordshire	71	243	.40	95	273	.46
Surrey	43	100	.50	123	153	.88
South Glamorgan	58	133	.50	104	188	.62
Manchester	85	156	.70	117	247	.56
Salford	63	105	.67	98	147	.75
Liverpool	48	137	.38	99	188	.57
Sheffield	85	144	.64	81	185	.46
Newcastle	74	225	.38	127	290	.47
Coventry	75	161	.49	105	192	.55
Leeds	76	120	.69	86	172	.54
London - CI	73	226	.47	161	307	.71
London - KCW	54	250	.36	129	290	.58
London - RK	36	150	.27	122	266	.51
London - MSW	39	108	.40	126	223	.59

Source: author's computation from NHSCR and Census migration data, Crown Copyright, supplied by ESRC/JISC Census Programme

Note: The FHSAs are selected with both in-migration rates above 100 per 1000 (10%) per year.

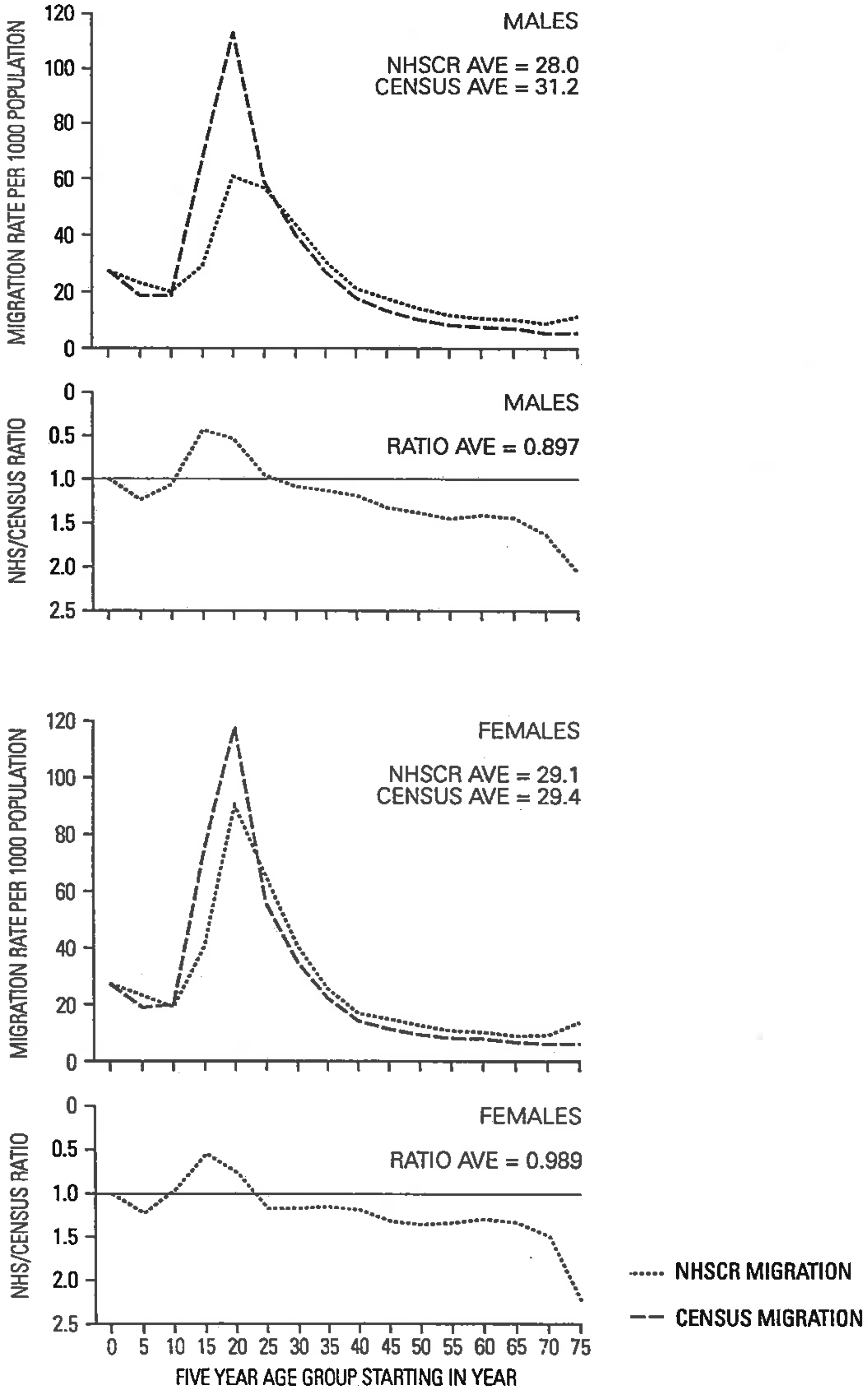


Figure 16: Comparison of NHSCR and Census migration rates and their ratios by age and gender, 1990-91

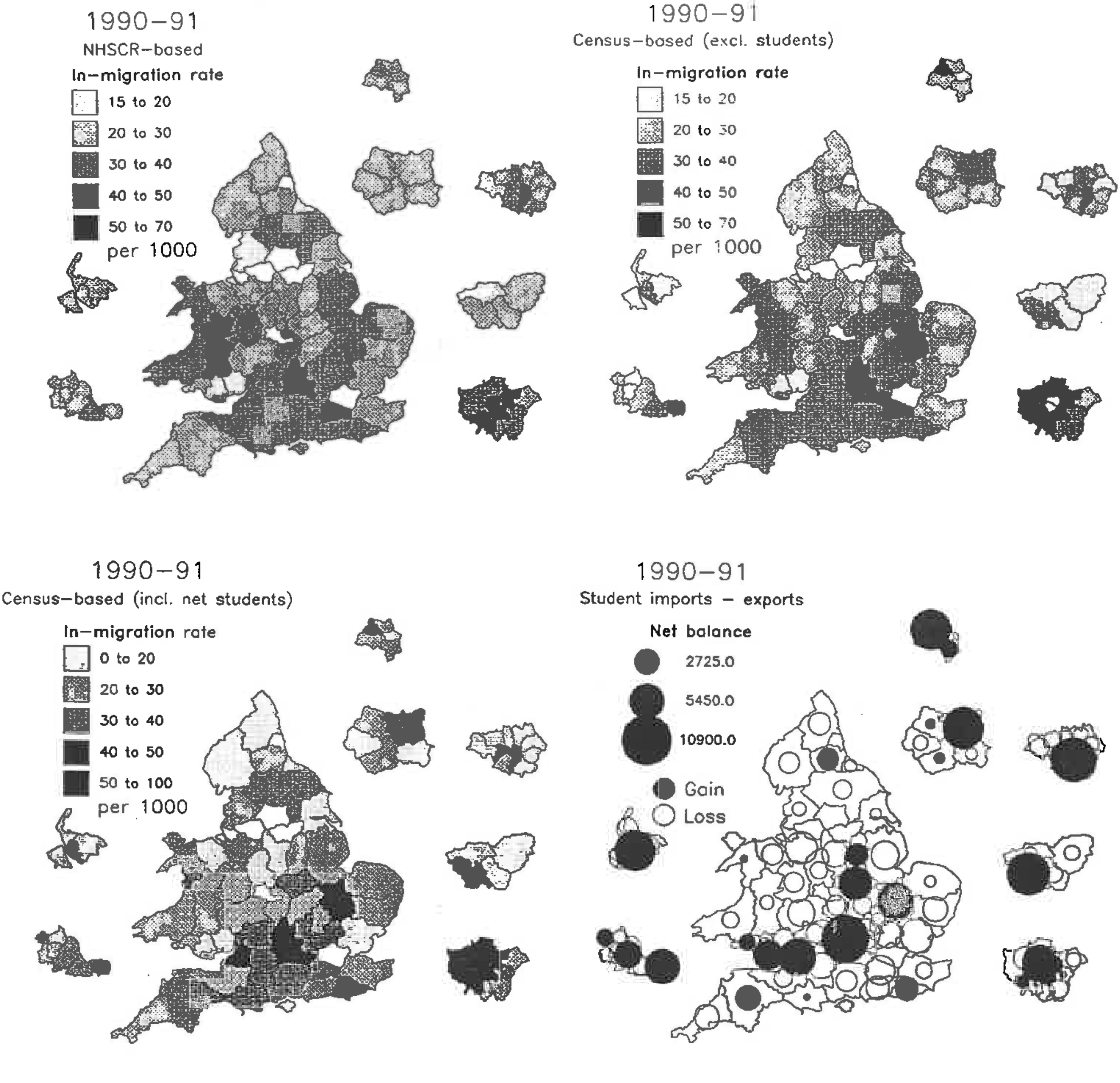


Figure 17: NHSCR and Census in-migration rates and student net migration, 1990-91

(2) There appears to be a greater discrepancy between the two migration measurement instruments in 1990-91 than appeared to be the case in 1980-81.

(3) The overall agreement is, however, still good enough to allow combined use of the two data sources with care for analyses of national patterns, but for local work further investigation is indicated. In projection work, the major value of the NHSCR data set would be to help pick major changes in the direction of migration trends rather than to establish precisely their magnitude.

(4) It is the age groups 15-19 and 20-24 which are the most different and problematic, because they are the most migratory. Should students be included at their parental home residence for planning purposes or at their term-time addresses? Most local authorities need to plan for the peak demands on their local settlement and transport systems so that adopting the term-time residence would be the optimum. However, for resource allocation purposes care must be taken not to count students twice.

5. CONCLUSIONS

This study places the migration experience that is to be reported from the 1991 Census in the context of a longer time series. Table 2 showed that, in terms of the aggregate volume of migration, 1990-91 was one of the most depressed years of the 1975-92 period. Only one year had fewer inter-FHSA and inter-region migrants, and that was 1981-82. In comparing the migration results of the two Censuses, we will be comparing similar years. However, these two years were far from typical in the 17 year time series.

The development of TIMMIG as a flexible integrated migration and population information system provides a means of more effective monitoring of time series data at different spatial scales and allows crucial interactions between the level and pattern of migration revealed in our spatial analysis to be identified. The pattern of migration in the boom years was different from that in the bust years, although the position of the regions in terms of net migration rates and volumes has remained broadly stable over the period since 1975. The migration system has a long run directional structure of channels but the flow of migrants along those channels fluctuates with the spatial propagation through the country of economic cycles. Whilst these fluctuations reflect changes in the migration propensities of subgroups of the economically active population, they also reflect marked variations in the behaviour of the young and the elderly, whose contrasting migration rate changes since 1975 have been reported.

Comparison of the Register derived and Census derived migration in 1990-91 showed that the closeness of fit, though still very high, was lower than in 1980-81. A very important influence on the comparison was the treatment of information on student movement. Student numbers expanded throughout the 17 year period, but particularly towards the end. The reported findings clearly indicate that further research into both student and non-student levels and patterns of migration in the 15-29 age group is required. This research will be facilitated by the publication of the origin-destination flow data on migration (SMS and LBS Table 100) which we await with anticipation.

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