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INTERNAL MIGRATION AND REGIONAL POPULATION DYNAMICS IN EUROPE: UNITED KINGDOM CASE STUDY

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CONTENTS

SUMMARY

This case study examines recent population change patterns and internal migration activity in the United Kingdom. A wealth of knowledge about population dynamics in Britain is revealed. The spatial patterns of population change and net migration are intricate mosaics of gains and losses. Gains and losses in population were principally determined by net internal migration. The decade long population change patterns and one year long migration patterns were in close agreement. This was surprising in view of temporal instability in population change and migration patterns. The dominant spatial pattern was one of deconcentration from the cores of city regions to hinterlands for both the largest metropolises and also their subsidiary partner cities. There were also signs of loss in population and migrants in declining resource regions (former mining areas, fishing ports) and gains in new resource frontiers - particularly in north-east Scotland reflecting the vigorous development of onshore facilities for the offshore oil and gas fields of the North Sea. The pattern of overall population and migrant redistribution was predominantly that of the middle labour force/family ages reinforced at much lower mobility levels but with sharper patterns of redistribution by the pre-retirement and retirement ages. People in the young adult ages in contrast redistributed to different destinations, showing a unique shift to the dense neighbourhoods of big cities. With respect to the urban system, there was significant redistribution both downward and outward. Downward redistribution meant shifts from large metropolitan cities to medium and small sized freestanding cities. Outward redistribution meant shifts to the outer commuting rings around cities, often deep into the countryside, This was not a return to the rural idyll, merely the expansion of the daily urban systems to cover most of lowland Britain. Strong preferences for low density living were revealed by shifts towards districts in Rural Areas and by net flows to low density wards and sectors. Similar strong shifts out of areas of above average into below average unemployment were detected, though both relationships with density and unemployment were either not present or weak for young adults. Some ambiguity was revealed in the fortunes of Inner London areas. Migration data from the 1991 Census showed intense outward movement. Downward population shifts were on a lesser scale because of the compensating effects of higher than average natural increase and high immigration. However, a re-analysis of 1991 population by ONS led to a substantial upward revision of London borough populations, and so places doubt on the size of outward shift of population through internal migration.

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ACKNOWLEDGEMENTS

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All of the machine readable and census data used in the study are made available via the Economic and Social Research Council and Joint Information Systems Committee purchase, and have been supplied by the ESRC/JISC supported Census Dissemination Unit at Manchester Computing (thanks to Keith Cole and Virginia Knight) and the UKBORDERS team at Edinburgh University Computing Service (thanks to Donald Morse and Alistair Towers). Alistair Towers was particularly helpful in providing the very large files of boundary data that we needed. Our thanks to various researchers at the University of Newcastle (Mike Coombes, David Atkins) and Danny Dorling at the University of Bristol for providing via the Census Dissemination Unit a variety of "look-up" tables enabling us to use the Newcastle functional region schema and to link the geographical units used in the 1991 Census with those in the 1981. Tony Champion at the University of Newcastle provided valuable comments on an earlier draft.

At the University of Leeds, Oliver Duke-Williams was very helpful in implementing lookup tables produced by us with his program, smstab, for extracting migration tables from the Special Migration Statistics. Our thanks are also due to Alison Manson for producing finished versions of the graphs in the report and to Christine Macdonald for word processing the text and tables.

1. CONTEXT

In the 1990s the countries of Europe are collectively engaged in the "European project". The European project involves the closer integration of countries in international organisations (such as the Council of Europe) or in multi-country institutions (such as the European Union). One of the requirements of successful co-operation between European countries in collective projects is an agreed and comparable database of information about countries and their constituent regions. It is not possible to determine "membership dues" or "membership benefits" on a fair and equal basis without knowledge of demographic, economic and social statistics. The Directorate of Social and Economic Affairs of the Council of Europe has been active in collating national statistics for over 30 countries (Council of Europe 1995). The Statistical Office of the European Communities (EUROSTAT 1995a, 1995b) has been pursuing harmonisation of national and regional statistics for the member states of the European Union (originally 6, now 15).

In terms of demographic statistics, the Council of Europe (e.g. Council of Europe 1995) now provides excellent statistics on population stocks, population structures, fertility, mortality and reasonable statistics on international migration at the country level, while EUROSTAT (e.g. EUROSTAT 1995a, 1995b) provides equivalent detail for European Union (EU) members and detailed statistics at regional level within most member states.

However, there is a major gap in these statistics with respect to internal migration and its role in regional population change. Considerable progress has been made by the European Commission and Eurostat in developing regional population projections for the European Union (see Rees 1996 for a review). The primary aim of the work has been to find ways of incorporating internal migration data into multi-country, multi-regional population projection (see Van Imhoff *et al*. 1995 for a methodological report). The EU regional projections are carried out for the second regional level in the Nomenclature of territorial units for statistics (NUTS): there were 183 such regions in the 12 country (EUR12) definition of the EU, averaging 1.86 million people. Such regions are rather large as a spatial filter to use to understand the patterns and processes of population change within countries, and many national researchers had used much smaller units with some success (e.g. Dorling 1995; Boudoul et Faur 1982). Kupiszewski (1996) established for Poland that the surface of population change at *Voivodship* scale (49 units) between 1980 and 1990 was virtually flat while that at commune scale (4000 units) had lots of peaks and valleys. Urban gains were paired with rural losses at the coarser *Voivodship* scale.

In a feasibility study for the Council of Europe Rees and Kupiszewski (1996) sought information from the National Statistical Offices of 28 member states about the availability of data on population and migration by age and sex at different spatial scales. The conclusion was that sufficient reliable information was available to study population change at fine spatial scales and that internal migration data were available in most countries at scales finer than those hitherto used. Building on that knowledge, the comparative study for which this is the first country report aims to compile for 28 countries that were members of the Council of Europe in mid-1995 a picture of population change at fine spatial scale (as close to the level defined by EUROSTAT as NUTS5 or its equivalent in non-EU countries) and of internal migration at the smallest practical scale (which will probably turn out to be around NUTS 3 on average).

The remainder of the paper is divided into the following principal sections. The next section, section 2, reviews knowledge about regional population change and internal migration in the United Kingdom, drawing on work by UK geographers (Champion, Dorling, Stillwell and others). Section 3 describes the methods used to provide structure to the mass of recent information in such a way as to test the main relationships suggested by previous research. Section 4 describes the patterns of population change and migration at small area scale. Section 5 uses a classification of the urban system based on journey to work flows to make sense of the patterns. Section 6 adopts an alternative socio-economic classification of districts to analyse population movements. Section 7 then relates population change and net internal migration to the density of residential areas. Section 8 establishes the relationships between population dynamics and unemployment levels. In each of sections 4 to 8, the analysis looks at the way net migration patterns differ between broad age groups, revealing considerable changes in migration directions at different life course stages. The final section provides a summary of findings.

2. INTERNAL MIGRATION AND POPULATION CHANGE REVIEWED

The population of the United Kingdom has grown rather slowly in the post-1945 period by international standards; growth reached a nadir in the 1976-81 period when only 27 thousands were being added to the population, although in the 1990s this had climbed to around 200 thousand. In relation to a total population of 58 millions this only constitutes 0.3 per cent. Attention has therefore been focused not on the growth of the national population but on the redistribution of the population internally. Most of this internal redistribution results from

internal migration. Natural change is much less variable (Champion 1996, Figure 7). Net international migration influences population change to a significant degree in London.

Several different geographical frameworks have been used to describe population change: (1) administrative areas, (2) functional areas (3) areas classified on single associated variables and (4) areas classified using many variables.

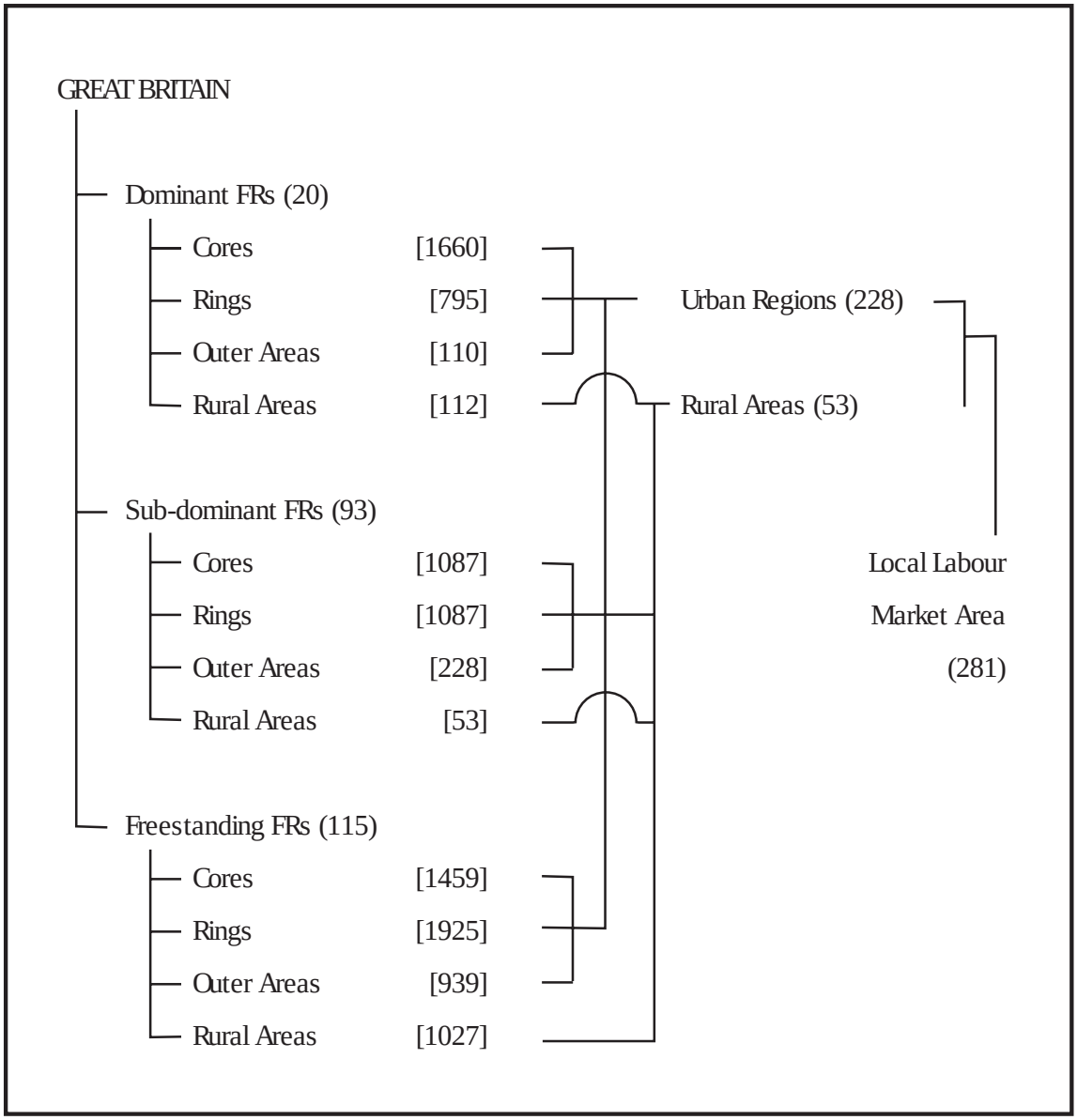
Administrative areas within the UK are in order of size: (1) the constituent historic countries (England, Wales, Scotland, Northern Ireland), (2) the regions (nine statistical regions within England plus the 3 other countries), (3) the counties (65 in Great Britain together with Northern Ireland), (4) the districts (459 in Great Britain). Using this information, several important features of population redistribution through net migration have been identified

1. Net losses of around 50 thousand a year from the North to the South occurred between at least the mid-1970s (when migration data first became available) to 1988, and were followed by a period of balance from 1989 to 1992. Losses from North to South resumed from 1993 (Stillwell, Rees and Boden 1992b; Champion 1996). The South is made up on the English regions: South East, East Anglia, East Midlands and South West; the North is the Rest of the UK.
2. Net losses of around 100 thousand a year from the Metropolitan Counties (Greater London, Greater Manchester, South Yorkshire, Tyneside, West Midlands, West Yorkshire) to the non-metropolitan counties occurred in the 1975 to 1996.

Administrative geography provides a very coarse filter with which to examine population change. It also suffers from continual boundary changes which disrupt time series. Coombes *et al*. (1982), Champion *et al*. (1987) and Champion (1989) have argued strongly for the adoption of urban-centred regions as the proper spatial framework for studying population change. Their scheme divides Britain into a set of 281 Local Labour Market Areas (LLMAs) on the basis of journey-to-work flows to employment centres (see Figure 1 for a typology of LLMAs). The LLMA classification recognises three kinds of functional region: dominants, sub-dominants and free-standing. Dominants are the most important centres for 20 metropolitan regions while resting inside these metropolitan regions are lesser urban centres. Watford, for example, forms a subdominant functional region within the London metropolitan region (see Champion *et al*. 1987 for a more detailed account).

Migration occurs within urban-centred regions' as well as between them, and the functional regions' framework allocates wards or postal sectors to zones defined in terms of functional proximity (strength of journey to work ties) to the largest employment centre in each functional region. Four zones are recognised: cores embracing all the built up area around an employment centre; rings, areas sending at least 15% of their employed residents to a core; and

Figure 1: The Functional Regions Framework
(Source: adapted from Figure 1.1 in Champion et al 1987)



(20) = number of functional regions

[228] = number of census areas, wards in England and Wales, pseudo-(postcode) sectors in Scotland (excluding wards in City of London, Grampian region and three extreme values)

outer areas which are tied to the centre they send most commuters to. Rural areas are LLMAs with small populations which for current purposes are attached to larger functional regions they have most journey to work connections with.

Figure 2 shows the classification of the wards of England and Wales and the pseudo-sectors of Scotland into the twelve categories formed by combining the functional region and zone groupings. Most categories are composed of areas from a variety of geographic locations distributed throughout the UK. The analysis reported later in the paper focuses on this generic classification of areas rather than particular places within the UK because of the need to compare between countries.

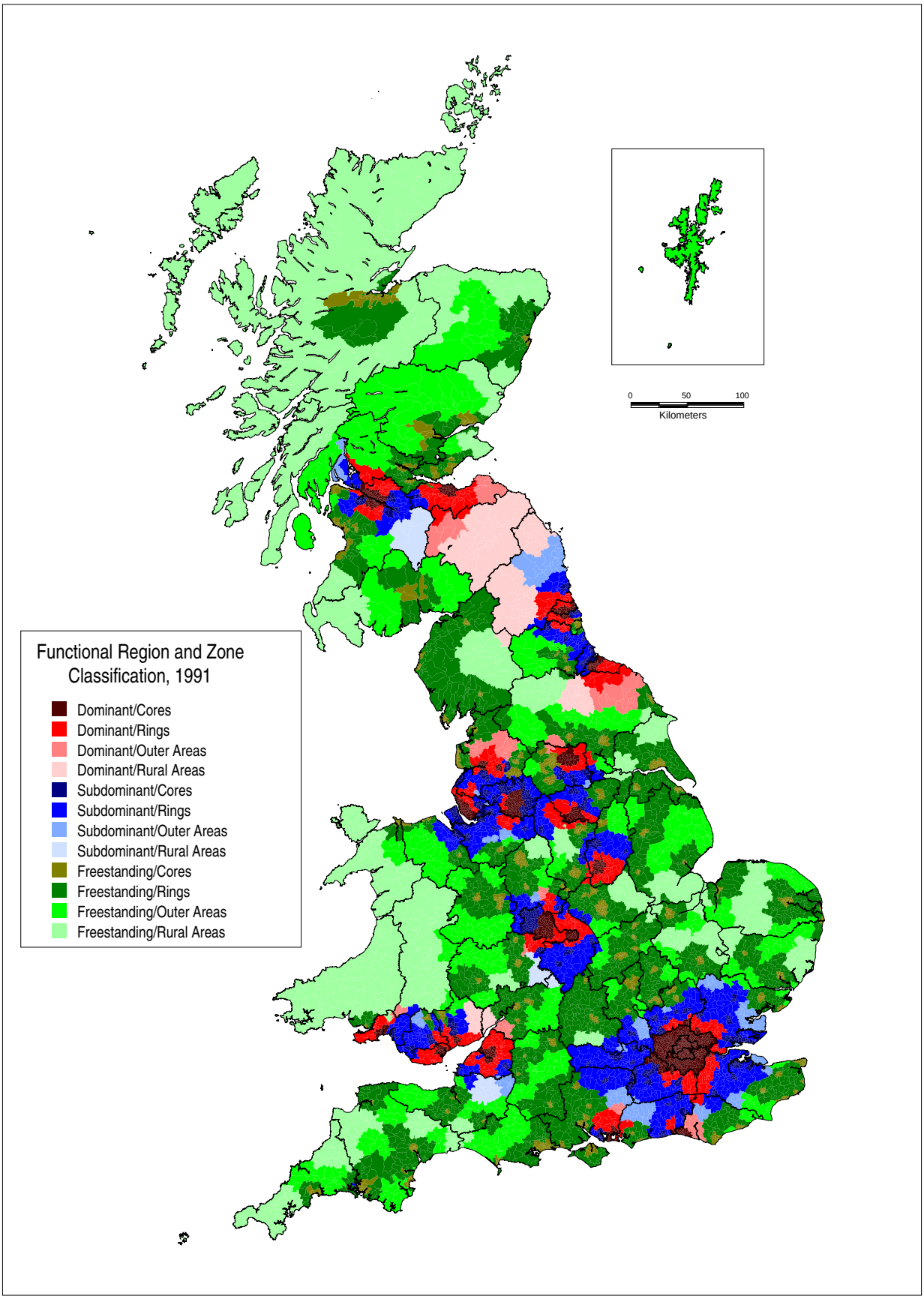
The functional region framework was originally defined using 1971 Census journey to work data for pre-1974 local government areas. Subsequent work has redefined the LLMAs in 1981 and 1991 by best fit assignment of smaller units (wards or wards and pseudo-postal sectors) to the 1971 areas. Champion (1989) summarises what investigations have revealed:

> "the pattern of centrifugal movement has gone far beyond suburbanisation and local decentralisation between core and ring of individual metropolitan areas or functional regions. It is also clear that this process of longer-distance deconcentration has been underway for most of the post war period." (Champion 1989, pp.100-1.)

The 1950s saw an inverse relationship established between urban size and population increase, which became more pronounced in the 1960s, with rural areas switching from loss to gains. The early 1970s saw remoter rural areas having the highest relative gains ("the high tide of counterurbanisation") but the later 1970s and early 1980s saw a downturn in the rates of deconcentration. Champion and Dorling (1994) have reviewed population change for the 40 year period, 1951-91, and confirm this picture.

Analysis of time series migration data derived from the National Health Service Central Register (Stillwell, Rees and Boden 1992a; Stillwell, Rees and Duke-Williams 1996) has added to the inter-censal picture by providing a year-by-year picture at a coarser spatial scale from mid-1975. These analyses show clear fluctuations in the strength of decentralisation with the economic cycle, particularly when examining population shifts between London and surrounding regions. In times of economic boom in the mid-1970s or the 1985-89 period, Greater London experienced heavy net out-migration, while in times of recession losses shrunk. Conversely, the other southern regions (Outer South East, East Anglia, South West, East Midlands) gained heavily in boom periods. The boom periods with rising employment and house prices give households the confidence to move decentrally out of the main cities, recession periods cause house prices to stagnate or fall, remove job opportunities, reduce the gains to be made from migration and increase the risks.

Figure 2: Functional Region and Zone Classification of Areas in Great Britain, 1991



Later on in the report we will be examining population changes between the censuses of 1981 and 1991 and migration flows in the 1990-91 period prior to the 1991 Census. The two Censuses were taken at times of economic recession when migration volumes were low and decentralisation less pronounced than in the mid-decade period. However, decadal population comparisons will subsume the state of decentralisation at high, mid and low tidal points.

One important influence on the level of migration activity is stage in life course. Certain career stages see many changes in status: leaving home, entering and leaving higher education, forming a partnership with a person of the opposite sex, finding a job are all crowded into late adolescence and early adulthood. The relationship between life career and migration is usually examined by computing migration rates for each age group (see Champion 1996, Fig 9 and Stillwell, Rees and Duke-Williams 1996, Figs 16.11 and 16.12 for the Great Britain graph).

Life course is also associated with differences in the spatial direction of migration. Stillwell, Rees and Duke-Williams (1996) analyse the net migration flows for 35 NUTS2 regions reported in the 1991 Census. The dominant, all ages, pattern is loss of migrants from the largest metropolitan areas and gains in other regions in all sections of the country. This aggregate pattern is repeated for the *family* ages (1-15, 30-59) but the *leaving home* age group, 16-19, shows a markedly different pattern. Greater London experiences positive inflows for this age group while a majority of non-metropolitan regions record net migrant losses, and the other metropolitan regions smaller net losses. These flows represent the channelling of a widely dispersed population of students-to-be to a more concentrated set of destinations, locations of higher education institutions. The *starting career* ages (20-29) show small losses from Greater London but losses from other metropolitan areas and gains to non-metropolitan areas, as in the all age pattern. The *retirement* ages (60-74) show a return to the sharp division between metropolitan and non-metropolitan regions and more selectivity with respect to destinations than at other ages. The *elderly* ages (75+) show the most distinct pattern of metropolitan losses and non-metropolitan gains. At and after retirement migrants are freer to choose destinations than when tied to work locations, and they clearly opt for the pleasanter environments and lower population density of non-metropolitan regions.

Dorling (1995, pp.18-19) has described population change at the ward scale for 1971-81 and 1981-91 using Census data converted to a uniform geographical base - the 1981 Census ward. He presents a cartogram of percent population change for each intercensal decade. The 1970s saw more extreme changes than the 1980s. In the 1970s 36% of people lived in wards losing more than 5% of their population, while in the 1980s the equivalent per cent was only 21. In the 1970s 30% of people resided in areas gaining 10% or more in population, while in

the 1980s the percentage in this category was only 22. Urban core - rural area contrasts were more marked in the 1970s. However, the directions of change remained generally the same. In the 1980s, however, many Inner London wards showed population gain due to redevelopment and immigration from abroad. The other conurbations did not experience the same turnaround in trend.

Dorling (1995, pp. 58-59) also maps the overall level of mobility in the year to the 1991 Census. These maps show particularly high mobility in areas of inner city student residence where more than one in six of the population moves every year. The North in general shows lower mobility than the South, and mobility is particularly low in the older suburban areas.

Discussion to date in this review has emphasised the relationships between population change and the net direction of migration flows and the settlement structure of the country. However, urban regions have different economic bases and different records of success in a competitive urban and regional system. Owen (1992) has demonstrated, at the regional level, the importance of job-related migration gains and losses through an analysis of Labour Force Survey data. The South East, East Anglia and South West regions have consistently received in the 1970s and 1980s net inflows of migrants taking up employment from the Midlands, the industrial North and the peripheral regions (Scotland, Wales, Northern Ireland). The Midlands has received migrant flows from the North and periphery and lost to Southern regions. These job-related migrations have fluctuated with the economic cycle being lower in recessions and higher in booms.

This review suggests a number of questions about internal migration and population change in the UK which need to be addressed.

1. To what extent have the decentralisation trends identified by Champion and others during the 1970s continued into the 1981-91 decade? Work at region, county and district level suggests they have, at a dampened level, but analysis at the finest scale is needed to confirm this, and the investigation of population change needs to be extended to an analysis of internal migration as well.
2. The functional region classification is, of course, peculiar to the UK. To what extent can the findings be associated with such a classification be replicated using more general predictive indicators which can be repeated across other European countries? We use population density as such an indicator later in the paper.
3. The variation between functional regions in population change and migration reflects economic well being of different places. General classifications of districts developed by the Office of Population Censuses and Surveys have been used by Champion (1986) and

Dorling (1995) to analyse population change and net migration. An updated classification (Wallace, Charlton and Denham 1995) is now available for use with 1991 Census migration data.

4. This general classification is, again, peculiar to the UK. To what extent can the findings associated with such a classification be replicated using more general predictive indicator which can be repeated across other European countries. We use unemployment rate as such as indicated later in the paper.

3. METHODS USED AND DATA EMPLOYED

To investigate internal migration and population change the following strategy was adopted.

3.1 Geographic scale

Analysis was undertaken using the finest scale geographic data available. The spatial scale chosen was therefore wards in England and Wales and postal sectors in Scotland. It is possible to carry out the work on both population change and migration at this scale.

3.2 Geographic units

Detailed population data are available at this scale only from the decennial censuses of 1981 and 1991. Unfortunately, the definitions and boundaries of the wards and sectors changed between censuses. Dorling (1995) adopted the solution of converting 1991 Census data to 1981 ward boundaries by constructing a look up table that assigns each enumeration district (England and Wales) or output area (Scotland) to a 1981 ward on a best fit basis. Bracken and Martin (1995) assigned both 1981 and 1991 Census data to a set of common 200 metre grid squares on a best fit basis.

Such techniques are applicable to the data in the Small Area Statistics (SAS) because the SAS are available for the smaller units. They are not, however, applicable to the inter-ward flow data in the Special Migration Statistics. Therefore the 1991 Census area was adopted as the unit of analysis. For England and Wales a count of population in 1981 within 1991 boundaries was published in the Ward and Parish Monitors and supplied by the Office for National Statistics in machine readable form. For Scotland the 1991 areas were designed to match those used in the 1991 Census. The 1991 areas are postal sectors (e.g. EH8 9) or part postal sectors (e.g. IV1 2 (PT) in district 22 and IV1 2 (PT) in district 24), defined to fall exactly into local government districts. They are collectively known as “pseudo-sectors”.

Some difficulty was experienced in matching 20 areas in Aberdeen in (Grampian region) the 1981 and 1991 Censuses, and these are omitted from some analyses.

3.3 Variables

3.3.1 Population and population change data

It would seem a simple matter to count population in an area at one census and compare it with a similar count at another. Unfortunately, there are difficulties. There are several population bases which could be used. These are set out in Table 1. The top panel in the table sets out the eight population components which are combined in various ways to form population bases. The bottom panel shows, for Great Britain as a whole, the variation in population counts and recorded change by population base. Ideally, a base close to the one used in the 1991 mid-year estimate should be used but in practice the only bases available in 1981 and 1991 were the present population (1971 base) and the present and absent residents (1981 base). The 1981 base populations were not available for 1991 Census wards in 1981 so we were forced to use the present population base.

Overall use of this base and some matching problems means an underestimate of population change between 1981 and 1991 - a 0.25% decrease in the "this study" column compared with a 2.5% increase in the "1991 estimate" column. We do not believe that this seriously affects comparisons between areas except where there is change in visitor numbers which can occur with the opening and closing of hotels, hostels and holiday camps, for example.

3.3.2 Migration

Internal migration within Great Britain has been recorded in population censuses since 1961 using a question on usual residence one year ago (and on two occasions in 1966 and 1971 a five year question has been used as well). These data are used to establish the degree of mobility. Most attention in the analysis is paid to the results of the most recent population census in 1991 using the Special Migration Statistics for wards and sectors.

Migration is extensively tabulated in the Small Area Statistics of the 1991 Census, but these statistics have one serious disadvantage. They are only tabulated for migrants who reside in an area at the census. In effect they are tables of migration into or within an area only. No data on the numbers of migrants by origin who have left areas are provided.

Migrant flow data classified by both origin and destination within Great Britain are provided in the Special Migration Statistics from the 1991 Census in two sets: set 1 provides

Table 1: Comparison of population totals and change for Great Britain, 1971-91

Population component	1971 base	1981 base	1991 base	1991 estimate
1. Present residents	✓	✓	✓	✓
2. Absent residents (part of household present)		✓	✓	✓
3. Absent residents (wholly absent household, enumerated)			✓	✓
4. Absent residents (wholly absent household, imputed)			✓	✓
5. Visitors	✓			
6. Students at term-time residence less students at usual residence				✓
7. Allowance for under-enumeration				✓
8. Population change between Census and mid-year				✓

Year	This study	1971 base	1981 base	1991 base	1991 est.
1971		53,979			54,388
1981	54,217	54,147	53,557		54,815
1991	54,082	54,146	53,340	54,889	56,207
1971-81 change		+168			+427
1981-91 change	-135	+9	-217		+1,392

Sources:
1. Census population: OPCS and GROS (1993), Summary table. The present population for this study are summed from the contributing SAS areas excluding 23 areas.
2. Estimates: ONS (1996), Table 2, p43.

Notes:
1. This study excludes 23 areas out of 10,505 containing a total population of just under 53 thousand in 1981 (present definition).

information at ward scale while set 2 contains data at district scale (Flowerdew and Green 1993, Rees and Duke-Williams 1994). In this paper we make use of set 1 which provides the finest geographic scale. The classification of migrants in this ward set is limited to ten broad age and sex groups but even these groupings show how migration varies with the life course. Most of the analysis uses net migration - the difference between in-migrants to a ward and out-migrants from a ward. However, flow data are extracted using the *smstab* program (Rees and Duke-Williams 1994) running on the MIDAS service at Manchester Computing. The *smstab* program enables the user to introduce classifications of the wards of Great Britain.

3.4 Classifications

Two classifications are used in the analysis of population change and internal migration.

(1) the functional regions discussed earlier

(2) a general classification of districts developed by the Office for National Statistics.

3.4.1 Functional regions

The nature of this classification was discussed in detail in section 2 and Figure 2 shows the distribution of the 12 classes formed by crossing functional region type and zone class.

Table 2 sets out the distribution of the 1981 Census present population across the 12 functional region-zone classes. The British population is overwhelmingly urban. Only 5.1% of the population lives in Rural Areas, while 61.7% is concentrated in urban cores, though by 1991 these figures had changed to 5.4% and 60.1% respectively. Metropolitan areas dominate in housing 62.7% of the 1981 population (61.2% of the 1991), but are lessening in importance.

3.4.2 The ONS classification of districts

The Office for Population Censuses and Surveys (now part of the Office for National Statistics) has prepared a new classification of the districts of Great Britain (Charlton, Denham and Wallace 1995). Figure 3 maps the clusters using one map per family, while Table 3 lists the Family, Group and Cluster names and reports the distribution of population across the classes. The classification uses 37 variables derived from the 1991 Census SAS and a modified form of hierarchical cluster analysis was employed to create three nested levels of grouping

(i) families of district (6), (ii) groups of districts (12) and (iii) clusters of districts (34). Each of the 34 clusters belongs to one of the 12 groups which in turn belong to one of the 6 families. The nature of each cluster of districts is defined by the combination of cluster, group and family labels. So, for example, cluster 5 is labelled *Accessible amenity* within the *Coast and*

Table 2: Population classified by functional region type and zone within functional region, 1981 Census, Great Britain

Functional region type	Zone within Functional region: Cores	Rings	Outer Areas	Rural Areas	Totals
Dominant (Metropolitan)					
Population	15,725	3,831	350	256	20,161
%	29.0	7.1	0.6	0.5	37.2
Sub-Dominant (Metropolitan)					
Population	8,232	4,620	825	148	13,824
%	152	8.5	1.5	0.3	25.5
Freestanding					
Population	9,511	5,971	2,369	2,380	20,232
%	17.5	11.0	4.4	4.4	37.3
Totals					
Population	33,467	14,422	3,544	2,784	54,217
%	61.7	26.6	6.5	5.1	100.0

Notes:
1. Population in 1000s Population of Great Britain.
2. % = % of total population of Great Britain.

Sources:
1. Population data from Tables 1 in 1981 Census Small Area Statistics. Crown Copyright. ESRC/JISC Purchase. Provided on the MIDAS service by the Census Dissemination Unit, Manchester Computing.
2. Functional region codes for areas derived from Coombes *et al.* 1982, and supplied by Mike Coombes, University of Newcastle upon Tyne, to ESRC/JISC, made available on the MIDAS service, Manchester Computing.

Figure 3a: The Distribution of District Types in the OPCS Classification based on the 1991 Census

Rural Areas

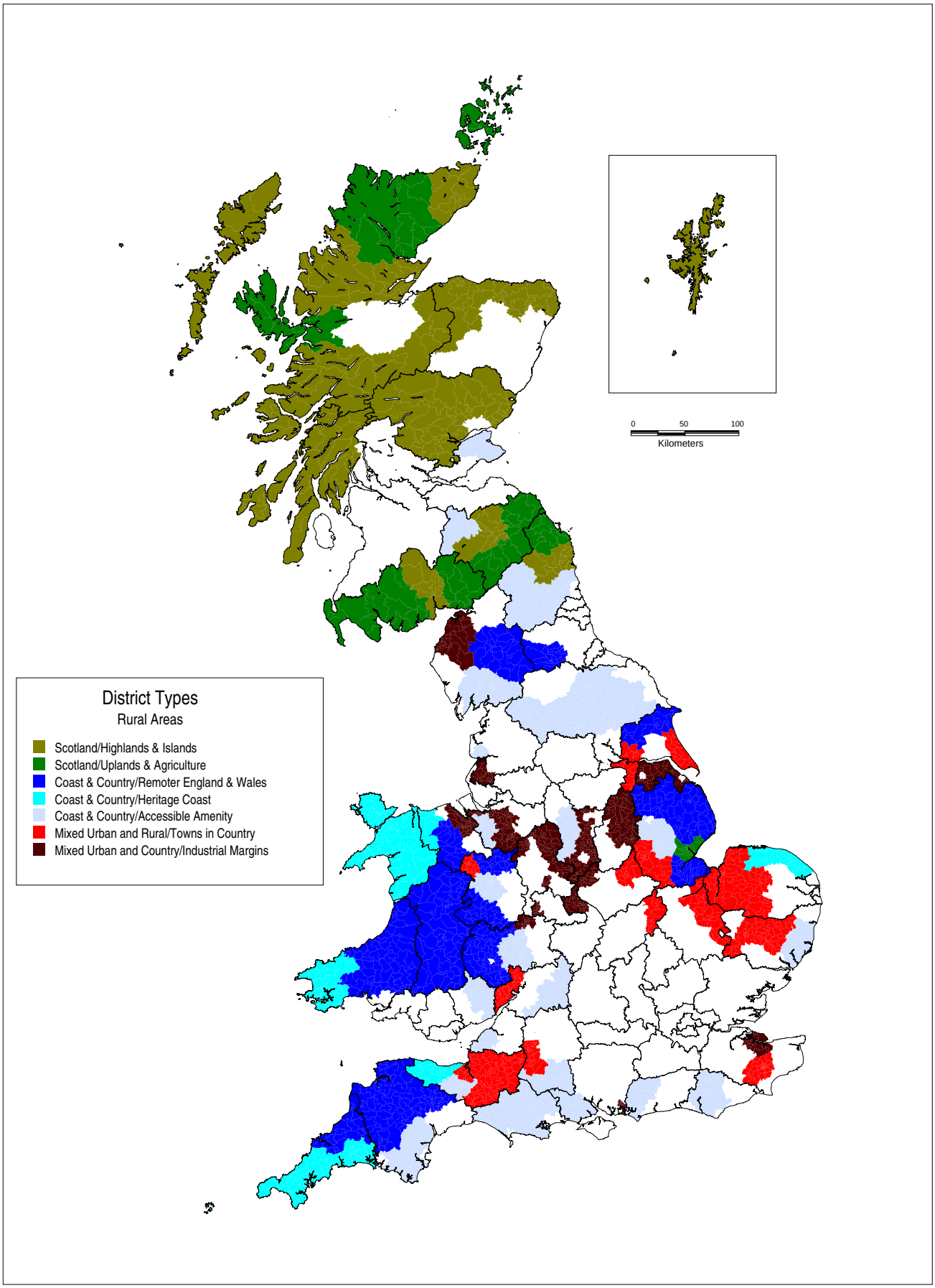


Figure 3b: The Distribution of District Types in the OPCS Classification based on the 1991 Census

Prospering Areas

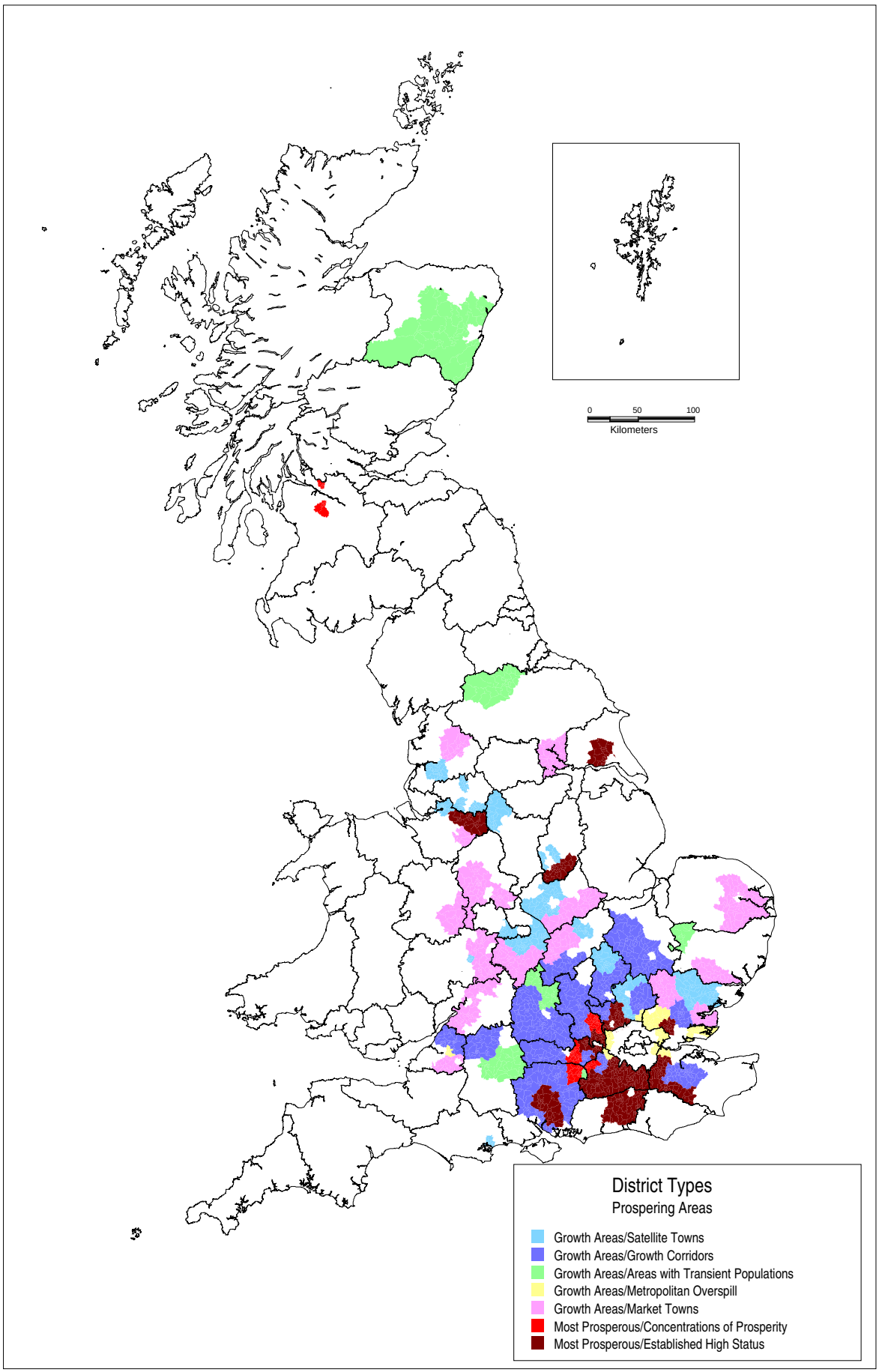


Figure 3c: The Distribution of District Types in the OPCS Classification based on the 1991 Census

Maturer Areas

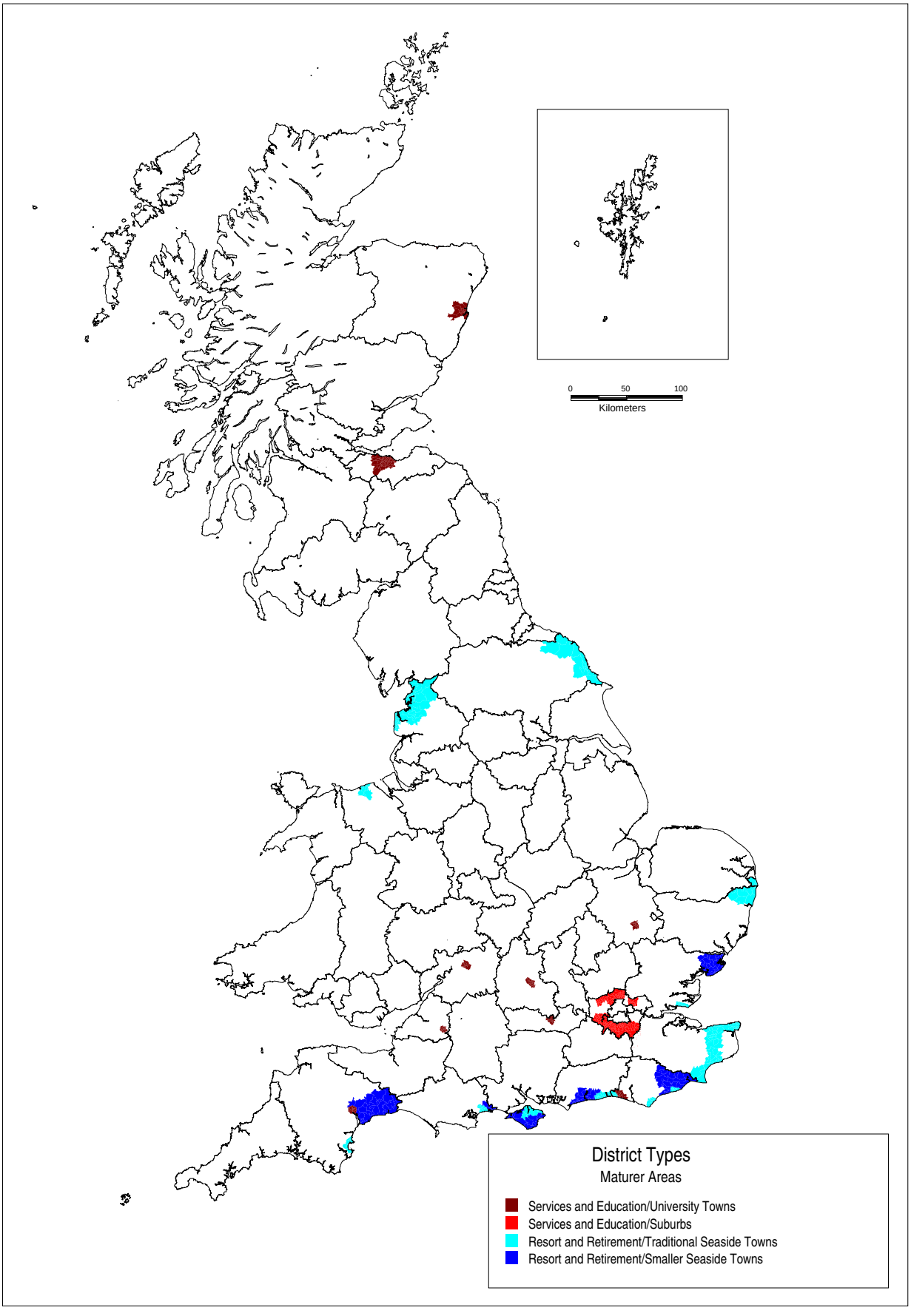


Figure 3d: The Distribution of District Types in the OPCS Classification based on the 1991 Census

Urban Centres

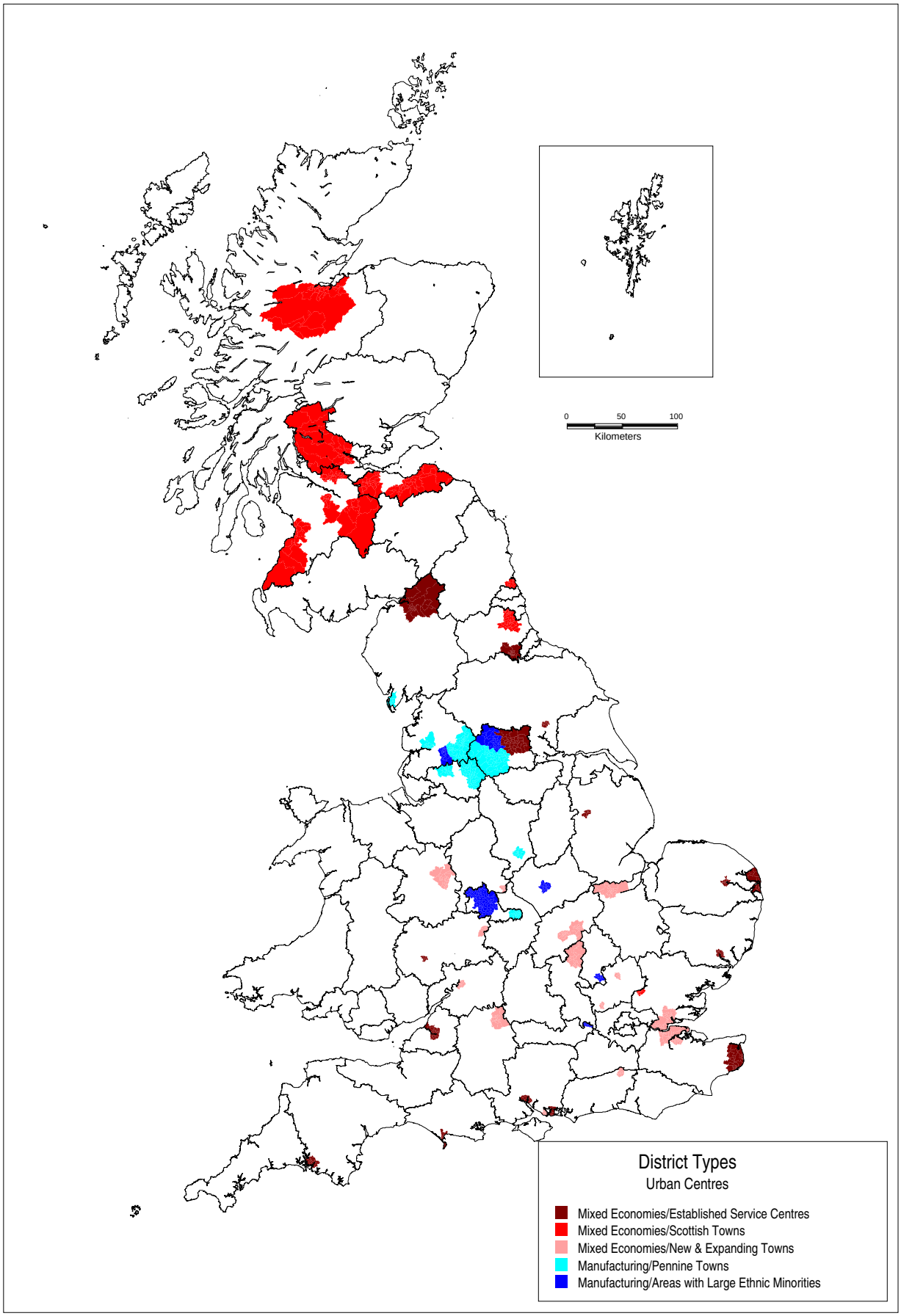


Figure 3e: The Distribution of District Types in the OPCS Classification based on the 1991 Census

Mining and Industrial Areas

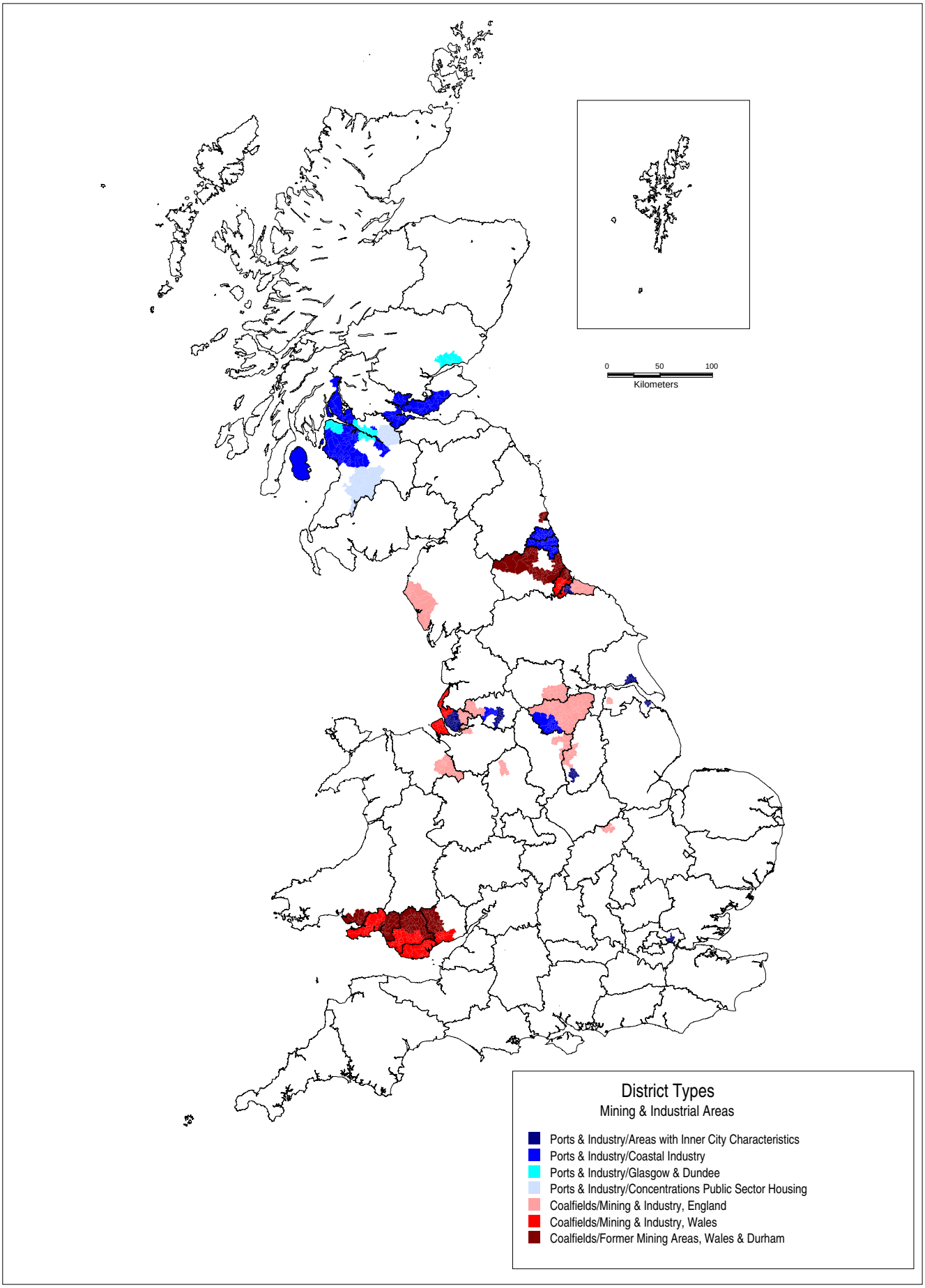


Figure. 3f: The Distribution of District Types in the OPCS Classification based on the 1991 Census
Inner London

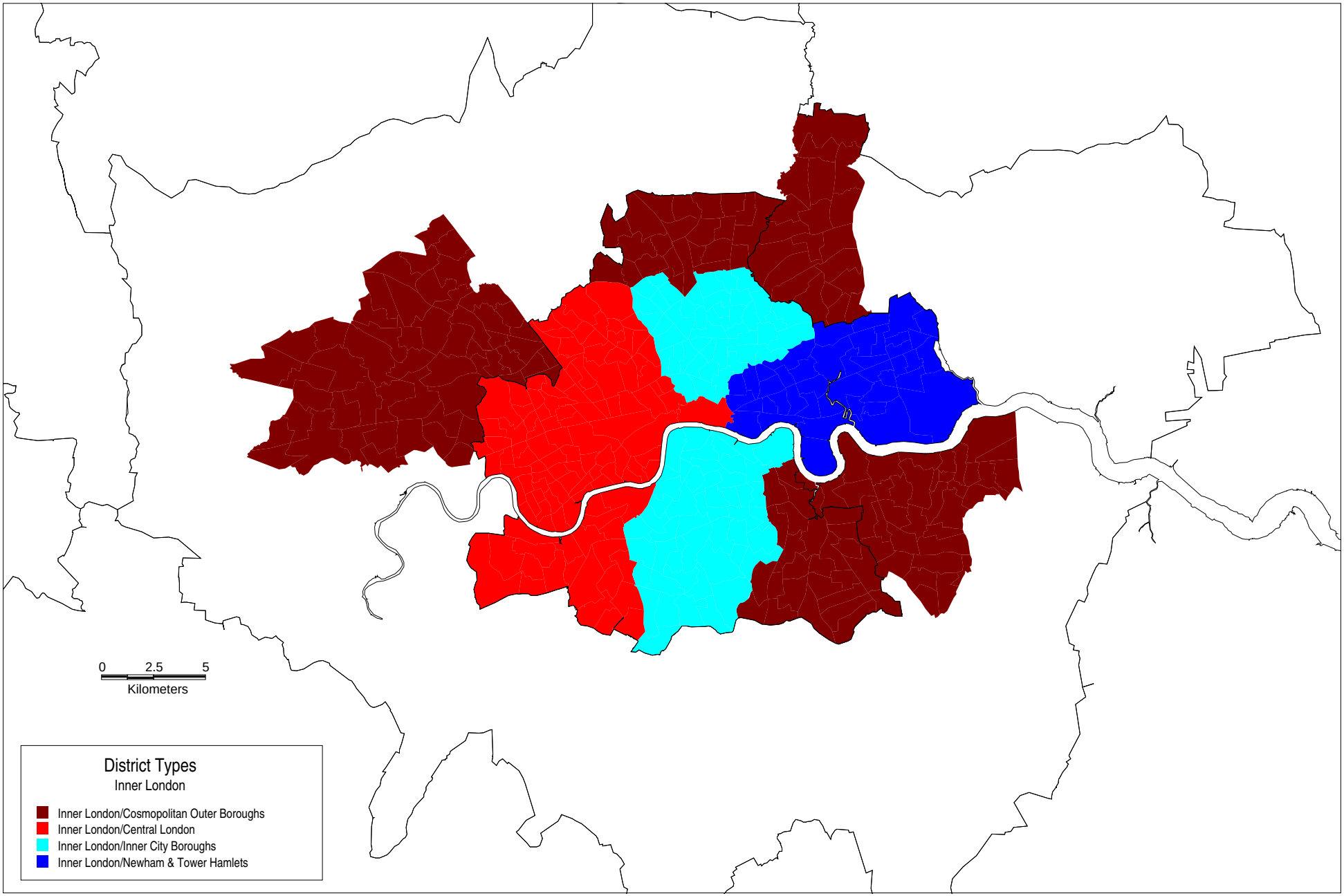


Table 3: Population distribution by the ONS district classification, 1981 and 1991, Great Britain

FAMILY Group Cluster	Per Cent of GB Population					
	1981			1991		
	Family	Group	Cluster	Family	Group	Cluster
RURAL AREAS	17.6			18.4		
Scotland		1.8			1.8	
Highlands and islands			1.3			1.4
Uplands and agriculture			0.5			0.5
Coast and country		8.4			8.9	
Remoter England and Wales			2.1			2.3
Heritage Coast			1.6			1.7
Accessible amenity			4.7			5.0
Mixed urban and rural		7.4			7.6	
Towns in country			2.6			2.8
Industrial margins			4.8			4.9
PROSPERING AREAS	21.4			22.2		
Growth areas		16.7			17.4	
Satellite towns			5.4			5.5
Growth corridors			5.1			5.5
Areas with transient populations			0.8			0.9
Metropolitan overspill			2.4			2.4
Market towns			3.0			3.1
Most prosperous		4.7			4.8	
Concentrations of prosperity			0.8			0.9
Established high status			3.9			3.9
MATURER AREAS	11.3			11.3		
Services and education		7.0			6.9	
University towns			2.6			2.5
Suburbs			4.5			4.4
Resort and retirement		4.3			4.4	
Traditional seaside towns			3.4			3.4
Smaller seaside towns			0.9			1.0
URBAN CENTRES	20.6			20.4		
Mixed economies		10.4			10.6	
Established service centres			4.8			4.7
Scottish towns			2.1			2.1
New and expanding towns			3.5			3.8
Manufacturing		10.1			9.8	
Pennine towns			4.6			4.5
Areas with large ethnic minorities			5.5			5.3
MINING AND INDUSTRIAL AREAS	22.7			21.5		
Ports and industry		11.9			11.0	
Areas with inner city characteristics			3.8			3.5
Coastal industry			5.5			5.2
Glasgow and Dundee			2.0			1.8
Concentrations of public sector housing			0.6			0.5
Coalfields		10.8			10.5	
Mining and industry, England			5.1			5.0
Mining and services, Wales			3.3			3.3
Former mining areas, Wales and Durham			2.3			2.2
INNER LONDON	6.4			6.3		
Inner London		6.4			6.3	
Cosmopolitan outer boroughs			2.6			2.5
Central London			1.7			1.6
Inner city boroughs			1.5			1.5
Newham and Tower Hamlets			0.6			0.7
GREAT BRITAIN	100.0	100.0	100.0	100.0	100.0	100.0

Source: computed from 1981 and 1991 Census SAS.

country group and *RURAL AREAS* family. An example of such a district is Craven (North Yorkshire). The classification is thus a summary verbal description of the essential environmental, employment and social character of the district. The classification is not purely aspatial in that several of the district types have geographic labels (e.g. Inner London, Glasgow and Dundee) which identify these districts as having a particular, unique social and demographic mix.

3.5 Key indicators

Because classifications like the functional region scheme or the district grouping will be peculiar to the country concerned, we have used two general indicators, likely to be available in most European countries, to help in exploring the relationship of population change/internal migration and to urbanisation/counterurbanisation on the one hand, and to economic well being on the other.

3.5.1 Population density

We use population density (persons per hectare) as an indicator of the intensity of settlement of an area. Dorling (1995, p9) provides maps of population density in 1991. Most of the land area (86%) is inhabited at low population densities (less than 2.5 persons per hectare) but only 16% of the population is found in these areas. Conversely, areas with densities of 50 persons per hectare or more occupy only 1% of the land area but house 15% of the population. Table 4 shows the distribution of the Great Britain population by density for 1981 and 1991, revealing a systematic shift to lower densities. A full analysis of recent population density shifts in Great Britain is provided by Dorling and Atkins (1995).

3.5.2 Unemployment rate

Unemployment rates were widely used to provide indicators of the health of labour markets in European countries. Within the European Union unemployment rates are published on a comparable basis for NUTS 2 regions (Eurostat 1995b). The British Census provides counts of persons reporting their economic activity in the week prior to the Census as unemployed. The percentage of the economically active population (both male and female) reporting themselves unemployed in 1991 (computed using counts from Table S08 of the Small Area Statistics) is plotted on Figure 4 (see also Dorling 1995, p89 for an equivalent cartogram). Unemployment is concentrated in inner city wards and pseudo-sectors and in areas where resource based industries (coal mining in particular) have been in decline. The 1991 picture is a snapshot in a continuously changing panorama that moves up and down with the economic

Table 4: Distribution of the 1981 and 1991 populations by density of ward population

Density (persons per hectare)	1981 %	1991 %
0-<1	8.5	8.9
1-<5	13.0	13.5
5-<10	8.9	9.1
10-<20	16.4	16.6
20-<20	27.2	26.8
40-<60	16.8	16.1
60+	9.3	9.0
Total	100.0	100.0

Source: 1991 and 1981 Census SAS, Crown Copyright, ESRC/JISC Purchase.

Notes:
1. Population densities are computing using 1991 Census data.
2. The 1981 % is based on the present definition. The 1991 % is based on the 1991 Census resident definition, for persons ages 1+.

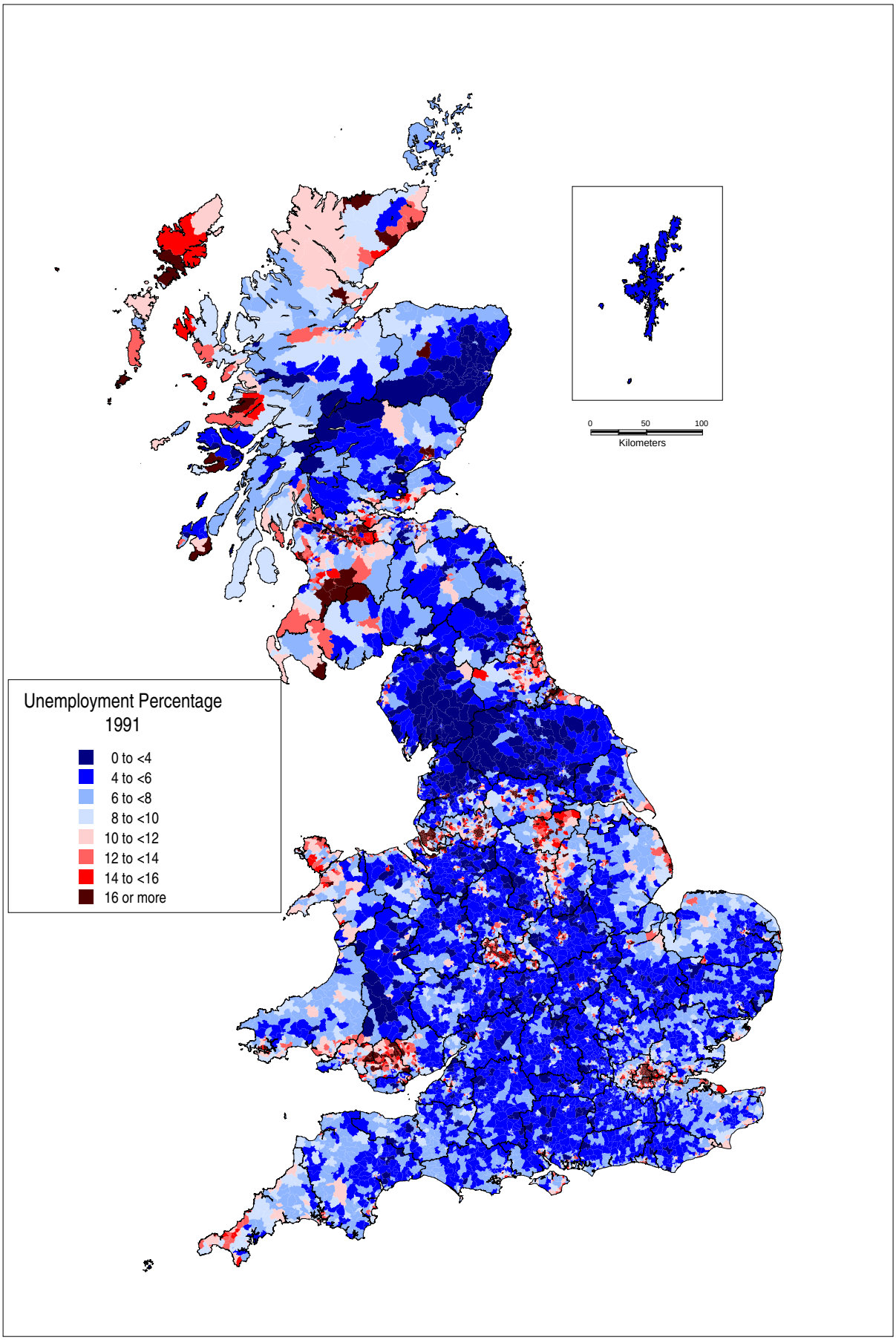
Table 5: Distribution of the 1981 and 1991 populations by unemployment

Unemployment (percentage intervals)	1981 %	1991 %
<4	5.8	6.3
4-<6	23.3	24.4
6-<8	19.1	19.6
8-<10	14.2	14.1
10-<12	10.8	10.5
12-<14	8.0	7.6
14-<16	5.6	5.3
16-<18	3.8	3.6
18-<20	3.6	2.5
20+	6.8	6.0
Total	100.0	100.0

Source: 1991 and 1981 Census SAS, Crown Copyright, ESRC/JISC Purchase.

Notes:
1. The unemployment classification uses 1991 Census data.
2. The unemployment percentage is for both men and women = 100* (unemployed/economic active).
3. The 1981 % is based on the present definition. The 1991 % is based on the 1991 Census resident definition, for persons ages 1+.

Figure 4: The Distribution of Unemployment, Great Britain, 1991



cycle. Dorling (1995 pp 96-97) carried out an analysis how the regional impacts of the economic cycle vary: the use in unemployment between 1980 and 1985 impacted more severely in the North while that between 1990 and 1993 affected the South in equal measure. Table 5 shows how the distribution of the population by unemployment experience has shifted over the 1981-91 decade. The population has moved significantly into areas of lower unemployment experience.

3.6 Mapping methods

Dorling (1995) has argued strongly that conventional mapping techniques - particularly shaded maps of areas of unequal densities - should be replaced by cartograms in which map areas are proportional to population size, so as to give proper weight to urban population being at high densities in small area. We have not attempted to follow this advice for two reasons: technical difficulty (although a key algorithm is available Dorling 1995) and the difficulty of the reader (particularly a non-national) in understanding the cartogram. To move someway towards the Dorling position, we use inset maps in which population change or net migration rates are plotted on symbols whose size is proportional to the contributing population. Such a technique is also valuable for countries where only the geographic centroids of statistical areas are available and not their boundaries. This is likely to be the case in other case studies.

4. SPATIAL PATTERNS

In this section of the paper we discuss the geographical patterns revealed in a set of maps of population change and net internal migration. The maps are paired: the first member is a shading (choropleth) map of the whole of Britain while the second in the pair is a map of circles proportional to the area populations, shaded according to population change percentage or net migration rate per 1000. The second maps focus on the largest urban concentrations in Britain: Greater London and its region, Birmingham and its region and the cluster of city regions that flank the southern Pennine hills of Northern England (Merseyside, Greater Manchester, Leeds-Bradford and the Sheffield region). The first map of a pair gives over-prominence in terms of population experience to low density rural areas; the second map of a pair restores the balance by focusing on high density urban populations.

4.1 The pattern of population change, 1981-91

The first pair of maps (Figure 5A and 5B) show percentage change in the present population between 1981 and 1991 for wards in England and Wales and pseudo-sectors in Scotland. The

Great Britain map (Figure 5A) shows a pattern of losses in the cores of large cities and gains in their outer areas and rural hinterlands. Dorling (1995, p.19) has mapped change using 1981 wards for both 1971-81 and 1981-91, and finds the intensity of this urban deconcentration process much reduced in the second decade. Whereas in the 1970s 75% of people lived in wards with changes of greater than 5% up or down, in the 1980s the equivalent percentage was only 50.

The pattern in the 1980s is also less regular in that major counter examples of the general structure can be found. Figure 5B shows that many wards in the centre of London gained population. Two processes were at work: redevelopment and influx from abroad. Areas which had seen slum clearance or factory or dock closure in the 1960s and 1970s began to be redeveloped in the 1980s: the most prominent examples being the wards to the east of the City of London (financial district) extending to the former docklands where warehouses were converted to residences and empty sites build on. Similar redevelopment occurred in many other inner London areas.

A second class of exceptions to the general pattern of urban deconcentration/gain to peripheral areas are areas of resource industry shrinkage - former mining areas such as South Wales, parts of Yorkshire and Northumberland-Durham. Population losses also occurred in some of the most remote British areas (some of the Hebridean Islands, parts of the North West Highlands, the Holyhead region of Anglesey, parts of Pembrokeshire and South Cornwall).

4.2 The pattern of net internal migration, 1990-91

The second pair of maps (Figures 6A and 6B) plot the rate of net internal migration for wards (England and Wales) or pseudo-sectors (Scotland). Many authors have mapped in-migration rates at different scales (Champion 1996, Dorling 1995 p.59) but these are difficult to interpret because the rate of out-migration (unavailable from the standard census tables) is highly correlated. It is only when we difference in- and out-migration using data from the Special Migration Statistics that significant patterns emerge. The class intervals in Figures 6A and 6B are the same numbers as in the population change maps although the net migration variable is expressed per 1000 population not per 100. However, if the net migration rates observed for the one year interval prior to the 1991 Census persisted for a decade they would be equivalent to the decade interval percentages of the population change maps. Population change is not, of course, equivalent to net internal population movement but this component is undoubtedly the most important contributor (demonstrated by Dorling 1995, p.20 at district/NUTS 4 scale and by Champion 1996 at county/NUTS 3 scale). Variation in natural increase plays a minor role in population change variation. The seaside towns of Britain's coast attract elderly in-migrants

Figure 5a: Population Change, Great Britain, 1981-91

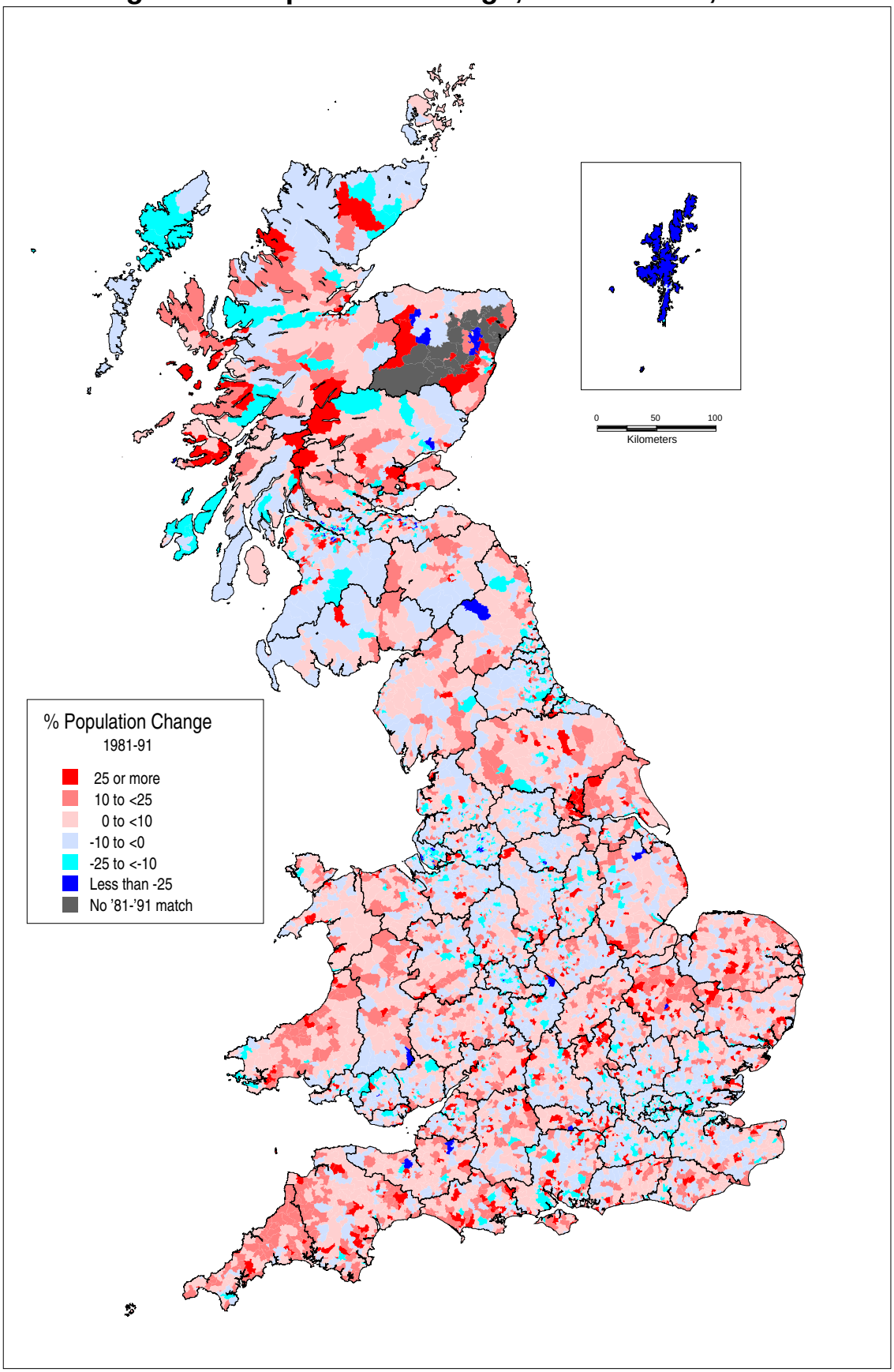
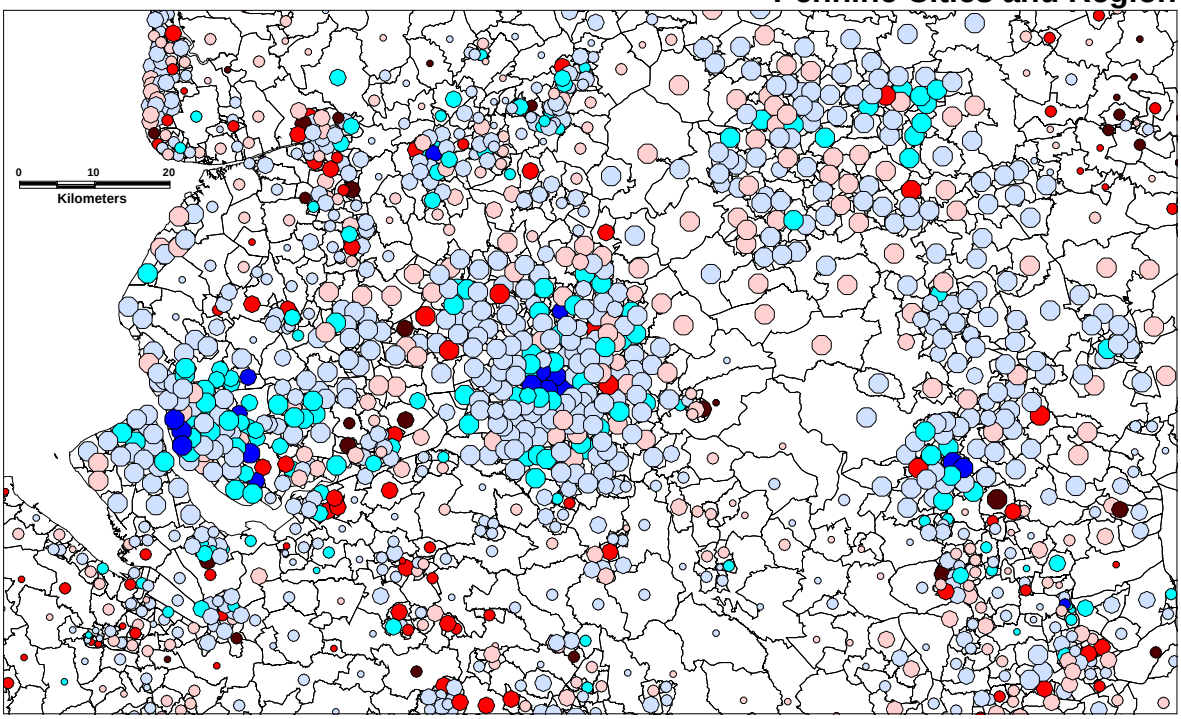
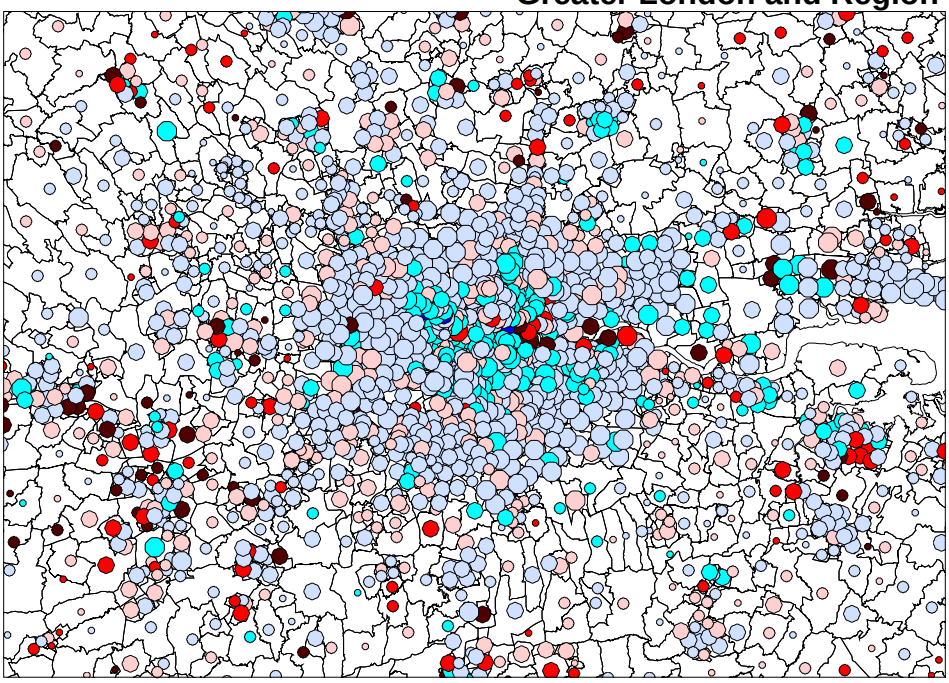


Figure 5b: Population Change, Major Metropolitan Areas, 1981-91

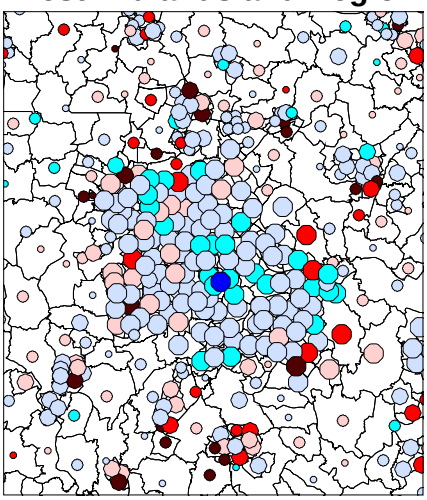
Pennine Cities and Region



Greater London and Region



West Midlands and Region



Total Population, 1981

- 0 to <2,000
- 2,000 to <5,000
- 5,000 to <10,000
- 10,000 to <40,000

% Population Change 1981-91

- 25 or more
- 10 to <25
- 0 to <10
- -10 to <0
- -25 to <-10
- Less than -25

Figure 6a: The Pattern of Net Migration, All Ages, Great Britain, 1990-91

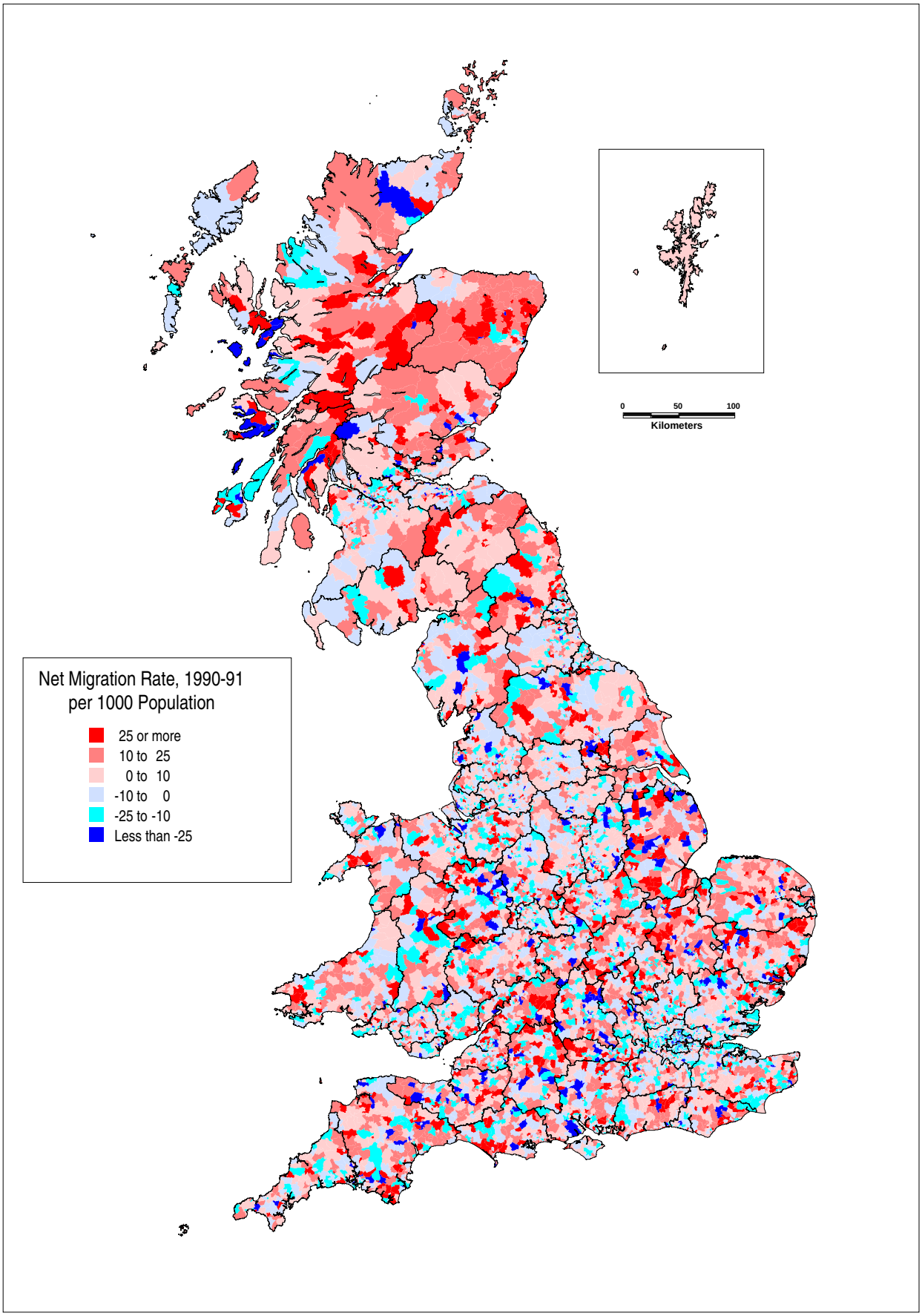
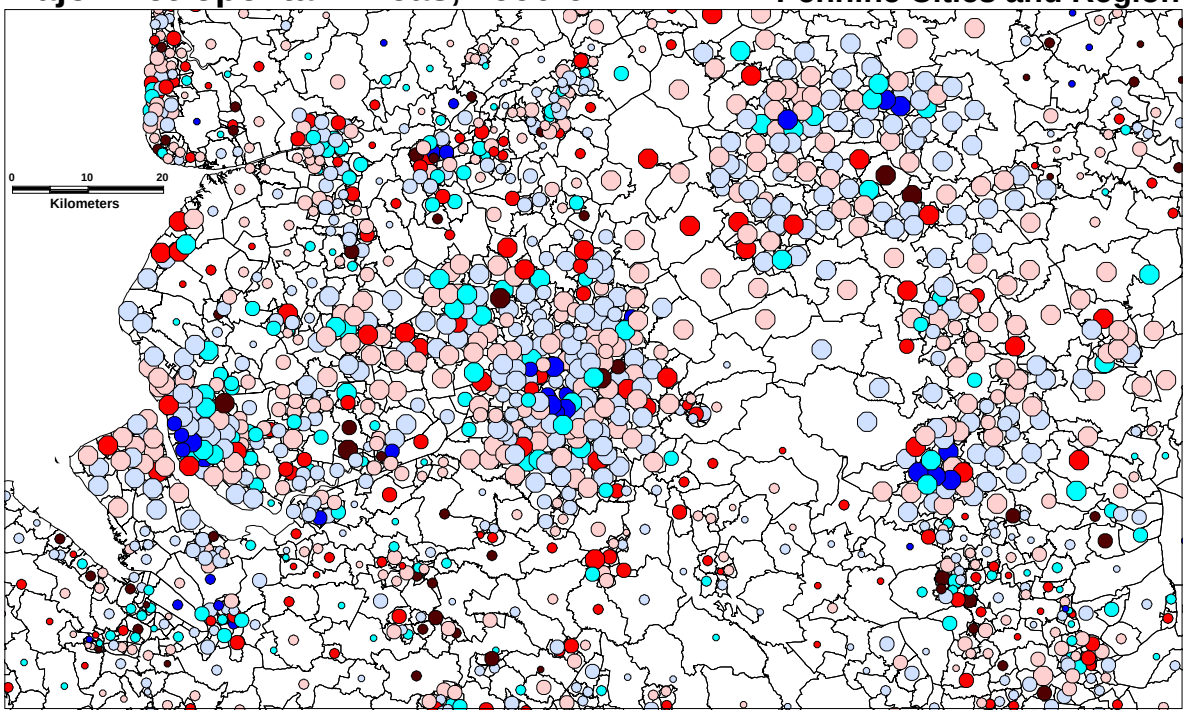
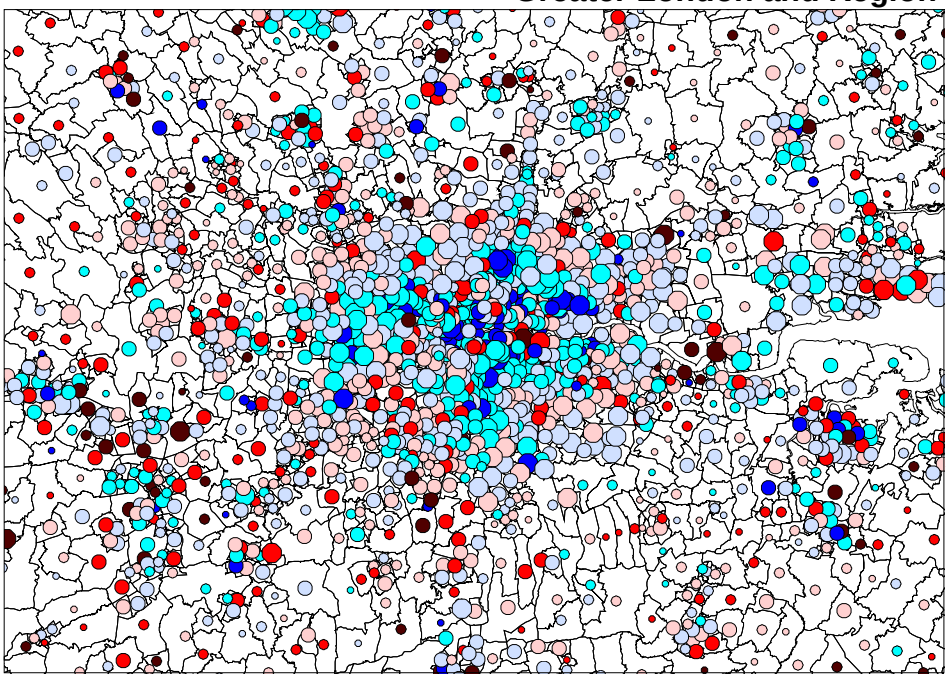


Figure 6b: The Pattern of Net Migration, All Ages
Major Metropolitan Areas, 1990-91

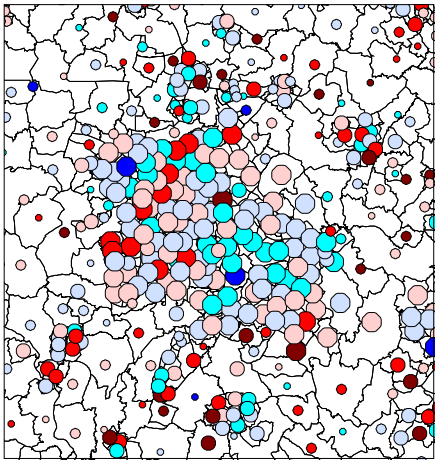
Pennine Cities and Region



Greater London and Region



West Midlands and Region



Total Population, 1991

- 0 to <2,000
- 2,000 to <5,000
- 5,000 to <10,000
- 10,000 to <40,000

Net Migration Rate, 1990-91
per 1000 Population

- 25 or more
- 10 to <25
- 0 to <10
- -10 to <0
- -25 to <-10
- Less than -25

but suffer from natural decrease, while rapidly growing towns to the north and west of London show higher than average natural increase due to in-migration of family age migrants.

The net internal migration patterns are broadly similar to those of longer term population change but there are wider spreads of gains and losses, particularly in the metropolitan areas shown in Figure 6B. Compare, for example, the Greater London maps: Figure 6B shows more intense migration losses over the inner boroughs than Figure 5B shows population losses. On the other hand many suburban wards show net migration gains in 1990-91 but overall population losses in 1981-91 decade. This may well be a period effect: at the beginning of the decade inner London boroughs were still losing population heavily but by the end of the decade they were gaining (Dorling 1995, p.21). Another explanation may be the underestimate of population change: a 0.25% decrease in this study based on Census data compared with a 2.5% increase based on estimate data (Table 1).

4.3 Net migration over the life course

The picture of population movements painted above refers to the whole population: behind this picture are several very different patterns related to the stage in life course people are in. The Special Migration Statistics give us a coarse framework of ten age-sex groups to use in classifying migrants at fine spatial scales (NUTS5 - wards or sectors). Migrants are divided into five broad ages, 1-15, 16-29, 30-44, 45 to pensionable age, pensionable age and over, and into males and females. Pensionable age, at the time of the 1991 Census, was defined as 65 for males and 60 for females (it has since been equalised as 65 for both sexes). Using these data we present five map pairs of net migration (a Great Britain and a major metropolitan areas map in each pair) in Figures 7 through 11, selecting either male or female migrants at each age. There are gender differences (identified in the graphs of Figures 12 through 17) but they are very small.

4.3.1 The childhood and family ages, 1-15 and 30-34

These maps (Figures 7 and 9) are very similar in pattern, and close to the overall pattern except that migration rates are more extreme with more areas and people in the highest and lowest categories. This reflects the moderately high intensity of migration at these ages (see Stillwell, Rees and Duke-Williams 1996, Figure 16.11 or Champion 1996, Figure 9 for the graph of migration rates by age). The family ages are characterised by intense losses from the city cores and widespread gains in urban fringe and rural areas. The patchwork quilt appearance of the Great Britain maps (Figures 7A and 9A) reflects the widespread distribution of cities and towns over most of the country, each with its individual pattern of inner loss and outer gain.

4.3.2 The adolescent and young adult ages, 16-29

Figures 8A and 8B form a dramatic contrast to the childhood and family age maps. Large swathes of low density peri-urban or rural localities experience losses of more than 25 net migrants per 1000 population. Areas showing gains are found near the centre of the large metropolitan areas as well as the metropolitan periphery. The contrast in directions of movement is related to the purposes of migration in these two age groups. The 16-29 age band contains young men and women starting on their independent life careers. A large proportion (25% at least in 1991) seek to enter higher or further education; and for many, particularly in England, this means an associated migration. Hence the net migrant losses in a wide set of areas (light grey to white on the map) and gains in a few, located around institutions of learning. At the ages of leaving home for higher education the population is experiencing urban concentration. Urban concentration also makes sense for those setting up home after schooling or the student years because the cores of cities provide most of the older cheaper homes either for rent or for first time purchase.

Of course, by their mid or late twenties, young adults may be well established in their careers and beginning to find partners and raise children. This will indicate outward movement to better housing areas such as Warrington New Town (Pennine Cities map in Figure 8b), the commuter towns of Surrey (Greater London map) or Tamworth (West Midlands map).

4.3.3 The middle and pre-pensionable ages, 40-64/59

After 40 life slows down considerably and migration rates reach a minimum. Hence the paler shades in Figure 10 - more areas in the categories close to migration balance. The main urban concentrations of England and Scotland experience low rates of out-migration while surrounding areas show low rates of net in-migration. It is the remoter districts beyond metropolitan Britain that high rates of in-migration (mostly) or out-migration (in a few areas) are observed.

Migration at the end of this age band becomes more directed towards seeking pleasanter environments for post-work life. Although the statutory pension age for men is 65, a proportion of the labour force retires early (through choice or redundancy). On the Pennine Cities map (Figure 10b) the highest rates of in-migration (of 25 per 1000 of the resident population) are found in wards located in the inter-urban countryside or on the Fylde Coast (Blackpool, Lytham St. Annes).

Figure 7a: The Pattern of Net Migration, Males Aged 1-15 Great Britain, 1990-91

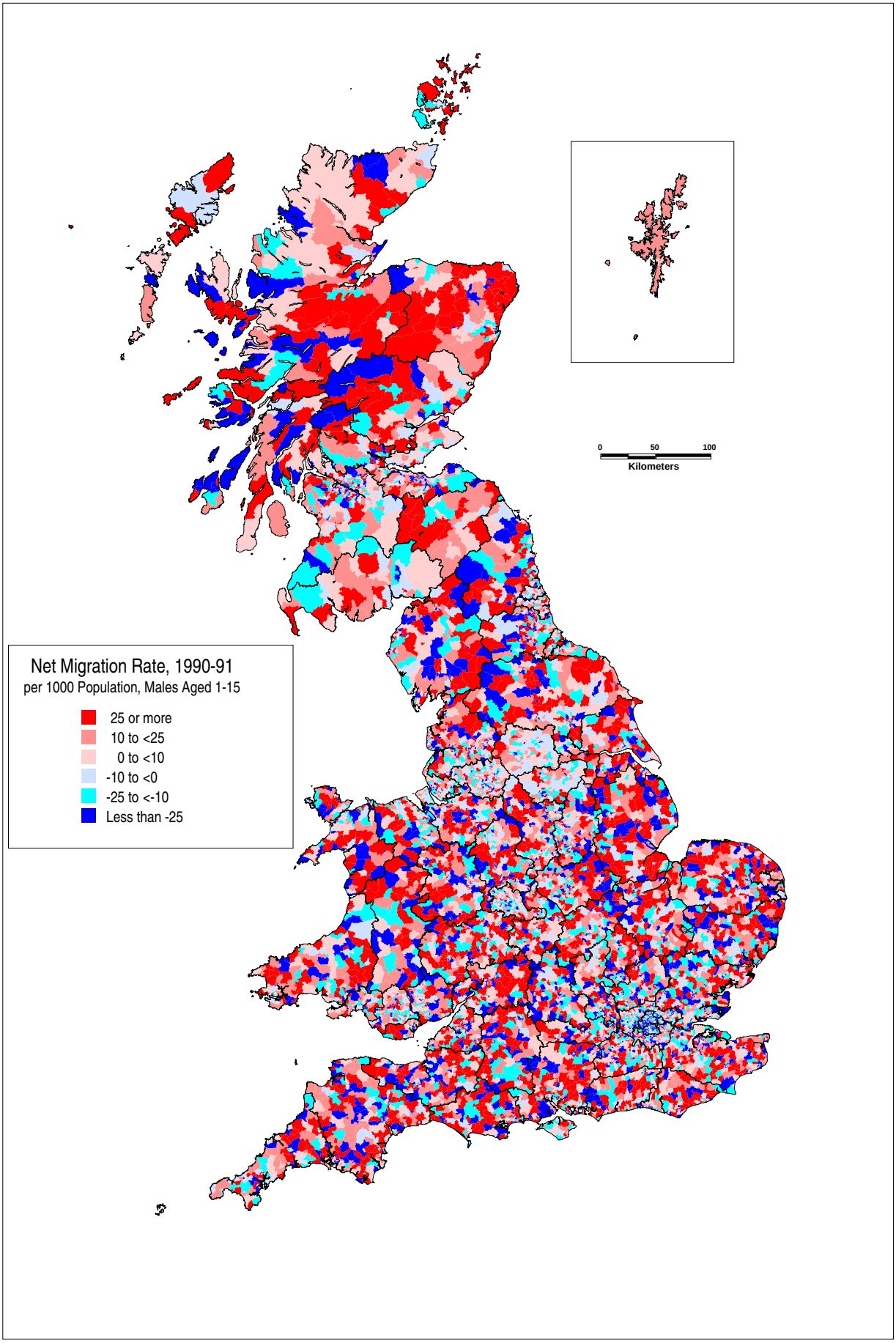
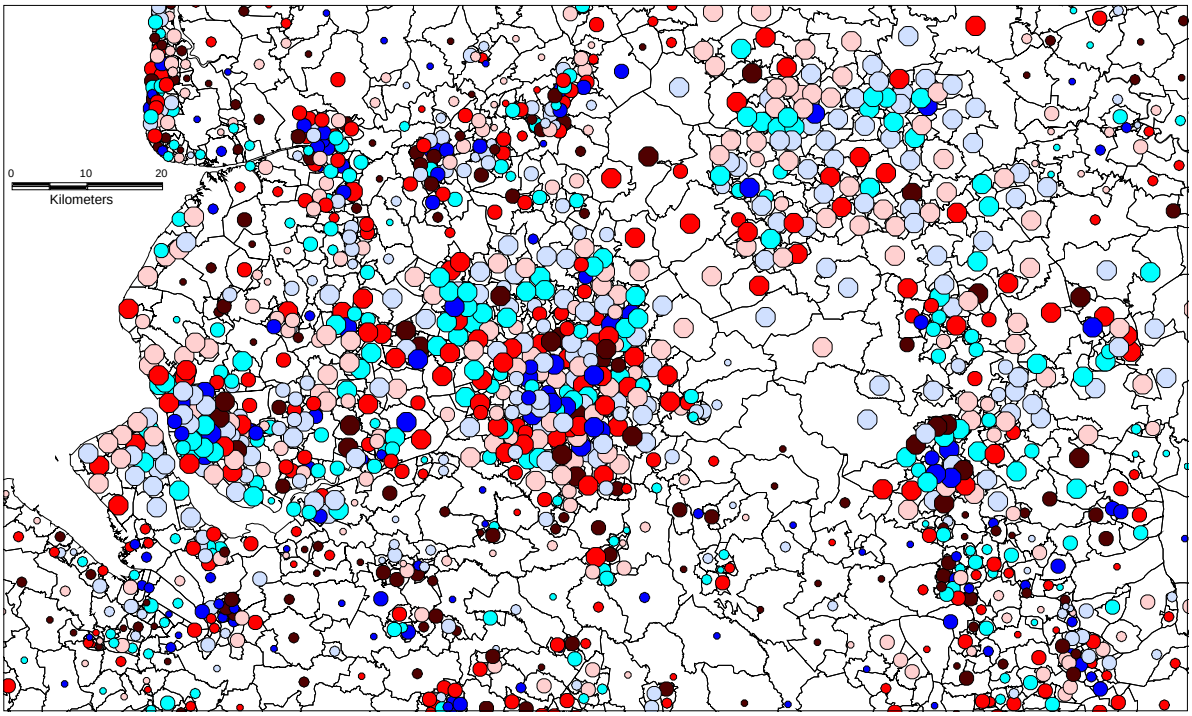
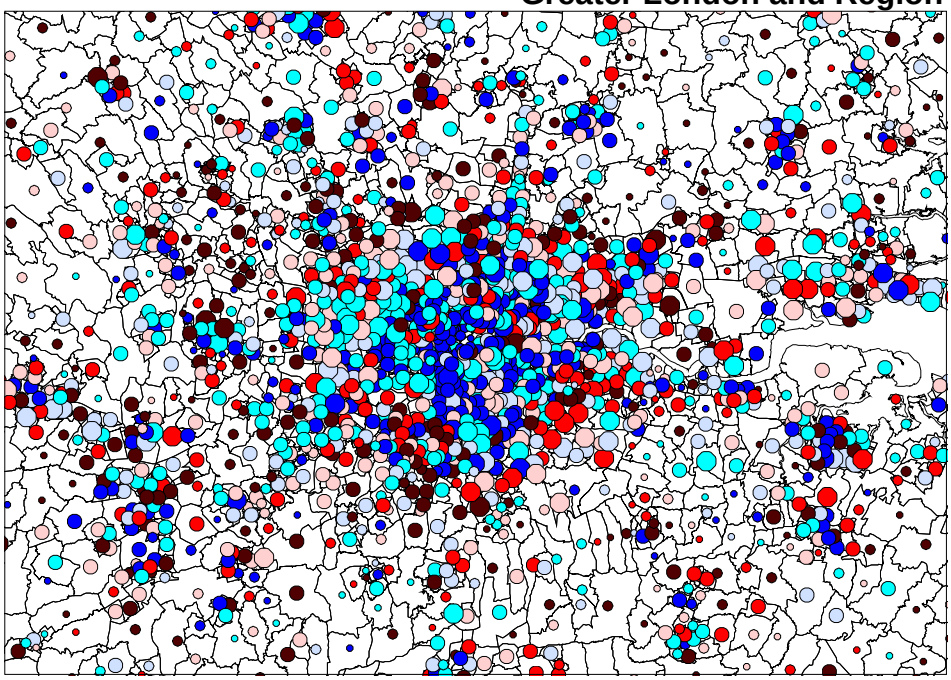


Figure 7b: The Pattern of Net Migration, Males Aged 1-15
Major Metropolitan Areas, 1990-91

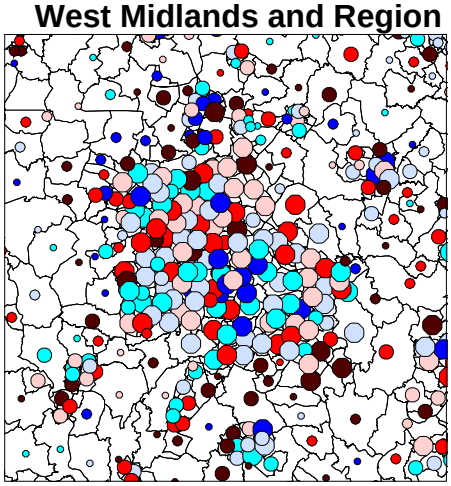
Pennine Cities and Region



Greater London and Region



West Midlands and Region



Population, 1991
Males Aged 1-15

- 0 to <200
- 200 to <400
- 400 to <1,000
- 1,000 to <5,000

Net Migration Rate, 1990-91
per 1000 Population

- 25 or more
- 10 to <25
- 0 to <10
- -10 to <0
- -25 to <-10
- Less than -25

Figure 8a: The Pattern of Net Migration, Males Aged 16-29
Great Britain, 1990-91

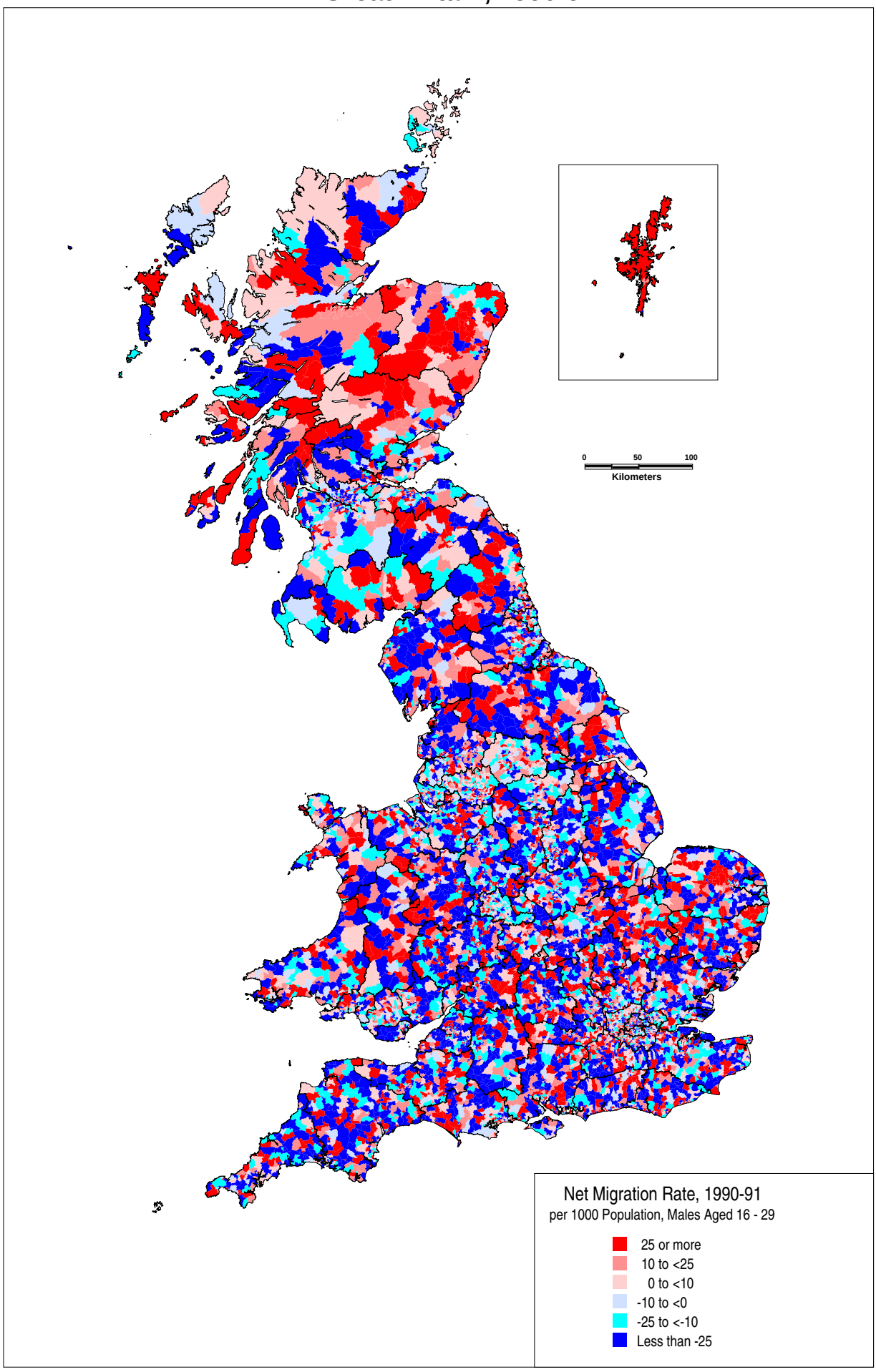
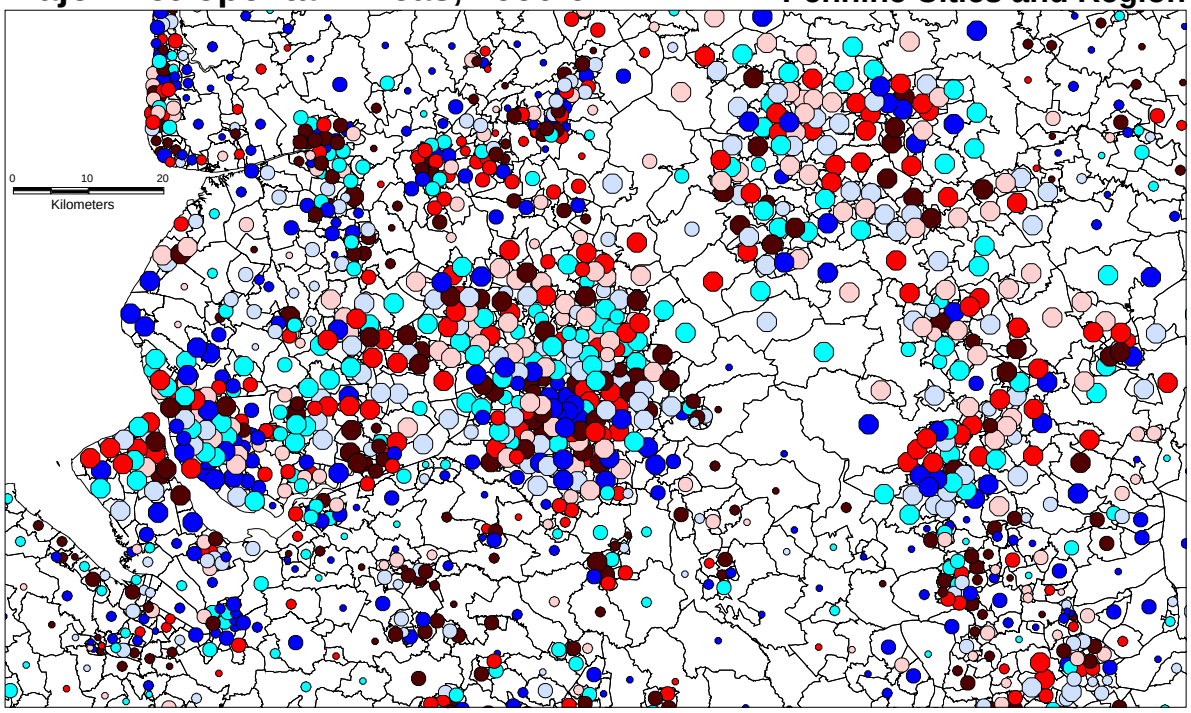
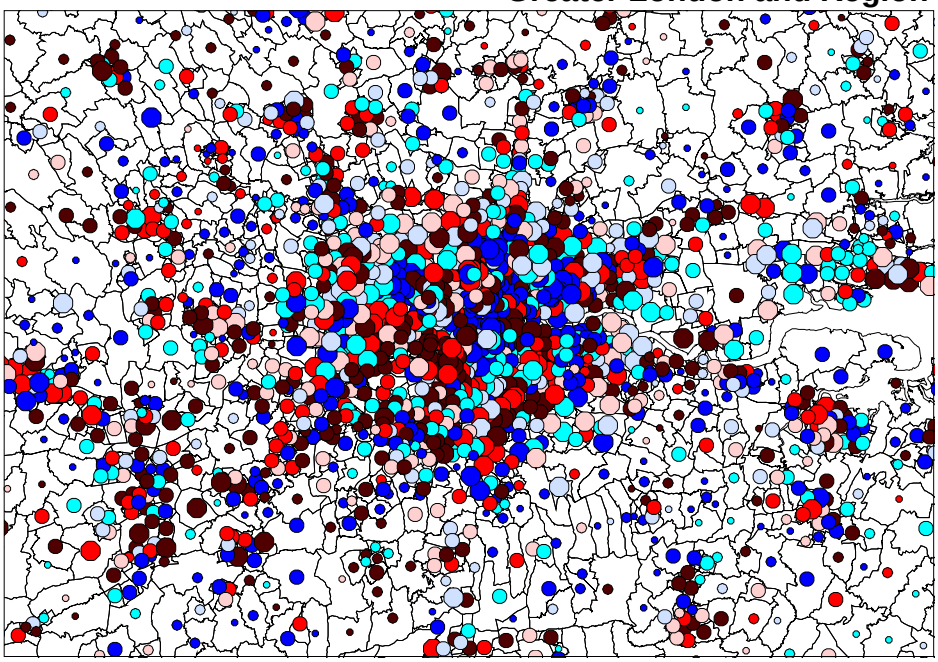


Figure 8b: The Pattern of Net Migration, Males Aged 16-29 Major Metropolitan Areas, 1990-91

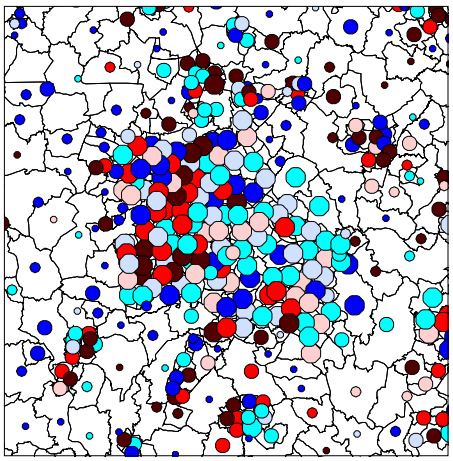
Pennine Cities and Region



Greater London and Region



West Midlands and Region



Population, 1991
Males Aged 16-29

- 0 to <200
- 200 to <400
- 400 to <1,000
- 1,000 to <5000

Net Migration Rate, 1990-91
per 1000 Population

- 25 or more
- 10 to < 25
- 0 to < 10
- -10 to < 0
- -25 to < -10
- Less than -25

Figure 9a: The Pattern of Net Migration, Females Aged 30-44 Great Britain,1990-91

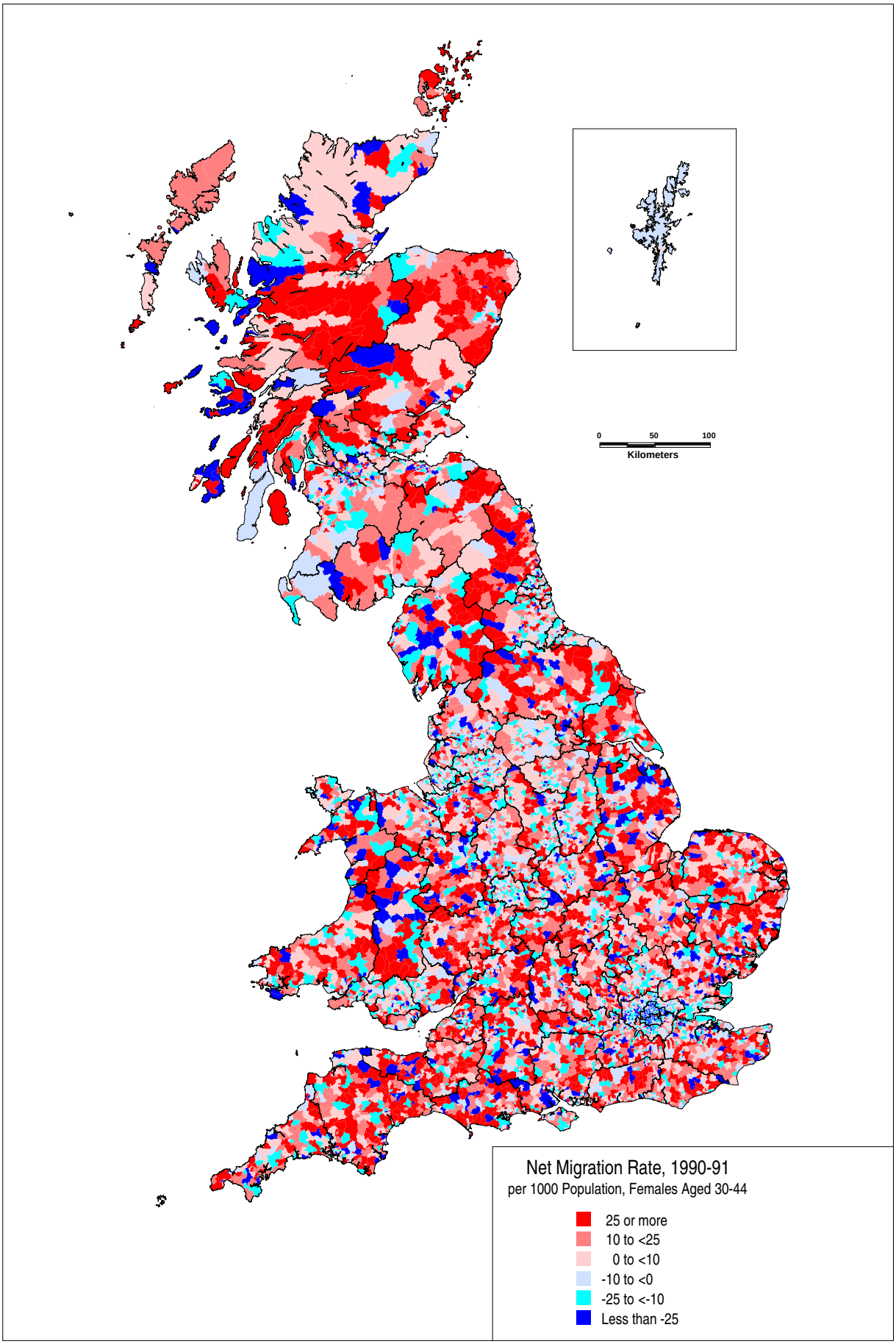
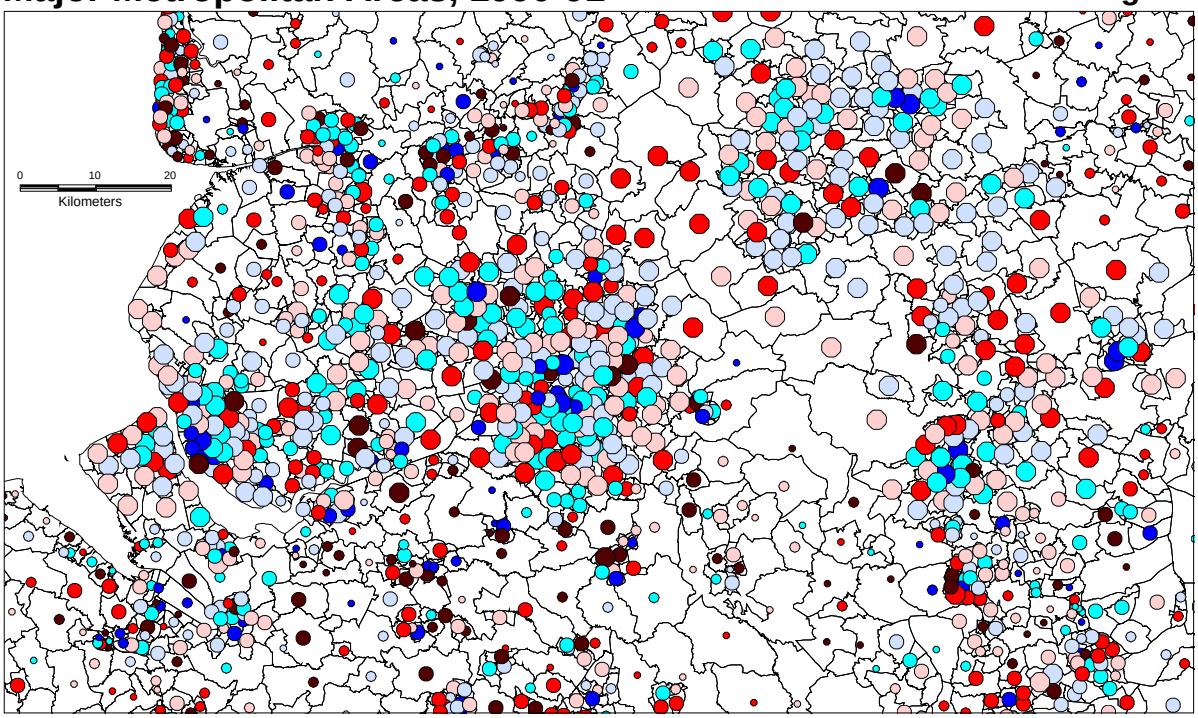
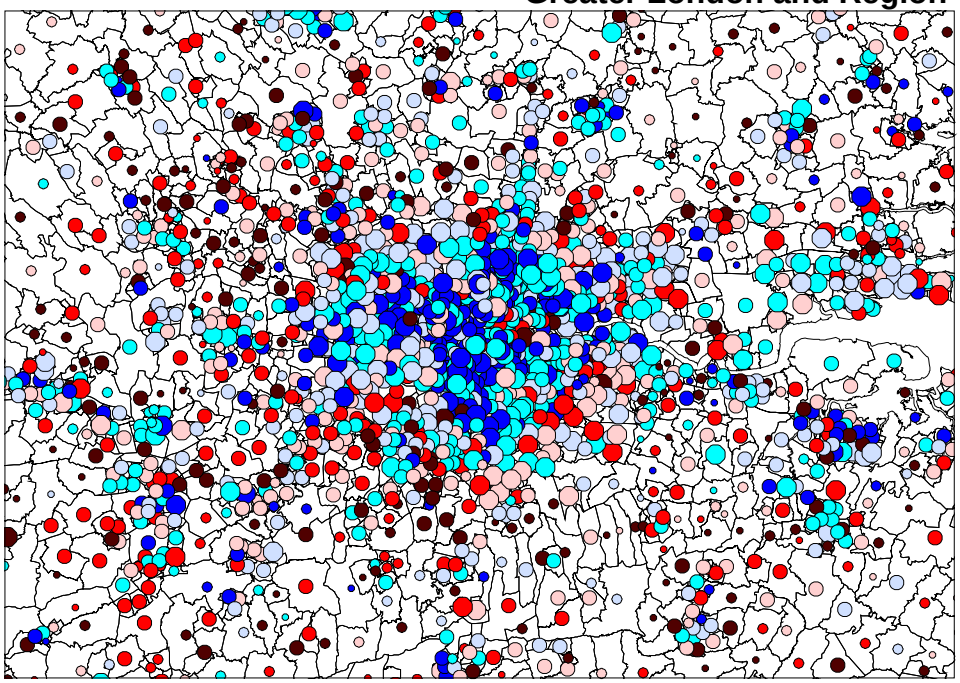


Figure 9b: The Pattern of Net Migration, Females Aged 30-44
Major Metropolitan Areas, 1990-91

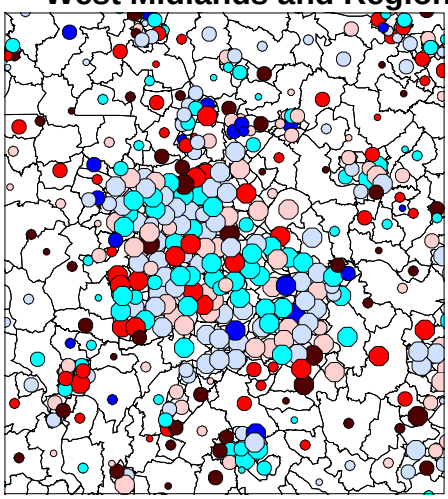
Pennine Cities and Region



Greater London and Region



West Midlands and Region



Population, 1991
Females Aged 30-44

- 0 to <200
- 200 to <400
- 400 to <1,000
- 1,000 to <5,000

Net Migration Rate, 1990-91
per 1000 Population

- 25 or more
- 10 to <25
- 0 to <10
- -10 to <0
- -25 to <-10
- Less than -25

Figure 10a: The Pattern of Net Migration, Males Aged 45 to 64
Great Britain, 1990-91

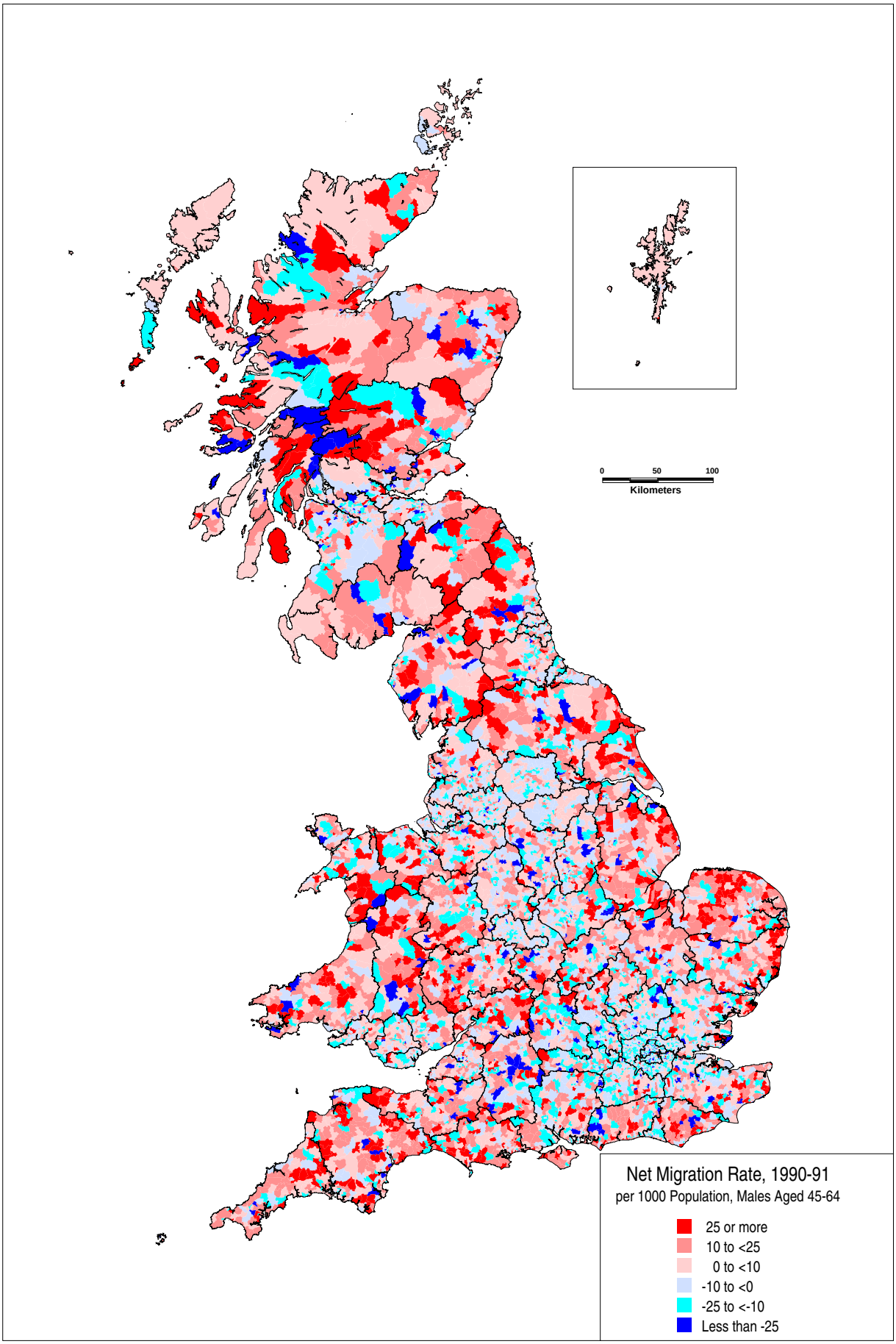


Figure 10b: The Pattern of Net Migration, Males Aged 45-64 Major Metropolitan Areas, 1990-91

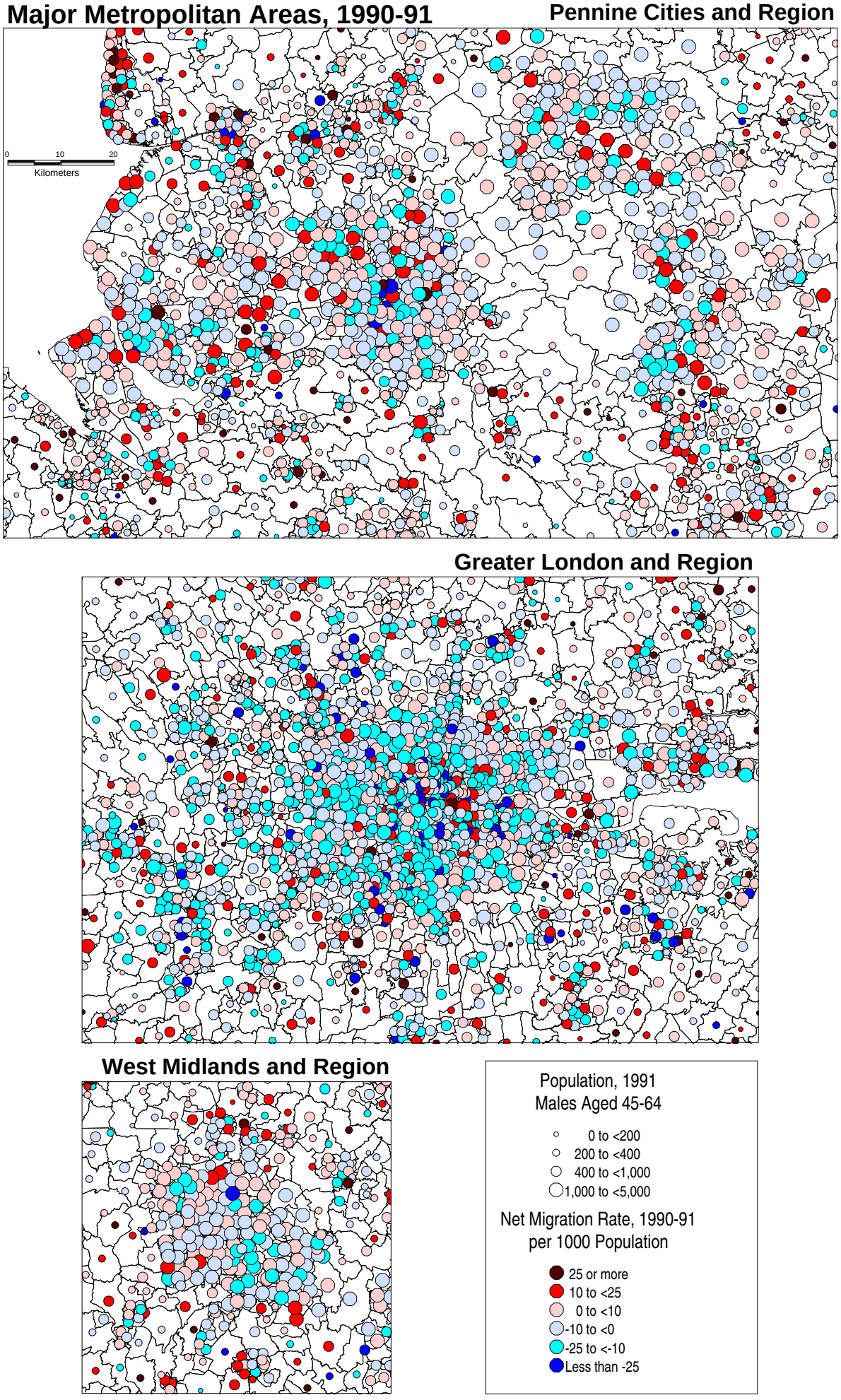


Figure 11a: The Pattern of Net Migration, Females Pensionable Age and Over, Great Britain, 1990-91

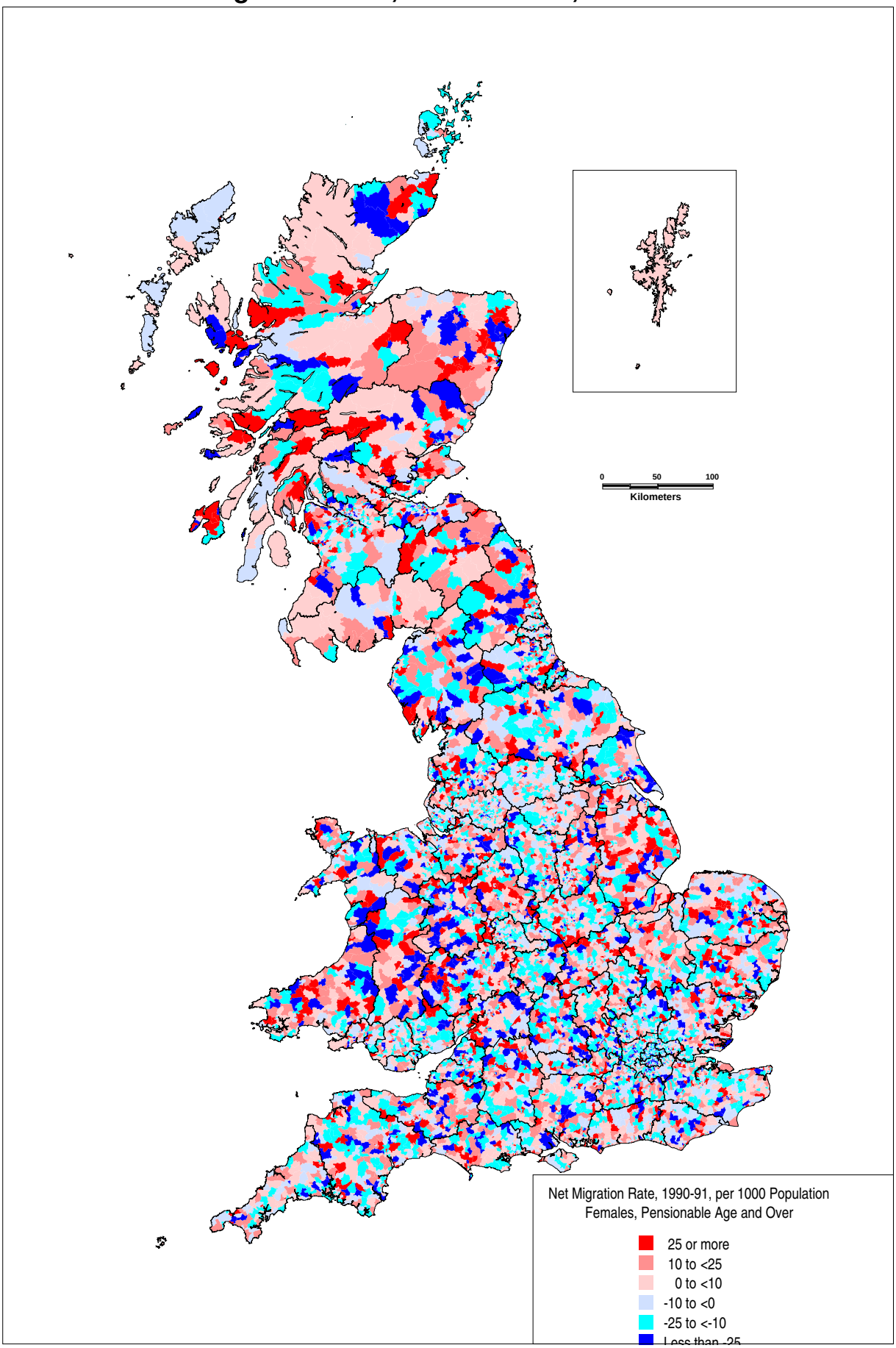
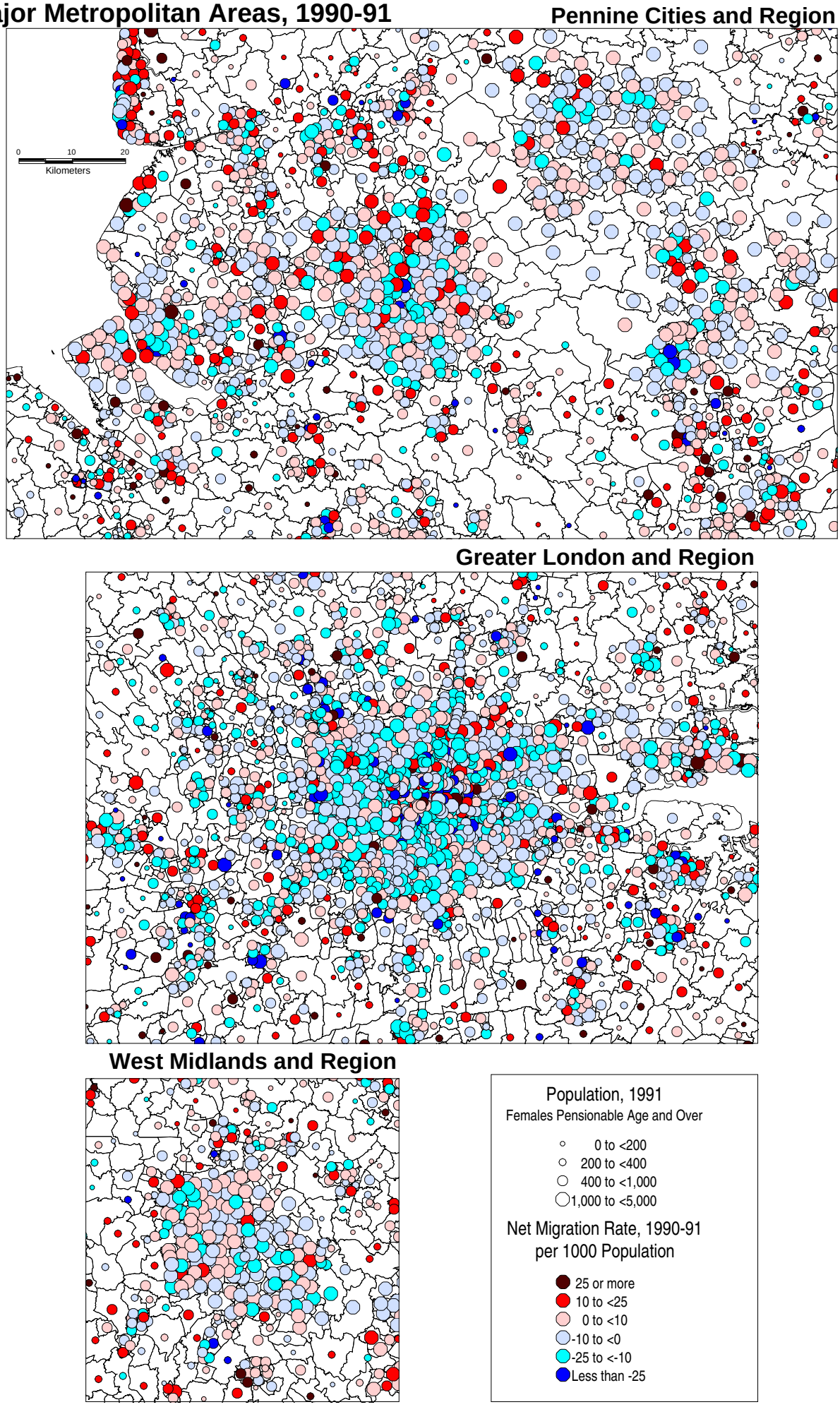


Figure 11b: The Pattern of Net Migration, Females Pensionable Age and Over Major Metropolitan Areas, 1990-91



4.3.4 The pensionable ages, 65/60 and over

The pattern of migration after the pension age threshold is more variegated than the pre-pensionable age map. More areas outside of the metropolitan regions show loss though there are still overall gains in these areas. The migration directions of the elderly are more complex than previous research at larger spatial scales had suggested (Warnes 1992, Rees 1992).

4.4 Making sense of the maps

The maps of population change and net internal migration show complex mosaics of movements in Britain over the 1981-91 period. To make better sense of these mosaics we need to simplify and summarise. The approach of classification of areas into types which we might expect to influence the directions of migration is a fruitful one,. In the next section of the paper we use the functional regions framework developed by geographers at the University of Newcastle to summarise population change and net migration. Previous findings (Champion *et al*. 1987) have shown Britain to be undergoing a process of counter urbanisation which included both decentralisation within urban regions, deconcentration from bigger cities to smaller and gains to rural regions from urban.

5. RELATIONSHIP TO THE URBAN SYSTEM

5.1. Gaining and losing urban systems

In section 2 we described the functional region framework developed by the team of researchers at the University of Newcastle. They have divided the country up into 282 Local Labour Market Areas (LLMAs) of which 228 are termed urban regions and 53 rural regions (those LLMAs with fewer than 50,000 inhabitants). Table 6 assembles lists of the fifteen top gainers and top losers between 1981-91, according to two criteria: percentage change and absolute change. The table also records whether those LLMAs previously appeared in the equivalent lists in Champion *et al*. (1987).

The gainers list includes principally smaller cities well away from the metropolitan heartland of Britain. Some are planned towns or towns with planned expansions - Milton Keynes (Buckinghamshire), Peterborough (Cambridgeshire), Redditch (Hereford & Worcester), Bracknell (Essex), Northampton (Northamptonshire) and Telford (Shropshire). Others are historic towns with medieval roots - St.Andrews (Fife), Oxford (Oxfordshire), Cambridge (Cambridgeshire), Norwich (Norfolk), Exeter (Devon). These city regions provide the environments that both enterprises and households are looking for in the late 20th century. Sufficient size to provide good business and consumer services, sites for modern office,

Table 6: Population change 1981-91: top and bottom Local Labour Market Areas

Highest LLMAs			Lowest LLMAs		
LLMA	Percentage Change	In 71-81 list	LLMA	Percentage Change	In 71-81 list
Milton Keynes	+33.9	✓	Liverpool	-10.5	✓
St. Andrews	+14.0		Greenock	-10.1	✓
Peterborough	+14.0	✓	Glasgow	-9.8	✓
Horsham	+13.9	✓	Manchester	-8.9	✓
Redditch	+13.9	✓	Paisley	-8.7	
Launceston	+13.2		Coatbridge & Airdrie	-8.3	
Newton Abbott	+13.2		St Helens	-7.9	
Huntingdon	+12.9	✓	Bathgate	-7.2	
Bracknell	+12.9	✓	Smethwick	-6.9	
Cardigan	+11.4		Port-Talbot	-6.6	
Northampton	+11.3	✓	Hartlepool	-5.8	✓
Newbury	+11.3		Sunderland	-5.8	
Inverness	+11.1		Harlow	-5.6	
St Austell	+10.7		Sheffield	-5.5	
Clacton	+10.3		West Bromwich	-5.4	✓
LLMA	Absolute Change (1000s)	In 71-81 list	LLMA	Absolute Change (1000s)	In 71-81 list
Milton Keynes	+54.7	✓	London	-337.2	✓
Bournemouth	+40.8	✓	Glasgow	-118.5	✓
Oxford	+34.1		Manchester	-104.3	✓
Peterborough	+27.9	✓	Liverpool	-99.4	✓
Northampton	+27.4	✓	Birmingham	-70.9	✓
Cambridge	+24.3		Sheffield	-35.4	✓
Swindon	+24.1		Newcastle-upon-Tyne	-30.7	✓
Norwich	+23.9	✓	Leeds	-27.9	✓
Reading	+22.0		Birkenhead & Wallasey	-17.1	✓
York	+17.6		Sunderland	-15.8	✓
Exeter	+16.5		Coventry	-15.7	✓
Southampton	+16.0		Smethwick	-14.5	✓
Telford	+15.2	✓	Middlesbrough	-13.8	
Basingstoke	+13.5		Paisley	-13.6	
Plymouth	+13.2		Motherwell	-13.0	

Source: computed from 1981 and 1991 Census data (Crown copyright, ESRC/JISC Purchase and Functional Region Codes (Coombes *et al.* 1982).

Notes:

1. A tick indicates the LLMA also appeared in the equivalent table for 1971-81 produced by Champion *et al*. (1987), Table 2.1, p21.

warehouse and factory developments at lower prices and proximity to countryside areas for recreation or living. They are regionally concentrated in the south of Britain but can be found elsewhere - Cardigan (Wales), Inverness (Scotland); Aberdeen should also be added to the list, its exclusion stemming from difficulties in matching areas between censuses.

The losing city regions are quite a different breed. The greatest absolute losses were experienced by the biggest urban centres - London, Glasgow, Manchester, Liverpool, Birmingham, Sheffield, Newcastle and Leeds.

It is likely that the losses recorded in Table 6 are over-estimates in view of the concentration of under-enumeration in inner cities of these metropolises but their position among the biggest losers is unlikely to be altered. The relative losers list contains some of the biggest absolute losers (Liverpool, Glasgow, Manchester, Sheffield) but includes more smaller city regions in close proximity to the major metropolitan centres which are more dependent on specialised industries in decline - Paisley (textiles), Coatbridge and Airdrie (heavy engineering), St. Helens (glass), Smethwick (non-ferrous metals), Port Talbot (steel), Sunderland (shipbuilding). All of these city regions are undergoing industrial restructuring and fighting hard to attract mew economic activities, but they compete with more attractive freestanding urban regions.

5.2 Deconcentration within and between urban regions

How much of the population movement in 1981-91 and 1990-91 was between urban regions and how much within urban regions? To answer this question we assemble statistics for the 12 classes of LLMAs formed by crossing functional region type (Dominant, Sub-dominant, Freestanding) and zone type within functional region (Cores, Rings, Outer Areas, Rural Areas). Table 7 records population change (both absolute and relative) in this structure and reproduces equivalent figures for 1971-81 from Champion *et al*. (1987). Table 8 repeats the analysis using net migration data for 1990-91.

The tables show clear evidence that deconcentration is occurring both within urban regions and between them, but that both processes slowed down in the 1980s compared with 1970s. Dominant functional regions (FRs) lost in both decades but losses were 40% less in the 1980s. Subdominant FRs gained half a million people in the 1970s but lost marginally in the 190s. Freestanding FRs posted gains of three quarters of a million in the 1980s but these were a third lower than in the 1970s.

Within functional regions the pattern in both decades was one of heavy losses in cores and gains in outer areas, rings and rural areas. However, the level of change was reduced in the 1980s - the absolute changes in the 1980s were only 56% of those in the 1970s. In both

Table 7: Population change 1981-91 and 1971-81 by functional region type and zone within functional region, Great Britain

Functional Region type	Cores	Zone within Functional Region: Rings	Outer Areas	Rural Areas	Totals
Dominant FR					
1981-91	-879	-1	+17	+11	-851
%	-5.6	-0.0	+5.0	+4.5	-4.2
1971-81	*-1,693*	*+314*	*+27*	*+15*	*-1,337*
%	*-9.7*	*+8.9*	*+8.5*	*+6.2*	*-6.2*
Shift	+814	-315	-10	-5	+486
Sub-Dominant FR					
1981-91	-176	+111	+28	+7	-30
%	-2.1	+2.4	+3.4	+4.7	-0.2
1971-81	*+111*	*+320*	*+79*	*+6*	*+515*
%	*+1.4*	*+7.4*	*+10.6*	*+4.3*	*+3.9*
Shift	-287	-209	-51	+1	-545
Freestanding FR					
1981-91	+81	+369	+164	+133	+746
%	+0.9	+6.2	+6.9	+5.6	+3.7
1971-81	*+116*	*+575*	*+220*	*+207*	*+1,118*
%	*+1.2*	*+10.6*	*+10.2*	*+9.4*	*+5.8*
Shift	-35	-206	-56	-74	-372
Totals					
1981-91	-974	+479	+209	+151	-135
%	-2.9	+3.3	+5.9	+5.4	+0.2
1971-80	*-1,466*	*+1,208*	*+327*	*+228*	*+296*
%	*-4.2*	*+9.1*	*+10.1*	*+8.8*	*+10.6*
Shift	+492	-729	-118	-77	-431

Sources:

1. 1981-91. England and Wales populations from the Ward and Parish Monitors, Table 1, supplied as a computer file by the Office for National Statistics. Crown Copyright.
2. 1981-91. Scotland populations from the 1991 Census Small Area Statistics and the 1981 Census Small Area Statistics. Crown Copyright. ESRC/JISC Purchase.
3. Comparability of areas was checked using the 1991 Census Small Area Statistics recompiled by Manchester Computing using a look-up table supplied by the Department of Geography, University of Newcastle-upon-Tyne.
4. 1971-81. Champion *et al*. (1987), Table 2.2, p22.

Notes

1. Population change is reported in 1000s. Because of independent rounding rows and columns may not sum exactly to totals.
2. All comparisons used a population present basis (used in the 1971 Census). The areas used in 1971-81 comparisons are the 1981 Census wards in England and Wales and pseudo-sectors in Scotland.
3. The areas used in the 1981-91 comparison are the 1991 Census wards in England and Wales and pseudo-sectors in Scotland.

Table 8: Net migration between functional region type and zones within functional regions, Great Britain, 1990-91

Functional Region type	Zone within Functional Region: Cores	Rings	Outer Areas	Rural Areas	Totals
Dominant FRs					
Migrants	-93	+8	+2	+2	-81
Rate	-6.2	+2.1	+6.6	+6.7	-4.2
Sub-Dominant FRs					
Migrants	-8	+15	+4	+1	+12
Rate	-1.1	+3.1	+5.1	+8.0	+0.9
Freestanding FRs					
Migrants	-8	+39	+20	+18	+69
Rate	-0.9	+6.1	+7.9	+7.4	+3.3
Totals					
Migrants	-110	+61	+27	+21	0
Rate	-3.4	+4.1	+7.1	+7.3	0.0

Sources:
1. Migration: 1991 Census Special Migration Statistics, set 1, Table M01. ESRC/JISC Purchase. Made available by the Census Dissemination Unit, Manchester Computing. Extraction software used: smstab written by Oliver Duke-Williams.
2. Population aged 1+: 1991 Census Small Area Statistics. Crown Copyright. ESRC/JISC Purchase.

Notes:
1. Net migration flows are in 1000s.
2. Net migration rate = net migrants per 1000 population aged 1+ in 1991.

decades greatest gains in absolute numbers of people were in the rings (the light green, light orange and light pink areas on Figure 2) but the highest relative gains were in the outer areas. Rural areas had smaller gains but note that the functional region classification assigns relatively little of Britain's land area to this category (the dark brown, dark blue and dark mauve areas on Figure 2). Note that if losses to cores were reduced in the 1980s this necessarily meant also that gains to non-core areas were also lowered.

There are some departures from the pattern predicted by the marginals which show how urban deconcentration in shifting. In 1971-81 only Dominant Cores were also losing and gains to Freestanding Cores were reduced. Dominant Cores reduced their losses substantially between decades. What is probably at work here is urban regeneration in the 1980s following on from the emptying of "discarded" areas in the 1970s. All major British metropolises are making efforts through public and private investment in partnership to breathe new economic life into inner city areas. This is possible only for a portion of the inner city of these metropolises so far.

Table 9 provides a picture of population movement at the start of the 1990s. A rough idea of how these movements compare with the 1980s and 1970s can be gauged by multiplying the net migrant figures by ten and regarding the rates as per cents rather than per thousands, though some allowance must be made for higher natural increase and net immigration in areas of net internal out-migration. The levels and rates of migration in 1990-91 are very close but usually a little higher, in equivalent terms, than the 1981-91 population changes, probably reflecting the dampening effects of other demographic components. There are two minor differences which might be indicative of new 1990s trends - a switch from population gain over the decade in Freestanding Cores to migration loss in the year before the 1991 Census, and a switch from population loss in Dominant Rings to net migration gain. But overall 1990-91 provides a fair representation of the population movements of the whole 1981-91 decade.

Several authors (Champion 1989, Stillwell Rees and Boden 1992b and Dorling 1995) looked at the population and migration shifts in Britain at county or district or a mixed county-district scale in the 1988-90 boom period and saw signs of a new pattern of less counterurbanisation and changes in inter-regional migration. In 1990 and 1991 the bubble of hyper-activity in housing and labour markets burst. Conditions of reduced migration and recession ensued in 1990-92, followed by slow economic growth from 1993.

5.3 Migrant flows between urban system components

It is useful to put the pattern of net migration in the context of the underlying gross flows. To keep things relatively simple we look at flows between the three functional region types in

Table 9: Migrant flows between functional region types, Great Britain, 1990-91

Origin	Destination			
	Dominant FRs	Sub-dominant FRs	Freestanding FRs	Total
		Gross migrants		
Dominant FRs	1,408,083	157,223	167,076	1,732,382
Sub-dominant FRs	117,693	852,179	129,870	1,099,742
Freestanding FRs	125,763	102,326	1,627,925	1,856,014
Total	1,651,539	1,111,728	1,924,871	4,688,138
		Net migrants		
Dominant FRs	0			
Sub-dominant FRs	-39,350	0		
Freestanding FRs	-41,313	-27,544	0	
Total	-80,843	+11,986	+68,857	
		Ratio of In-Migrants to Out-Migrants (%)		
Dominant FRs	100			
Sub-dominant FRs	75	100		
Freestanding FRs	75	79	100	
Total	75	105	130	100
		Effectiveness (%)		
Dominant FRs	-			
Sub-dominant FR	-14	-		
Freestanding FR	-14	-12	-	
Total	-14	2	13	

Sources: as Table 8.
Notes:
1. Effectiveness % = absolute value of 100 x (net migrants. gross migrants)

Table 9 and between zone types in Table 10. Table 9 shows that some 4.7 million persons moved residence in the year prior to the 1991 Census or 8.5% of the Great Britain population. Of these 800 thousand or 17 percent of migrants moved between functional region types. The pattern of flows is consistent with the ordering dominant, subdominant, freestanding, with each type losing more migrants to the type to the right than it gains indicating that migrant preferences are consistent across the typology. The bottom two panels show how great the imbalance in flows between FR types is: flows into dominant FRs are only 75% of flows out, while flows into sub-dominant from freestanding FRs are only 79% of the reverse flow. The final panel displays the "effectiveness" of net migration by expressing it as a percentage of the gross glows between FR types. The level of net migration in this classification is about one-seventh of the gross level, showing significant redistribution.

Table 10 repeats the analysis for zones within functional regions. Just under 1.2 million migrants or 25% moved between zones. The pattern of migration is consistent with the ordering - cores, rings, outer areas and rural areas, each zone losing migrants to the zones to the right. The bottom panels in Table 10 show that the further the zones are apart in this ordering the lower the ratio of in-migrants to out-migrants and the larger the effectiveness. The further apart zones are in characteristics - the higher the probability of imbalance in flows. Note that this finding is quite different from the well known fall off in volume of migration with increasing distance which is part of the explanation of the pattern of gross flows in Tables 9 and 10.

5.4 Migrant flows by city size

Following the work of Boudoul *et* Faur (1981) in examining the relationship between population change and settlement size in France, many authors have reported on the relationship in a variety of countries. Champion (1989) plots the relationship for Great Britain for 1951-61, 1961-71 and 1971-81. Table 11 updates the relationship using slight different population size bands, but expands our view by cross-classifying areas by zone as well as population size of Local Labour Market Area. Table 12 repeats the analysis using net migration in 1990-91 as the crossclassified variable.

The totals columns in Table 11 and 12 give the general relationship, which is one of substantial population loss in largest city regions, small losses in medium sized cities, and successively bigger relative gains the smaller the city region. However, this average relationship is not completely reproduced within functional region zones.

There is a clear negative relationship between population size of urban region and population change and net migration for cores, but there is no systematic relationship for rings

Table 10: Migration flows between zones within functional regions, Great Britain, 1990-91

Origin	Destination				
	Cores	Rings	Outer Areas	Rural Areas	Total
			Gross migrants		
Cores	2,441,212	421,561	74,783	45,602	2,983,158
Rings	342,099	705,563	59,929	37,727	1,145,318
Outer Areas	56,240	50,574	186,486	14,055	307,355
Rural Areas	34,115	29,045	12,866	176,281	252,307
Totals	2,873,666	1,206,723	334,064	273,665	4,688,138
			Net migrants		
Cores	0				
Rings	-79,462	0			
Outer Areas	-18,543	-9,355	0		
Rural Areas	-11,487	-8,682	-1,189	0	
Totals	-109,492	+61,405	+26,709	+21,358	0
			Ratio of in- migrants to out-migrants (%)		
Cores	100				
Rings	81	100			
Outer Areas	75	84	100		
Rural Areas	75	77	92	100	
Totals	80	114	122	128	100
			Effectiveness (%)		
Cores					
Rings	10				
Outer Areas	14	8			
Rural Areas	14	13	4		
Totals	11	7	10	12	

Sources: and notes: as Table 9.

Table 11: Population change 1981-91 by population size of functional region and zonewithin functional region, Great Britain

Population size of Functional Region (1000s)	Zone within Functional region: Cores	Rings	Outer Areas/ Rural Areas	Totals
<100				
Pop. change	+13	+102	+157	+272
% change	+0.5	+4.6	+5.5	+3.4
100-<200				
Pop. change	-38	+126	+99	+187
% change	-0.6	+3.1	+5.7	+1.5
200-<400				
Pop. change	-71	+182	+77	+188
% change	-0.9	+4.7	+5.8	+1.5
400-<800				
Pop. change	-146	+102	+26	-18
% change	-3.0	+4.3	+6.9	-0.2
800+				
Pop. change	-731	-33	+2	-763
% change	-6.3	-1.7	+3.4	-5.6
Total				
Pop.	-974	+479	+360	-135
%	-2.9	+3.3	+5.7	-0.2

Sources: as Table 7.
Notes:
1. Population change is in 1000s.

Table 12: Net migration by population size of functional region and zone within functional region, Great Britain, 1990-91

Population Size of Functional Region (1000s)		Zone within Functional Region			
		Cores	Rings	Outer Areas/ Rural Areas	Totals
<100	migrants	+2,747	+12,766	+20,930	+36,443
	rate	+0.9	+5.6	+7.0	+4.5
100 - <200	migrants	+512	+20,250	13,469	+33,207
	rate	-0.1	+4.8	+7.4	+2.7
200 - <400	migrants	-19,087	+17,170	+9,607	+7,690
	rate	-2.5	+4.2	+6.7	+0.6
400 - <800	migrants	-18,393	+8,227	+3,707	-6,459
	rate	-3.9	+3.3	+9.4	-0.9
800+	migrants	-74,266	+2,998	+345	-70,923
	rate	-6.7	+1.6	+6.2	-5.5
Totals	migrants	-109,511	+61,411	+48,058	0
	rate	-3.4	+4.1	+7.2	0.0

Source: 1991 Census SMS and SAS. Crown Copyright. ESRC/JISC Purchase

Notes:
1. Rate = net migrants per 1000 population aged 1+.

or outer/rural areas except that the rates of population growth or net in-migration are lower than in the other size brackets. The negative externalities of city size appear confined to city cores and to the very largest city regions.

5.5 Deconcentration across the life course

We must now ask, in view of the variation across the net migrant maps for different age groups (Figures 7 to 11), how the patterns of within and between urban region deconcentration differ. Figure 12 captures this variation using a graphical technique from Champion *et al*. (1987). The three graphs refer to functional region type. The height of the bars measures the rate of net internal migration in the relevant zone-age group-sex combination. The widths of the bars are proportional to the populations living in the areas of each functional region-zone-age group-sex combination. Thus the area of the bars is proportional to the number of net migrants in the bar category.

The key variation we focus on here is between age groups because the differences in rates between male and female migrants are small and the net flows differ only in size in the pensionable age population.

The family ages, 1-15 and 30-44, experience net out-migration from all cores and contribute net in-migrants to all rings where they are the major contributor, These ages also contribute net migrants to outer and rural areas, although the rates and flows are matched by older ages.

The late adolescent and young adult ages, 16-29 have a quite different pattern: losses from dominant cores are the smallest of any age group; they contribute net in-migrants to subdominant cores (males and females) and to freestanding cores (males). The level of net in-migration to non-core areas is the lowest of all age groups.

The pre-retirement and retirement ages, 40 to pensionable age and pensionable age and above lose net migrants from dominant and sub-dominant cores but not, on balance from freestanding cores. Net in-migration for these groups is directed mainly towards the rings, outer and rural areas of freestanding FRs. Although rates of in-migration to dominant and sub-dominant outer and rural areas is high, the net flow is small.

How do the different age-sex groups vary their migration behaviour according to city region size? Figure 13 shows that the general relationship is replicated in four of the five age groups. It is strongest (steepest lines) for the family ages and weaker for the older age groups. For 16-29 year olds, however, the general negative relationship does not hold for the extreme size groups: young people leave the smallest places ("boring - nothing to do") on balance and they have the smallest net loss of all ages in the largest cities.

Figure 12: Net migration by functional region type and zone for broad ages & sex, Great Britain, 1990 – 91

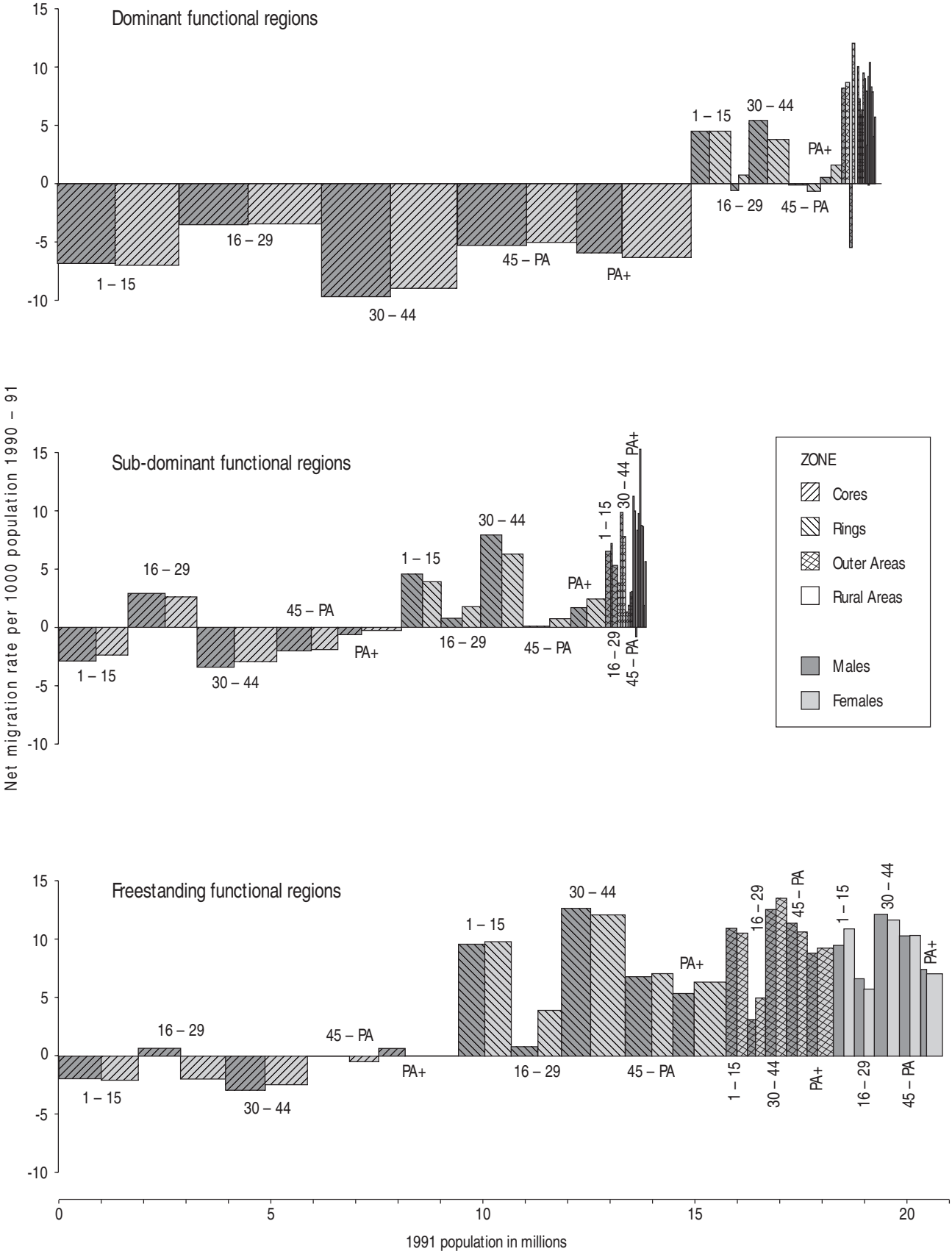
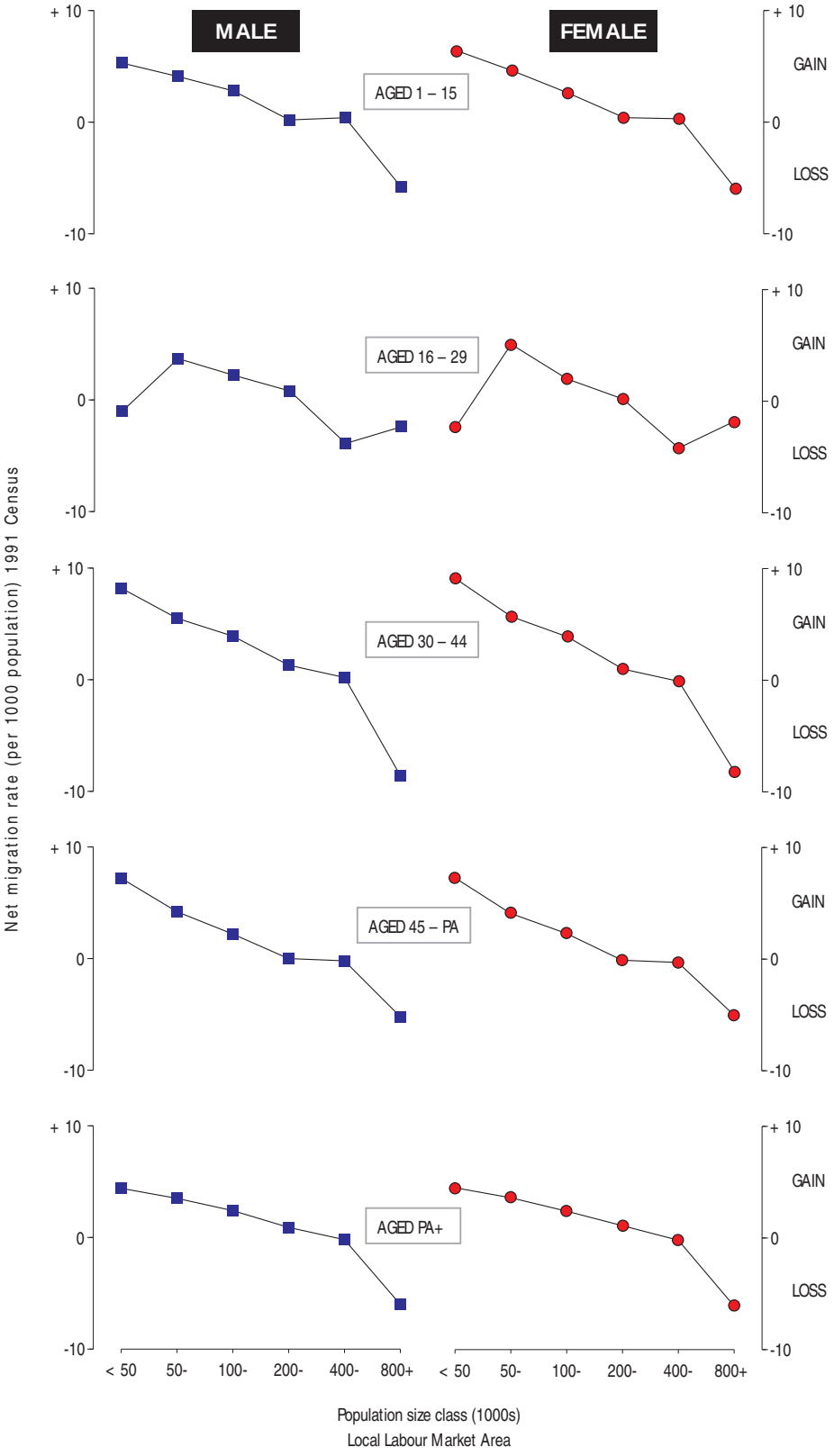


Figure 13: Net migration of functional region population size for age-sex groups, Great Britain, 1990 – 91



6. RELATIONSHIP TO THE DISTRICT CLASSIFICATION

The functional regions' framework employed in the previous section uses the settlement system of Britain described as a set of nodes and their journey to work hinterlands. The classification has no socio-economic content, although it would be possible to develop one using census indicators. However, for present purposes, such a socio-economic classification is available - the classification of the 459 districts of Great Britain by the Office for National Statistics, described in section 3. A similar classification has also been developed for wards and sectors but had not been released to the academic community at time of writing. We have therefore attached the relevant district classification to wards and sectors and use it to look at the relationship between population movement and the socio-economic character of areas.

6.1 Population change and the district classification measurement issues

Table 13 reports on population change between 1981 and 1991 for the families, groups and clusters of the ONS classification. Two sources of population change are used: the 1981 and 1991 Census counts of population present for wards and sectors which are used in this report, and the post-census revised estimates of district population for 1981 and 1991. The two measures of population change are close together (the correlation coefficient over the clusters is 0.91) but the estimate value is systematically greater than the census:

estimate % change = 3.0 + 0.81 census % change

The largest differences are for Inner London where population decrease or very low increase in the Census measure becomes low to high increase in the estimate measure. The smallest differences are in rural areas.

Why do the two measures of population change differ? The reason is that there is strong evidence that the 1991 Census was an undercount (just over 2.0%). The 1991 mid-year estimate adds a calculation of this under-enumeration to the Census resident population together with allowances for changes between the April Census date and mid-year and for counting students at their term-time residences. There is also a difference between the Census resident population (1991 definition) and the Census present population (1971 definition) used in this study (see Table 1).

Table 14 organises net migration rates using the ONS classification. These rates use the 1991 Census resident population, and are also affected by problems of undernumeration since the missing population is more likely to have migrated in the year prior to the Census than the enumerated population. Also the migration statistics fail to track properly migration of students. These measurement issues will be borne in mind as results are interpreted.

Table 13: Population change by district classification, Great Britain, 1981-91

FAMILY Group Cluster	Population Change 1981-91 Census Family	Group	Cluster	Estimate Family	Group	Cluster
RURAL AREAS	4.7			6.1		
Scotland		1.4			1.7	
Highlands and islands			1.3			1.6
Uplands and agriculture			1.5			2.2
Coast and Country		6.7			7.8	
Remoter England and Wales			7.3			8.3
Heritage Coast			7.1			8.2
Accessible amenity			6.4			7.4
Mixed urban and rural		3.3			5.2	
Towns in country			7.5			9.1
Industrial margins			1.1			3.1
PROSPERING AREAS	3.0			5.4		
Growth areas		3.4			5.8	
Satellite towns			1.4			3.7
Growth corridors			6.6			9.0
Areas with transient populations			8.1			11.6
Metropolitan overspill			-2.3			0.4
Market towns			5.0			7.0
Most prosperous		1.7			3.6	
Concentrations of prosperity			7.2			10.6
Established high Status			0.5			2.2
MATURER AREAS	0.4			3.1		
Services and education		-2.0			1.0	
University towns			-0.2			1.1
Suburbs			-3.0			1.0
Resort and retirement		4.2			6.6	
Traditional seaside towns			3.1			5.7
Smaller seaside towns			8.2			9.7
URBAN CENTRES	-1.0			1.8		
Mixed economies		1.5			3.8	
Established service centres			-1.7			0.8
Scottish towns			-0.3			1.3
New and expanding towns			7.1			9.6
Manufacturing		-3.7			-0.3	
Pennine towns			-2.6			0.1
Areas with large ethnic minorities			-4.6			-0.6
MINING AND INDUSTRIAL AREAS	-5.1			-2.3		
Ports and industry		-7.5			-4.4	
Areas with inner city characteristics			-8.7			-4.4
Coastal industry			-4.7			-2.3
Glasgow and Dundee			-13.2			-10.2
Concentrations of public sector housing			-7.1			-5.1
Coalfields		-2.5			0.1	
Mining and industry, England			-2.3			0.1
Mining and services, Wales			-1.7			1.4
Former mining areas, Wales & Durham			-4.0			-1.9
INNER LONDON	-6.3			2.0		
Inner London		-6.3			2.0	
Cosmopolitan outer boroughs			-6.8			0.1
Central London			-6.7			1.6
Inner city boroughs			-7.9			2.8
Newham and Tower Hamlets			0.5			8.7
GREAT BRITAIN	-0.2			2.5		

Source:

1. Census change computed from 1981 and 1991 Census SAS. Crown Copyright. ESRC/JISC Purchase.
2. Estimate change: Wallace and Denham (1996), Table 5.15.

Table 14: Net migration by district type, OPCS classification, Great Britain, 1990-91

FAMILY / Group / Cluster	Net migrants (1000s) Family	Group	Cluster	Net migration rate (per 1000 population) Family	Group	Cluster
RURAL AREAS	+55.1			+5.5		
Scotland		+7.9			+8.0	
Highlands and Islands			+6.3			+8.7
Uplands and agriculture			+1.6			+6.0
Coast and Country		+31.7			+6.6	
Remoter England and Wales			+8.7			+7.1
Heritage Coast			+4.7			+5.2
Accessible country			+18.3			+6.8
Mixed urban and rural		+15.5			+3.8	
Towns in country			+19.6			+7.1
Industrial margins			+4.9			+1.9
PROSPERING AREAS	+36.4			+3.0		
Growth areas		+28.1			+3.0	
Satellite towns			+3.4			+1.1
Growth corridors			+13.2			+4.5
Areas with transient populations			+5.8			+11.8
Metropolitan overspill			-2.2			-1.7
Market towns			+7.8			+4.6
Most prosperous		+8.3			+3.2	
Concentrations of prosperity			+1.8			+3.8
Established high Status			+6.5			+3.1
MATURER AREAS	-5.9			-1.0		
Services and education		-16.1			-4.3	
University towns			-8.4			-6.2
Suburbs			-7.7			-3.2
Resort and retirement		+10.2			+4.3	
Traditional seaside towns			+4.7			+2.5
Smaller seaside towns			+5.5			+10.2
URBAN CENTRES	-20.5			-1.9		
Mixed economics		-5.5			-1.0	
Established service centres			-8.4			-3.3
Scottish towns			+0.7			+0.6
New and expanding towns			+2.2			+1.1
Manufacturing		-14.9			-2.8	
Pennine towns			-2.4			-1.0
Areas with large ethnic minorities			-12.6			-4.4
MINING AND INDUSTRIAL AREAS	-23.5			-2.0		
Ports and industry		-23.8			-4.0	
Areas with inner city characteristics			-12.8			-6.9
Coastal industry			-4.8			-1.7
Glasgow and Dundee			-5.7			-6.0
Concentrations of public sector housing			-0.4			-1.4
Coalfields		+0.3			+0.1	
Mining and industry, England			-0.2			-0.1
Mining and services, Wales			-1.2			-0.7
Former mining areas, Wales & Durham			+1.6			+1.4
INNER LONDON	-41.7			-12.2		
Inner London		-41.7			-12.2	
Cosmopolitan outer boroughs			-15.8			-11.6
Central London			-8.8			-10.0
Inner city boroughs			-12.1			-15.1
Newham and Tower Hamlets			-5.1			-13.9
TOTAL: GREAT BRITAIN	0.0	0.0	0.0	0.0	0.0	0.0

Source: Computed from 1991 Census SMS and SAS. Crown Copyright. ESRC/JISC purchase.

6.2 Population change and net migration for family types of district

Six families of district are distinguished in the ONS classification. Their order from Rural Areas at the top to Inner London in Tables 13 and 14 coincides with a general ordering in terms of well being and prosperity. This is also the order of population change as measured in this study, of population change as measured by the ONS estimates (with one major exception) and of net migration.

Rural Areas and Prospering Areas gain population and migrants on all measures. Maturer Areas gain population on this study's measure and migrants in 1990-91, but experience slight gains in population according to the ONS estimates. Mining and Industrial Areas lose population on both measures and also migrants. Inner London districts (London boroughs) show heavy losses on this study's population measure which disappear when allowance is made for substantial underenumeration in the capital. The difference figure in Table 13 suggests this may be 8%. Allowance for underenumeration would not, we would argue, turn net *internal* migration loss into gain because of the high rate of net *external* migration into Inner London (net external migration is immigration from outside the UK less emigration to outside the UK).

The variation of net migration with the life course and family type of district is captured in Figure 14. No single age-sex group reproduces the general relationship between family type and direction of migration, although the family ages are close. All age-sex groups contribute net in-migrants to Rural Areas. All age-sex groups experience net out-migration from Urban Centres, Mining and Industrial Areas, and Inner London. Four out of five age groups contribute net in-migrants to Prospering Areas, the exception being the pre-retirement age group. For age group 16-29 only the net gain to Prospering Areas exceeds that to Rural Areas - at other ages Rural Areas attract more net migrants. All age-sex groups experience small net migrant losses from Mature Areas apart from young adult males. Is the pattern of migrant flows between family types of district consistent with the general ordering from Rural Areas to Inner London? Table 15 summarises the evidence by assembling matrices of indicators for each age-sex group. Each matrix contains two sets of statistics. In the bottom left of the matrix are displayed the net flows (in 100s) between family types. So, for example, for 30-44 males there is a net inflow of 3,300 from Inner London districts to districts in Maturer Areas. In the top right of each matrix are set out, in italics, the effectiveness ratios which express the net flow as a percentage of the gross. So for flows between Inner London and Maturer Areas for 30-44 males, the effectiveness ratio is 31 per cent which indicates strong level of net redistribution to Maturer Areas.

Figure 14: Net migration by family type of district for age-sex groups, Great Britain, 1990 – 91

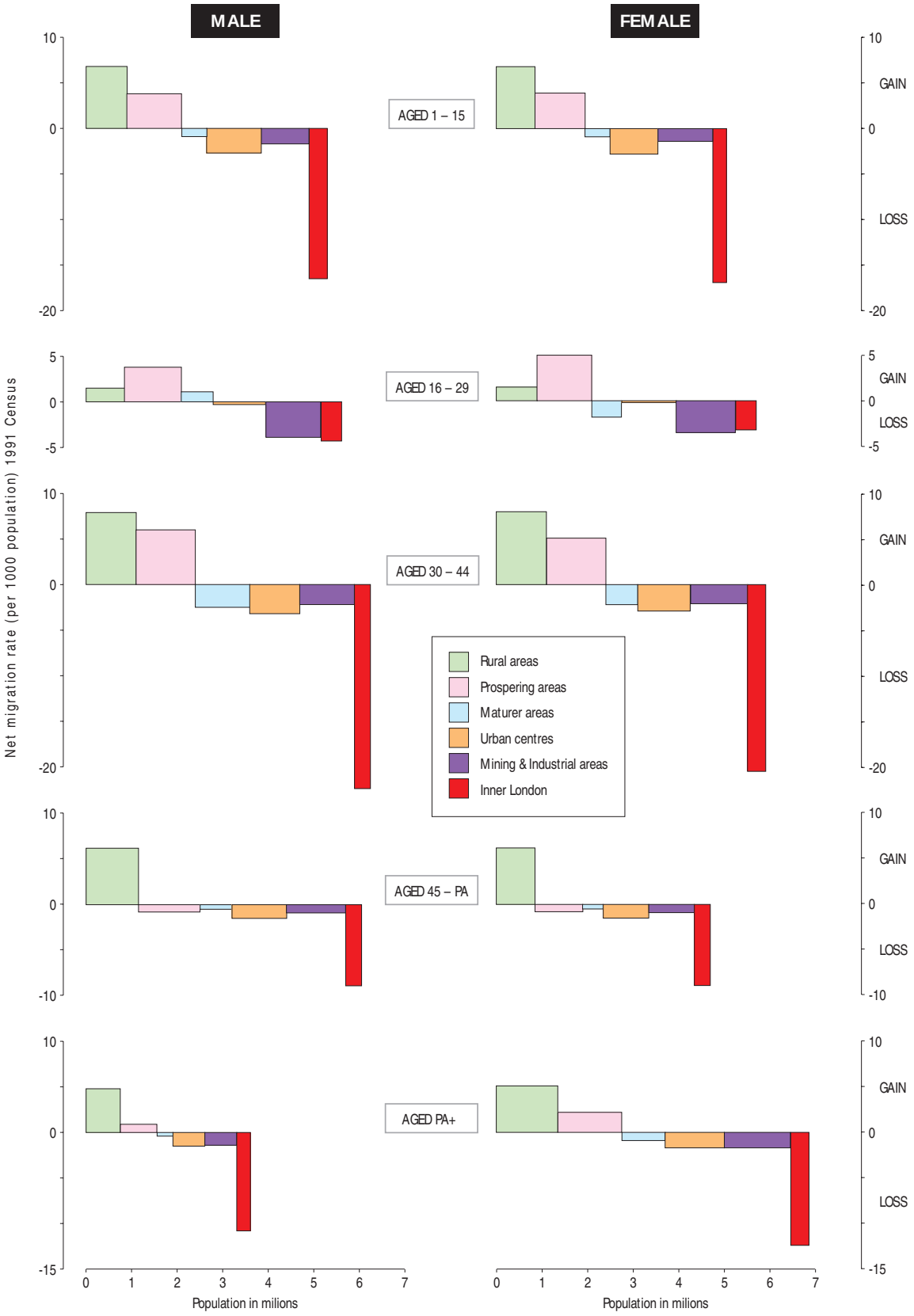


Table 15: Net migration and effectiveness ratios for flows between family types of district, Great Britain, 1990-91

Origin family type	Destination family type: Rural Areas	Prosp. Areas	Maturer Areas	Urban Centres	Mining & Ind.	Inner London	Rural Areas	Prosp. Areas	Maturer Areas	Urban Centres	Mining & Ind.	Inner London
			Aged 1-15, male						Aged 1-15, female			
Rural Areas		*12*	*14*	*18*	*15*	*56*		*12*	*16*	*17*	*13*	*53*
Prosp. Areas	18		*18*	*14*	*12*	*57*	18		*16*	*15*	*12*	*58*
Maturer Areas	8	17		*1*	*2*	*39*	8	14		*4*	*0*	*41*
Urban Centres	19	19	-0		*2*	*35*	17	20	-1		*0*	*36*
Mining & Ind.	12	8	0	2		*32*	11	8	-0	0		*31*
Inner London	6	18	19	6	3		6	18	19	5	3	
Total	64	45	-5	-31	-20	-53	60	43	-5	-30	-16	-52
			Aged 16-29, male						Aged 16-29, female			
Rural Areas		*3*	*1*	*1*	*5*	*6*		*3*	*1*	*1*	*2*	*11*
Prosp. Areas	8		*8*	*1*	*10*	*4*	9		*10*	*1*	*10*	*7*
Maturer Areas	-1	23		*1*	*7*	*9*	2	32		*1*	*4*	*8*
Urban Centres	2	4	2		*4*	*5*	4	6	-1		*5*	*6*
Mining & Ind.	9	21	7	8		*4*	5	20	4	10		*7*
Inner London	-3	6	20	-3	-2		5	10	19	-5	-4	
Total	15	47	7	-4	-47	-18	14	60	-12	-3	-44	-15
			Aged 30-44, male						Aged 30-44, female			
Rural Areas		*11*	*14*	*16*	*12*	*45*		*13*	*17*	*18*	*17*	*50*
Prosp. Areas	23		*19*	*13*	*13*	*39*	24		*20*	*14*	*13*	*49*
Maturer Areas	12	32		*6*	*4*	*31*	12	28		*5*	*0*	*33*
Urban Centres	23	30	-4		*4*	*26*	22	25	-3		*3*	*32*
Mining & Ind.	14	14	-1	4		*22*	16	11	0	3		*29*
Inner London	10	29	33	8	4		10	29	28	8	4	
Total	82	81	-16	-37	-26	-85	84	69	-14	-34	-25	-80
			Aged 45-pa, male						Aged 45-pa, female			
Rural Areas		*30*	*22*	*24*	*21*	*54*		*30*	*22*	*27*	*22*	*53*
Prosp. Areas	30		*6*	*7*	*4*	*37*	23		*6*	*9*	*8*	*43*
Maturer Areas	10	4		*1*	*4*	*32*	8	3		*2*	*7*	*37*
Urban Centres	16	5	0		*2*	*32*	13	5	0		*2*	*30*
Mining & Ind.	11	1	1	1		*32*	8	2	1	0		*24*
Inner London	6	8	10	3	2		4	6	8	2	1	
Total	72	-12	-3	-17	-11	-29	56	-7	-2	-16	-10	-21
			Aged pa+, male						Aged pa+, female			
Rural Areas		*26*	*24*	*29*	*27*	*75*		*21*	*27*	*30*	*24*	*73*
Prosp. Areas	11		*10*	*15*	*18*	*74*	17		*14*	*19*	*26*	*75*
Maturer Areas	6	3		*3*	*12*	*52*	14	9		*5*	*8*	*59*
Urban Centres	8	5	0		*7*	*65*	18	13	-1		*12*	*60*
Mining & Ind.	6	3	1	1		*48*	12	10	1	4		*52*
Inner London	4	7	6	3	1		7	16	15	5	1	
Total	35	7	-2	-10	-10	-20	69	31	-8	-21	-25	-44

Sources:
1991 Census SMS. Crown copyright. ESRC/JISC Purchase. Made available on the MIDAS service by the Census Dissemination Unit, Manchester Computing. Extracted using the smatab program written by Oliver Duke-Williams, University of Leeds.

Notes:
1. Net migrant numbers are displayed below the diagonal in each sub-table. The numbers are in 100s.
2. Effectiveness ratios are displayed in italics above the diagonal in each sub-table. Effectiveness = absolute value of net migrants divided by gross migrants expressed as a percentage.
3. Numbers in columns may not add to the totals, which have been independently rounded.

The Table 15 numbers show the by-now familiar variation between age groups. The largest net flows are contributed by the family ages. The late adolescent and young adult ages show most deviations and least redistribution (lowest effectiveness ratios). For the retired ages, although net flows are not large in volume terms, effectiveness ratios are very high, particularly out of Inner London and into Rural Areas. This suggests that when the elderly leave Inner London they rarely come back, and when they retire to the countryside they usually stay there. The rise in migration rates at older ages is a more local phenomenon.

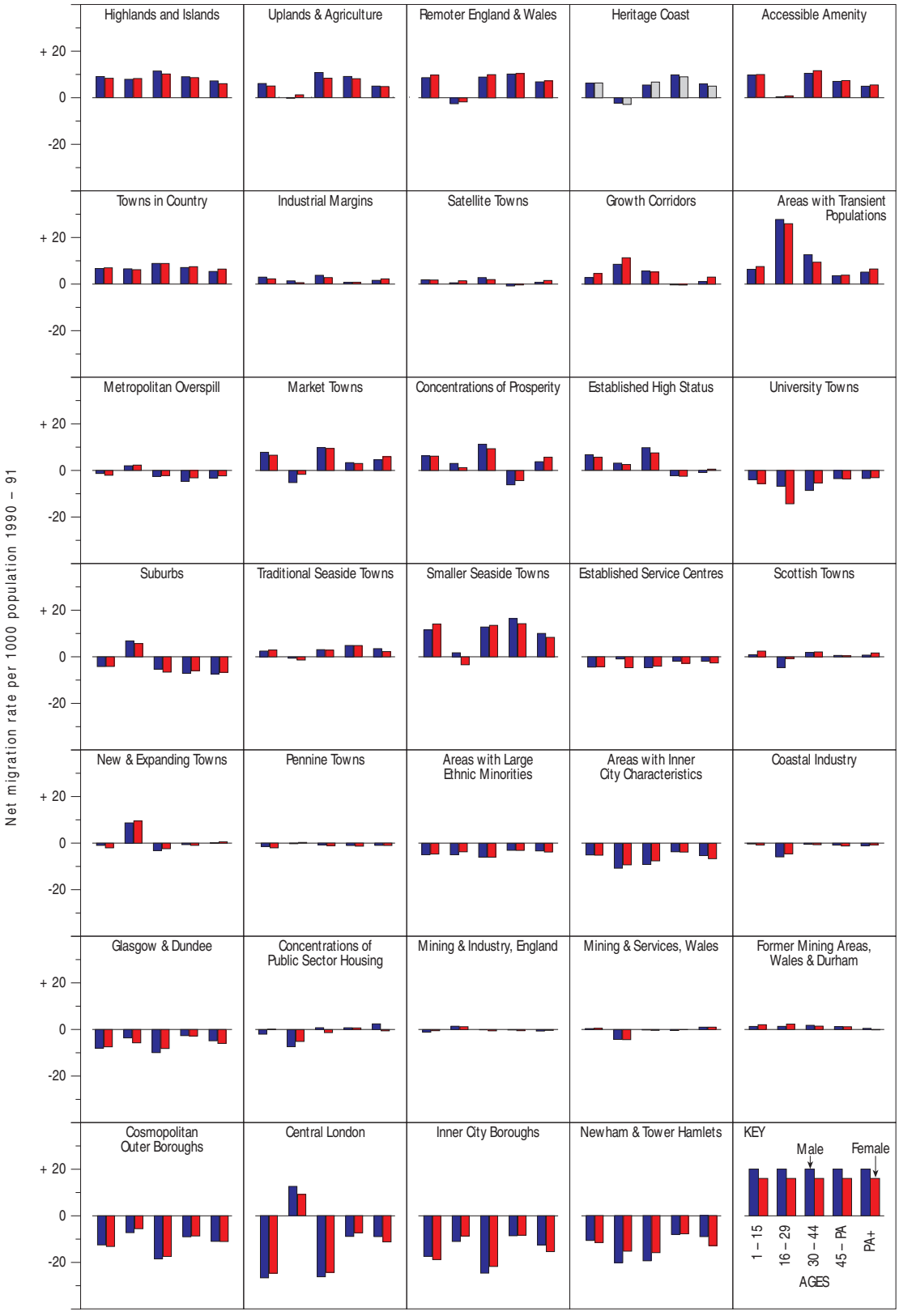
6.3 Population change and net migration for cluster types of district

The six family types hide some dispersion in population change and net migration values among the member districts, although the deviations between family type means and the cluster means are not great (Tables 13 and 14). Figure 15 attempts to summarise the way in which net migration changes across the 34 ONS clusters and across age-sex groups. Here we comment on some of the highlights.

Areas with Transient Populations, as their name implies, experience high net inflows. These areas are either districts around Aberdeen which have attracted migrant labour to run the off-shore oil and gas industry or districts in England with large military bases characterised by high personnel turnover practised by the Armed Services. *Smaller Seaside Towns* are found along the South Coast and experience high rates of net in-flow except in the young adult ages: the tide of development associated with retirement migration has moved on from the neighbouring *Traditional Seaside Resorts* which are no longer as attractive. The differing decision criteria of life course groups is illustrated if we contrast *Accessible Amenity* districts with *Central London* boroughs. Persons in the young adult ages move in the opposite direction to family, pre-retirement and retirement ages in Central London and are not impressed with the attractions of quiet but convenient countryside living.

This section and the previous have examined the relationships between population change and migration on the one hand and two classifications, one based on the urban system and the other on the socio-economic character of districts. To achieve comparability between this country study and other, we need to look at relationships with simpler variables which capture some of the key features of these classifications and which can be replicated in other European States. Section 7 describes the influence of population density on population change and migration.

Figure 15: Net migration rates by cluster type of district



7. RELATIONSHIP TO POPULATION DENSITY

Population density is computed by dividing the population of a region by its land surface area. It is expressed usually as persons per hectare or per square kilometre. The reciprocal of density is area per person - how much space each person commands for living. A thorough analysis of population densities in Great Britain is provided in Dorling and Atkins (1995). In the subsequent analysis and discussion, the population density measure used is the ward population divided by the area of the ward in hectares.

7.1 The changing meaning of population density

In agricultural regions population density is determined by the extent and productivity of farming land. Since the Industrial Revolution this direct connection has been broken. The Industrial Revolution saw the development of concentrations of extractive and manufacturing industry with associated rising population densities in the towns and cities in which these activities were located. The twentieth century has seen the further elaboration of economic organisation in the development of service industries in towns and cities: wholesaling, retailing, finance, business services, education, information services organised in competitive urban hierarchies. Cities have been the sources of enterprise and innovation for national economies and represent some of the greatest achievements of mankind.

However, the high population densities of cities have their negative effects on human living. High densities facilitate the spread of infectious diseases, cause problems in waste disposal, lead to diseconomies of congestion, produce intense airborne pollution, concentrate poverty and house the anonymous and disenchanted communities in which crime flourishes. These negative effects has been combated by new technological and social innovations - clean water and sewerage systems, high rise constructions, planning controls, traffic management, closed circuit television and urban government. One set of innovations - in urban transport - enabled cities to add to their population without necessarily increasing their densities. Successively, urban trams, commuter railways, the motor car, highway and super highway development have made possible the separation of residences and central workplaces, and the separation of workplaces from city centre locations. The result has been over the past four decades in Britain (Champion 1989) the deconcentration of both people and jobs to less densely inhabited areas, away from city centres

Lower density areas provide many advantages for both living and working. Lower densities mean lower land prices and cheaper housing, controlling for quality of provision (actual house prices maybe higher because much larger or better quality housing is provided in low density suburbs, commuter settlements or the suburbs). Lower densities mean that people

related pollution (noise, car exhaust fumes) are diluted. However, many studies suggest that these benefits of lower density living are taken up only if reasonable access to urban services using the car can be maintained. Very remote rural areas attract only those prepared for or able to live in a fair degree of isolation.

We now examine the evidence for these propositions.

7.2 The general density relationship

Table 16 reports the general relationship of population change and net migration with population density. The relationship is linear and negative - high density means population loss and net out-migration and low density means population gain and net in-migration. The threshold density is about 23 persons per hectare. Areas with lower density gain people and net migrants while areas with more than 23 persons loose people and net migrants.

In the middle of the range (densities of 10-50 persons per hectare) the population change and net migration rates on an annual basis coincide but divergence occurs at either end. Net internal migration in areas with densities over 50 is greater than population change. As suggested in connection with the maps, this is due to the compensating effects of high fertility and net external immigration in the dense centres of Britain's biggest cities. At the low density end the difference is due to the compensatory effects of lower than average natural increase in these areas.

7.3 The density relationship and the life course

Figure 16 graphs the density - net migration relationship for ten age-sex groups. The family ages (1-15, 30-44) display the clearest and strongest relationship. The slope of the parental age line is slightly steeper than that of children so that net in-migration rates at the low density end of the spectrum are lower for children. The older working ages exhibit the overall inverse relationship but with a reduced gradient. Revealed migration behaviour for the pensionable age groups is very similar to that of the pre-retirement age group over the density range 5 to 60+ persons/hectare, but does depart from the general relationship for the two lowest density categories, where net in-migration rates are lower. This deviation can be interpreted as evidence of a lower preference for living after retirement in the most remote places, without good access to health care facilities, use of which accelerates rapidly with age in this group.

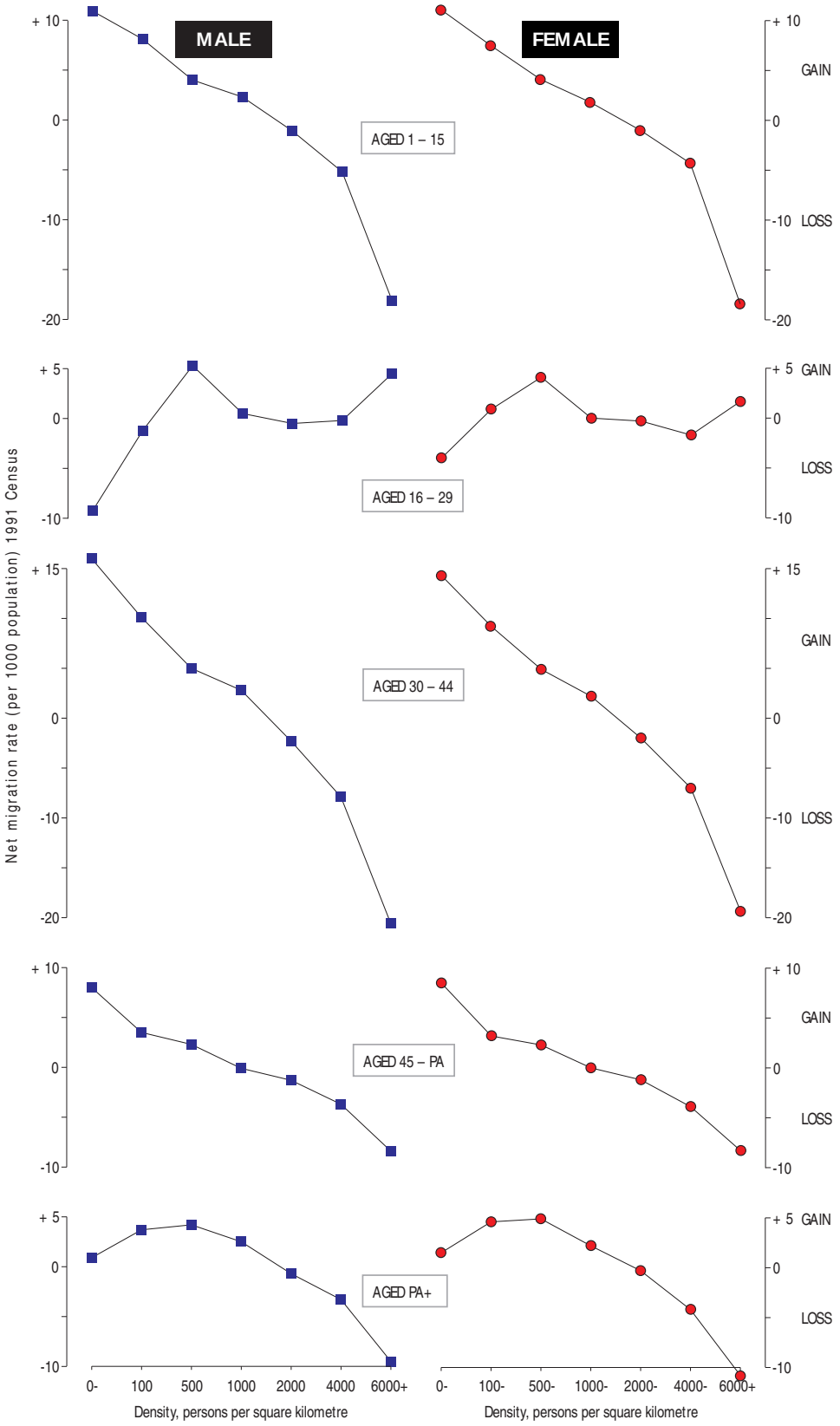
For late adolescents and young adults, the inverse relationship between density and net migration disappears. Young people leave the very lowest density areas, show the greatest preference for medium-low densities (5-<10 persons/hectare), are relatively indifferent across other density categories but have net inflows to the high density areas. As discussed earlier in

Table 16: The variation of population change, 1981-91, and net migration rate, 1990-91 with population density, Great Britain

Density Band 1991 (Persons per hectare)	Percent Population Change 1981-91	Net migration rate (per 1000 population) 1990-91
0-<1	+4.1	+6.2
1-<5	+3.8	+5.1
5-<10	+3.5	+4.2
10-<20	+1.3	+1.4
20-<40	-1.3	-1.1
40-<60	-4.0	-4.1
60+	-6.2	-10.2

Source: computed from the 1981 Census SAS and 1991 Census SAS and SMS. Crown copyright. ESRC/JISC Purchase.

Figure 16: Net migration by population density for age-sex groups, Great Britain 1990 – 91



connection with the parallel map (Figure 7), we believe this latter phenomenon reflects the migration to neighbourhoods near the big city universities and after graduation to new jobs in the expanding job sectors of big cities (finance and information industries). These flows are probably most characteristic of the under 25s and are balanced by more family age preferences of those aged 25-29.

7.4 Net migration between density bands

The consistency of the density-net migration relationship can be further tested by constructing net flow and effectiveness ratio matrices. This is done in Table 17 for all ages and males in each age group (female patterns are very similar).

The all ages, family and pre-retirement ages show net flows between areas in different bands to be regularly and consistently organised. Each density band loses to all lower density bands and gains from each higher. The degree of redistribution produced by migration flows is inversely related to the density-distance between the density bands. For example, the effectiveness ratio is 17 per cent between the 0-<1 person per hectare band and the 60 and over band but only 3 per cent between the two lowest density bands. Effectiveness ratios are much higher than the average for the family and pre-retirement ages.

As might have been anticipated from earlier analysis, things are different for the young adult ages. High density areas gain migrants from all but the next highest density band. Conversely, lowest density areas lose to all high density bands - a concentration rather than a deconcentration process. Effectiveness ratios are low for this age group: there is a lot of turnover but relatively little net redistribution.

The pensionable age group conforms to the general pattern except in the two lowest density categories. Also effectiveness ratios are particularly high for the highest density band. When people move in their retirement out of the centres of Britain's big cities, they tend never to return.

We now examine the influence of unemployment on population change and migration in section 8.

Table 17: Net migration flows and effectiveness ratios between population density bands, male migrants, Great Britain, 1990-91

Origin density band	Destination density band 0-<1	1-<5	5-<10	10-<20	20-<40	40-<60	60+
				All ages			
0-<1		*3*	*2*	*7*	*9*	*16*	*17*
1-<5	35		*1*	*5*	*8*	*13*	*15*
5-<10	10	15		*3*	*6*	*10*	*12*
10-<20	54	79	36		*3*	*8*	*9*
20-<40	93	148	94	100		*3*	*8*
40-<60	70	112	68	131	135		*8*
60+	37	55	33	66	147	155	
Total	299	374	205	128	-153	-362	-492
				Aged 1-15			
0-<1		*6*	*9*	*12*	*16*	*25*	*36*
1-<5	8		*6*	*10*	*13*	*20*	*34*
5-<10	5	6		*4*	*7*	*17*	*28*
10-<20	8	14	4		*5*	*12*	*22*
20-<40	14	23	10	16		*6*	*19*
40-<60	9	14	10	18	21		*17*
60+	5	8	5	12	28	26	
Total	49	57	19	20	-15	-46	-84
				Aged 16-29			
0-<1		*3*	*8*	*7*	*4*	*4*	*10*
1-<5	-7		*3*	*0*	*1*	*0*	*5*
5-<10	-8	-6		*2*	*3*	*1*	*5*
10-<20	-9	0	5		*0*	*1*	*5*
20-<40	-7	-4	9	3		*0*	*2*
40-<60	-4	0	2	5	1		*1*
60+	-5	-5	-4	-8	-8	3	
Total	-40	-83	27	42	-8	-2	27
				Aged 30-44			
0-<1		*8*	*11*	*17*	*18*	*26*	*38*
1-<5	13		*6*	*10*	*13*	*21*	*30*
5-<10	7	7		*3*	*9*	*15*	*27*
10-<20	16	18	5		*6*	*13*	*21*
20-<40	22	33	16	23		*6*	*16*
40-<60	15	23	12	25	26		*14*
60+	10	13	9	17	32	29	
Total	83	81	27	27	-35	-72	-109
				Aged 45-pa			
0-<1		*10*	*11*	*20*	*23*	*36*	*33*
1-<5	8		*5*	*10*	*13*	*24*	*30*
5-<10	4	3		*5*	*12*	*17*	*22*
10-<20	10	8	3		*5*	*11*	*19*
20-<40	14	13	9	7		*7*	*19*
40-<60	9	10	6	8	11		*17*
60+	4	5	2	5	12	10	
Total	49	31	13	-1	-20	-33	-38
				Aged pa+			
0-<1		*8*	*15*	*1*	*13*	*32*	*49*
1-<5	-3		*2*	*1*	*13*	*26*	*50*
5-<10	-3	-0		*2*	*12*	*20*	*49*
10-<20	0	0	1		*6*	*15*	*37*
20-<40	3	7	4	5		*6*	*24*
40-<60	3	6	3	6	5		*16*
60+	2	3	3	5	8	5	
Total	3	18	14	15	-6	-18	-26

Sources: as Table 16.
Notes:
1. Net migrant numbers are displayed below the diagonal in each sub-table. The numbers are in 100s.
2. Effectiveness ratios are displayed in italics above the diagonal in each sub-table. Effectiveness = absolute value of net migrants divided by gross migrants expressed as a percentage.
3. Numbers in columns may not add to the totals, which have been independently rounded.

8. RELATIONSHIP TO UNEMPLOYMENT

The Census indicator to be used in this analysis was defined earlier (section 3.5.2). Here we discuss first the role of unemployment in migration theory.

8.1 Unemployment: general force or individual motivator?

Nations, regions and localities are all part today of a global system of economic competition in which the barriers to trade, capital and employment (though *not* labour) flows are becoming ever lower. A nation, region or locality must deliver raw materials, goods, services or information to the global economy in which it has a comparative advantage based on national resources, population skills, inventiveness and efficiency. If the area fails to win market share, its enterprises shut down or move elsewhere, employment is lost and the economic well being of its residents worsens. Conversely, if an area develops goods or services that are competitive, its native enterprises grow and it attracts inward investment. Employment rises and the unemployment rate falls.

Migration is viewed in the competitive space economy as one of the equilibrating mechanisms, alongside changes in wage rates and capital flows. In European countries, compared with North American, migration responds more slowly to changes in the economic health of regions or cities. The reason appears to be the role of welfare systems (subsidised public housing) in increasing the costs of migration. Owen (1992) finds that, in times of economic recession, the rate of migration is closely related to employment change but less closely related in times of economic prosperity when migration for housing reasons becomes more important. The unemployed themselves are known to be less mobile than the employed (Green 1986) because of disconnection from job information, networks, and lack of resources for job searching in areas away from home. Therefore when we examine the relationship between unemployment and migration, unemployment is being used as indicator of the performance of the local economy. There is a slight conceptual mismatch between the migration event in the year prior to the Census and the unemployment rate which is measured at the census (the end of the migration year). However, this is not thoughy to bias the analysis too seriously.

8.2 The general unemployment relationship

Table 18 presents the variation of population and net migration with unemployment level. The relationship is inverse and linear: the greater the unemployment level the lower the rate of population change over the decade 1981-91. The relationship is very similar to that for density

Table 18: The variation of population change 1981-91 and net migration 1990-91 with unemployment class, Great Britain

Unemployment rate (per cent) 1991 Census	Population change 1981-91 Per cent	Net migration rate, 1990-91 (per thousand population)
<4	+7.2	+6.4
4-<6	+4.5	+4.0
6-<8	+2.3	+2.0
8-<10	-0.2	-0.5
10-<12	-2.1	-1.4
12-<14	-4.3	-2.8
14-<16	-4.6	-4.3
16-<18	-7.0	-4.7
18-<20	-7.0	-7.4
20+	-12.7	-12.6

Source: computed from the 1981 Census SAS and 1991 Census SAS and SMS. Crown copyright. ESRC/JISC Purchase.

- the greater extremes reflect the larger number of unemployment classes. Population change and net migration are close together through most of the unemployment range.

8.3 The unemployment relationship and the life course

Figure 17 charts the unemployment-net migration relationship for the ten age-sex groups. The family ages (30-44, 1-15) exhibit the strongest relationship (greatest range of net migration rates, steepest slope), particularly in the unemployment levels below the average. Unemployment level is a systematic but weaker influence on the two older age groups. In the pre-retirement age group this probably reflects the lack of opportunities for job-related migration for older workers. The relationship for the pensionable ages is slightly stronger but cannot be interpreted as a labour market relationship. The retired must be responding to the unattractive environment of high unemployment areas. For both these older age groups migration appears to be insensitive to unemployment levels below the average (8-<10% category).

As usual the relationship for young adults is different. There appears to be no systematic relationship for much of the unemployment range: it is only at very high levels of unemployment of 16% or more that a migration response (increasing net out-flows) occurs.

8.4 Net migration between unemployment bands

Table 19 reports, for male migrants, the net flows and effectiveness ratios between unemployment bands. In total nearly 100 thousand men moved over the year before the 1991 Census from above average unemployment areas to below average. Unfortunately these movements do not mean the migrants are also transferring from unemployment to employment or the British unemployment queue could be reduced to minimum frictional levels in a decade.

The matrices in Table 19 tell a story of very high consistency in migration flows between areas of differing unemployment levels. In the all ages matrix and in the separate age group matrices, areas lose migrants to lower unemployment bands. There are some exceptions in the young adult ages (16-29) and effectiveness ratios for this age group are low. Effectiveness ratios are higher for the pensionable ages reaching nearly 50 per cent for flows between the highest unemployment band and the lowest.

8.5 The combined influence of density and unemployment

So far we have treated the two predictor variables separately, but a glance at the unemployment map (Figure 4) will confirm that population density and unemployment are closely associated. The correlation over 10,482 areas, is, in fact, 0.44. To test the possibility that there was only

Figure 17: Net migration by unemployment level for age-sex groups, Great Britain, 1990 –91

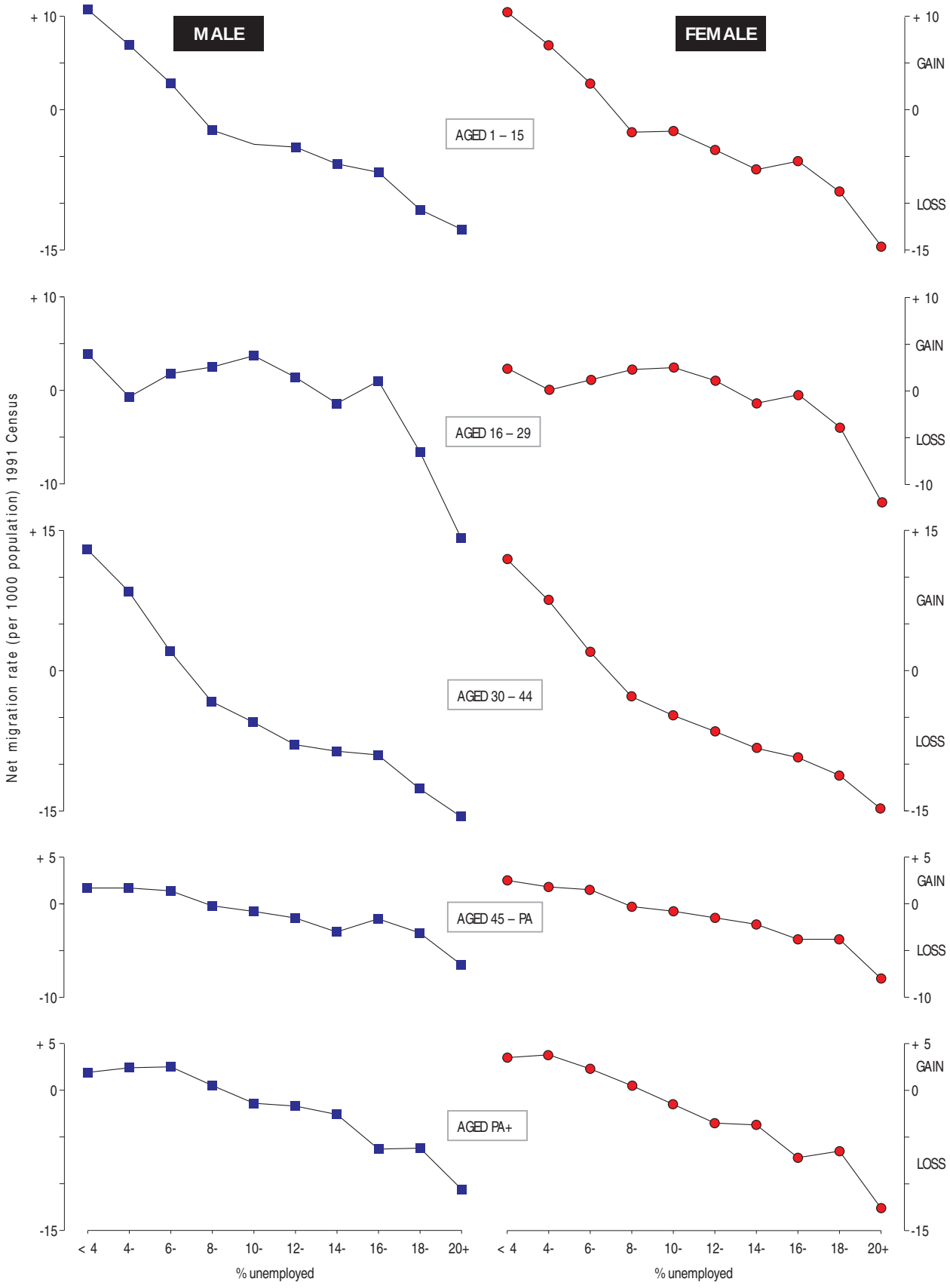


Table 19: Net migration and effectiveness between unemployment bands, for males, Great Britain, 1990-91

Origin unemp.	Destination % unemployed <4	4-<6	6-<8	8-<10	10-<12	12-<14	14-<16	16-<18	18-<20	20+
All ages										
<4		*2*	*6*	*11*	*9*	*14*	*14*	*10*	*11*	*13*
4-<6	40		*3*	*7*	*8*	*10*	*12*	*8*	*12*	*17*
6-<8	54	106		*3*	*4*	*7*	*10*	*9*	*13*	*18*
8-<10	48	141	66		*2*	*5*	*6*	*7*	*12*	*14*
10-<12	25	105	62	22		*1*	*3*	*7*	*10*	*14*
12-<14	21	75	63	46	9		*3*	*5*	*5*	*11*
14-<16	13	53	49	37	20	14		*2*	*3*	*11*
16-<18	5	19	30	22	25	16	6		*3*	*9*
18-<20	3	17	26	24	20	10	7	4		*4*
20+	10	52	77	64	59	57	48	30	13	
Total	219	529	214	-40	-80	-116	-125	-91	-98	-411
Aged 1-15										
<4		*5*	*13*	*19*	*17*	*26*	*18*	*17*	*14*	*10*
4-<6	9		*6*	*15*	*19*	*20*	*25*	*17*	*23*	*24*
6-<8	10	21		*6*	*9*	*13*	*20*	*18*	*20*	*30*
8-<10	7	25	11		*3*	*5*	*9*	*9*	*17*	*19*
10-<12	4	19	11	3		*1*	*4*	*11*	*15*	*19*
12-<14	3	12	10	5	-1		*2*	*6*	*5*	*15*
14-<16	1	8	8	5	2	1		*0*	*4*	*15*
16-<18	1	3	5	3	4	2	0		*4*	*9*
18-<20	0	3	4	3	3	1	1	1		*0*
20+	0	5	10	8	8	8	7	3	0	
Total	35	86	28	-16	-20	-16	-17	-13	-16	-49
Aged 16-29										
<4		*1*	*0*	*4*	*3*	*9*	*9*	*3*	*5*	*8*
4-<6	-3		*2*	*0*	*1*	*0*	*1*	*6*	*4*	*7*
6-<8	1	-11		*1*	*2*	*0*	*2*	*1*	*7*	*9*
8-<10	4	-1	-3		*0*	*2*	*2*	*0*	*10*	*7*
10-<12	2	-3	-5	-0		*2*	*1*	*2*	*5*	*9*
12-<14	3	0	-0	4	3		*4*	*4*	*0*	*9*
14-<16	2	-1	2	3	2	4		*0*	*3*	*7*
16-<18	1	-3	1	0	2	3	0		*2*	*8*
18-<20	0	1	3	4	2	0	1	-1		*4*
20+	2	6	10	8	9	10	8	6	3	
Total	13	9	19	20	23	7	-5	2	-10	-61
Aged 30-44										
<4		*4*	*13*	*19*	*17*	*25*	*20*	*15*	*17*	*16*
4-<6	11		*8*	*13*	*18*	*18*	*20*	*14*	*19*	*20*
6-<8	15	36		*6*	*11*	*13*	*15*	*14*	*15*	*22*
8-<10	11	34	17		*3*	*8*	*8*	*10*	*16*	*16*
10-<12	5	26	18	4		*3*	*7*	*10*	*12*	*16*
12-<14	4	16	13	8	2		*2*	*3*	*10*	*13*
14-<16	2	10	9	5	5	1		*3*	*5*	*10*
16-<18	1	4	5	4	4	1	1		*4*	*6*
18-<20	1	3	3	4	3	2	1	1		*3*
20+	1	7	10	8	8	6	5	2	1	
Total	51	125	24	-27	-33	-33	-25	-17	-16	-48
Aged 45-pensionable age										
<4		*3*	*1*	*9*	*7*	*9*	*9*	*6*	*2*	*5*
4-<6	3		*2*	*9*	*10*	*9*	*14*	*6*	*14*	*22*
6-<8	0	4		*5*	*4*	*9*	*10*	*11*	*21*	*17*
8-<10	2	9	5		*4*	*6*	*13*	*9*	*10*	*20*
10-<12	1	6	3	3		*4*	*7*	*6*	*8*	*16*
12-<14	1	3	4	2	2		*3*	*5*	*3*	*16*
14-<16	0	3	2	3	2	1		*2*	*3*	*12*
16-<18	0	1	2	1	1	1	-0		*4*	*13*
18-<20	-0	1	2	1	1	0	0	0		*7*
20+	0	3	3	4	3	3	2	2	1	
Total	7	26	16	-2	-5	-6	-9	-3	-4	-21
Pensionable age or over										
<4		*2*	*1*	*9*	*13*	*25*	*36*	*30*	*39*	*48*
4-<6	-1		*1*	*9*	*15*	*24*	*29*	*30*	*33*	*48*
6-<8	0	-1		*6*	*9*	*14*	*17*	*22*	*18*	*46*
8-<10	1	4	3		*7*	*6*	*8*	*27*	*25*	*36*
10-<12	1	4	3	2		*2*	*3*	*14*	*22*	*26*
12-<14	1	4	3	1	0		*5*	*13*	*11*	*26*
14-<16	1	3	2	1	0	0		*15*	*16*	*16*
16-<18	0	2	2	2	1	1	1		*8*	*13*
18-<20	0	1	1	1	1	0	1	0		*11*
20+	1	3	4	3	2	3	1	1	1	
Total	4	22	18	3	-5	-5	-5	-7	-5	-19

Sources: as Table 15.
Notes: as Table 17.

Table 20: The correlation of population change 1981-91 and net migration 1990-91 with unemployment and population density 1991, Great Britain

Variable	Correlations		Regression Coefficients				R squared
Age-sex	Density	% Unemp.	Density B	Density Beta	% Unemployed B	% Unemployed Beta	
Density	1.00	0.44					
Unemployed	0.44	1.00					
% Population change 1981-91	-0.20	-0.34	-0.04	-0.06	-0.83	-0.31	0.12
Net migration rate							
1-15, male	-0.28	-0.22	-0.25	-0.23	-0.59	-0.11	0.09
female	-0.27	-0.22	-0.24	-0.22	-0.63	-0.12	0.09
16-29, male	-0.05	-0.05	0.14	0.08	-0.67	-0.08	0.01
female	0.02	-0.04	0.07	0.04	-0.42	-0.05	0.00
30-44, male	-0.36	-0.28	-0.28	-0.29	-0.67	-0.15	0.14
female	-0.36	-0.29	-0.25	-0.29	-0.66	-0.16	0.15
45-pa, male	-0.27	-0.17	-0.13	-0.25	-0.12	-0.05	0.08
female	-0.25	-0.18	-0.12	-0.21	-0.23	-0.09	0.07
pa+, male	-0.20	-0.21	-0.09	-0.13	-0.48	-0.15	0.06
female	-0.23	-0.24	-0.11	-0.15	-0.60	-0.18	0.08
All ages	-0.27	-0.27	-0.12	-0.18	-0.56	-0.18	0.10

Source: computed from 1981 and 1991 Census SAS and Ward & Parish Monitor data and 1991 Census SMS. Crown Copyright. ESRC/JISC Purchase.

Notes:
1. Some 23 areas out of 10,505 are excluded from the analysis because of matching problems or extreme values.
2. The cases are weighted by 1981 present population for the population change analysis and by 1991 resident population for the net migration analysis.
3. All coefficients are significant at the 1% level.

one relationship involved not two, a regression analysis using the 10,482 wards and sectors was carried out, which attempts to predict population change and net migration from density and unemployment. The results are set out in Table 20.

Overall model fit is positive but very low. Only 10% of the variations in net migration rates are accounted for. That is not surprising given the mosaic complexity of the maps presented earlier. More encouraging is the confirmation that both predictor variables have significant independent relationships with the dependent variables.

The standardised beta coefficients give comparable information about the strength of the predictor variables. For the population regression these are -0.06 for density and -0.31 for unemployment, while for all ages net migration they are both -0.18. Unemployment levels were therefore more influential than density levels in predicting population change over the decade but the variables had equal effect in predicting net internal migration in the year before the 1991 Census.

Tables 21 and 22 provide a grouped summary of the combined effects of unemployment and density on population change and net internal migration. Both tables have a general surface which slopes from top left (positive rates) to bottom left (negative rates). The divide between increase cells and decrease runs on a diagonal across the tables from top right to bottom left but displaced a little upwards, particularly in the population change table. In this table, high unemployment, irrespective of density, is associated with population loss, while low unemployment is associated with population increase across all density bands. Also high density guarantees population loss except where unemployment is lowest. Where density is lowest, however, only in areas of less than 12% unemployment is there population gain.

Table 21: The variation of population change 1981-91 with unem[ployment and population density, Great Britain

% Unemployed	Population density (persons per hectare) 1991						
1991	0-<1	1-<5	5-<10	10-<20	20-<40	40-<60	60+
<4	+5.4	+5.5	+12.2	+10.2	+8.1	+3.7	+1.8
4-<6	+4.0	+5.3	+6.0	+4.4	+4.4	+1.2	-1.5
6-<8	+4.9	+4.3	+6.4	+2.1	+1.8	-1.2	-4.3
8-<10	+3.9	+3.0	+1.5	+1.8	+0.2	-3.1	-4.5
10-<12	+2.0	+0.2	-1.9	-1.1	-1.5	-3.5	-4.9
12-<14	-1.8	+3.3	-1.8	-3.3	-4.8	-5.2	-4.4
14-<16	-6.8	-2.1	-2.6	-3.7	-4.6	-4.8	-6.1
16-<18	-7.9	-7.0	-7.5	-4.2	-6.9	-8.2	-7.0
18-<20	-9.8	+6.3	-8.6	-5.5	-10.2	-4.3	-6.9
20+	-13.0	-15.3	-16.0	-16.1	-16.2	-12.1	-9.1

Source: computed from 1991 and 1981 Census SAS and 1991 Census SMS data. Crown copyright ESRC/JISC Purchase

Table 22: The variation of net migration 1990-91 with unemployment and population density, Great Britain

% Unemployed	Density (persons per hectare) 1991						
1991	0-<1	1-<5	5-<10	10-<20	20-<40	40-<60	60+
<4	+7.5	+8.0	+9.1	+6.1	+0.6	-4.7	-8.7
4-<6	+6.6	+5.5	+4.1	+3.1	+2.7	-0.4	-2.1
6-<8	+6.8	+5.3	+5.4	+2.7	+0.1	-2.2	-5.4
8-<10	+1.9	+4.7	+6.0	+0.8	-1.0	-4.5	-4.9
10-<12	+4.8	+2.8	-0.3	-0.4	-1.2	-2.8	-6.4
12-<14	+2.0	+1.0	+0.2	-0.7	-2.6	-3.7	-7.5
14-<16	+0.8	+1.2	+2.9	-3.8	-2.8	-5.4	-9.9
16-<18	-2.7	-0.9	+2.4	+0.3	-3.0	-3.7	-12.2
18-<20	+0.5	-12.9	+1.7	-1.6	-5.9	-6.5	-14.7
20+	-4.1	-4.6	-9.7	-13.1	-9.3	-12.0	-16.0

Source: computed from 1991 Census SMS and SAS data. Crown copyright ESRC/JISC Purchase

9. SUMMARY AND CONCLUSIONS

This case study has examined recent population change patterns and internal migration activity in the United Kingdom. A wealth of knowledge about population dynamics in Britain has been achieved.

(1) The spatial patterns of population change and net migration were intricate mosaics of gains and losses which confirmed the decision to work at the finest scale for which good data were available.

(2) Gains and losses in population were principally determined by net internal migration. The decade long population change patterns and one year long migration patterns were in considerable agreement. This was surprising in view of the prior emphasis on temporal instability in population change and migration patterns by Stillwell, Rees and Boden (1992b), Stillwell, Rees and Duke-Williams (1996) and Dorling (1995).

(3) The dominant map pattern was one of deconcentration from the cores of city regions to hinterlands both for the largest metropolises but also their associated and subsidiary partner cities.

(4) There were also signs of loss in population and migrants in declining resource regions (former mining areas, fishing ports) and gains in both in new resource frontiers - particularly in north-east Scotland reflecting the vigorous development of onshore facilities for the offshore oil and gas fields of the North Sea.

(5) The pattern of overall population and migrant redistribution was predominantly that of the middle labour force/family ages (30-44, 1-15) reinforced at much lower mobility levels but with sharper patterns of redistribution by pre-retirement and retirement ages.

(6) People in the young adult ages (16-29) redistributed to rather different destinations, showing a unique shift to the dense neighbourhoods of big cities, at least in the ages of higher education.

(7) With respect to the urban system, there was significant redistribution both downward and outward. Downward redistribution meant shifts from large metropolitan cities to medium and small sized freestanding cities. Outward redistribution meant shifts to the outer commuting rings around cities, often deep into the countryside, This was not a return to the rural idyll, merely the expansion of the daily urban systems to cover most of lowland Britain.

(8) Strong preferences for low density living were revealed by shifts towards districts in Rural Areas defined by the Office for National Statistics (ONS) and by net flows to low density wards and sectors.

(9) Similar strong shifts out of above average unemployment areas into below average areas were detected, though both density and unemployment effects were either not present or weak for young adults.

(10) Some ambiguity was revealed in the fortunes of Inner London areas. Migration data from the 1991 Census showed intense outward movement. Downward population shifts were on a lesser scale because of the compensating effects of higher than average natural increase and high immigration from overseas. However, a re-analysis of 1991 population by ONS and academic advisors led to a substantial upward revision of London borough populations, and so places doubt on the outward shift of population through internal migration. However, many of London's share of the "missing million" in the 1991 Census may well have been recent immigrants and their children rather than internal migrants. No demographic story can be complete without its unsolved mysteries.

Our final remarks highlight the gaps in the analysis which will be repaired in future revisions.

(a) The classifications and indicator bands may need to be adjusted to make them comparable with other countries.

(b) We would wish to add, where possible, equivalent data for Northern Ireland, which are mostly available but in need of some adjustment to align them with the information for Great Britain.

(c) It would be valuable to carry out an analysis of migration patterns using the 1981 Census Special Migration Statistics but this awaits adaptation of the extraction software used with the 1991 SMS.

REFERENCES

Boudoul J et Faur J P (1982) Renaissance des communes rurales au nouvelle forme d'urbanisation? *Economie et Statistique,* 149, 1-16.

Bracken I and Martin D (1995) Linkage of the 1981 and 1991 UK Censuses using surface modelling concepts. *Environmentl and Planning A*, 27, 3, 379-390.

Champion A G, Green A E, Owen D W, Ellin D J and Coombes M G (1987) *Changing places: Britain's demographic, economic and social complexion.* Edward Arnold, London.

Champion A G (1989) (ed.) United Kingdom: population deconcentration as a cyclic phenomenon. Chapter 5 in *Counterurbanisation: the changing pace and nature of population deconcentration*. Edward Arnold, London.

Champion A G (1996) Population review: (3) Migration into, from and within the United Kingdom. *Population Trends 83*, 5-16. HMSO, London.

Champion A and Dorling D (1994) Population change for Britain's functional regions, 1951-91. *Population Trends* 77, 14-23.

Coombes M G, Dixon J S, Goddard J B, Openshaw S, Taylor P J (1982) Functional regions for the population census of Great Britain. In Herbert D T, Johnston R J (eds.) *Geography and the urban environment 5.* John Wiley, London.

Council of Europe (1995) *Recent demographic developments in Europe: 1995*. Council of Europe Publishing and Documentation Service, Strasbourg.

Dorling D (1995) *A new social atlas of Britain*., John Wiley & Sons, Chichester.

Dorling D and Atkins D (1995) *Population density, change and concentration in Great Britain, 1971, 1981 and 1991*. Studies in Medical and Population Subjects No 58. HMSO, London.

EUROSTAT (1995a) *Demographic statistics 1995.* Office for Official Publications of the European Communities, Luxembourg.

EUROSTAT (1995b) *Regional Statistics 1995.* Office for Official Publications of the European Communities, Luxembourg.

Flowerdew R and Green A (1993) Migration, transport and workplace statistics from the 1991 Census. Chapter 10 in Dale A and Marsh C (eds.) *The 1991 Census User's Guide*. HMSO, London. Pp.269-294.

Green A E (1986) The likelihood of becoming and remaining unemployed in Great Britain. *Transactions, Institute of British Geographers* NS11, 37-56.

Kupiszewski M (1996) Two maps of population change in Poland. Paper presented to the Council of Europe, Meeting of the Group of Specialists on Internal Migration and Regional Population Dynamics, February 1996, Strasbourg.

OPCS and GROS (1993) *1991 Census. Summary Tables. Great Britain*. HMSO, London.

ONS (1996) *Population Trends 84.* HMSO, London.

Owen D (1992) Migration and employment. Chapter 12, in Stillwell J, Rees P and Boden P (eds.) (1992a) *Migration processes and patterns. Volume 2. Population redistribution in the United Kingdom.* Belhaven, London.

Rees P (1992) Elderly migration and population redistribution in the United Kingdom. Chapter 11 in Rogers A with Frey W, Speare A, Rees P and Warnes A (eds.) *Elderly migration and population redistribution.* Belhaven, London.

Rees P and Duke-Williams O (1994) The Special Migration Statistics: a vital resource for research into British migration. Working Paper 94/20, School of Geography, University of Leeds, Leeds, UK.

Rees P and Kupiszewski M (1996) Internal migration and regional population dynamics: a feasibility study for the Council of Europe. Working Paper 96/1, School of Geography, University of Leeds, Leeds, UK.

Rees P (1996) Projecting the national and regional populations of the European Union using migration information. Chapter 18 in Rees P, Stillwell J, Convey C and Kupiszewski M (eds.) *Population migrations in the European Union*. John Wiley, Chichester.

Stillwell J, Rees P and Boden P (eds.) (1992a) *Migration processes and patterns. Volume 2. Population redistribution in the United Kingdom.* Belhaven, London.

Stillwell J, Rees P and Boden P (1992b) Internal migrations trends: an overview. Chapter 3 in Stillwell J, Rees P and Boden P (eds.) (1992a) *Migration processes and patterns. Volume 2. Population redistribution in the United Kingdom*. Belhaven, London.

Stillwell J, Rees P and Duke-Williams O (1996) Migration between NUTS level 2 regions in the United Kingdom. Chapter 16 in Rees P, Stillwell J, Convey C and Kupiszewski M (eds.) *Population migration in the European Union*. John Wiley, Chichester.

van Imhoff E, van der Gaag N, van Wissen L and Rees P (1995) "Model selection for internal migration at the NUTS-2 level". Technical Report, Netherlands Inter-disciplinary Demographic Institute, Den Haag, Netherlands. Paper submitted to the *International Journal of Population Geography*.

Wallace M, Charlton J and Denham C (1995) The new OPCS area classification. *Population Trends 79*, Spring 1995, 15-30.

Wallace M and Denham C (1996) *The ONS classification of wards and sectors in Great Britain*. Studies in Medical and Population Subjects No 60. HMSO, London, Forthcoming.

Wallace M and Denham C (1996) *The ONS classification of local and health authorities of Great Britain*. Studies in Medical and Population Subjects No 59. HMSO, London.

Warnes A (1992) Age-related variation and temporal change in elderly migration. Chapter 3 in Rogers A with Frey W, Speare A, Rees P and Warnes A (eds.) *Elderly migration and population redistribution.* Belhaven, London.