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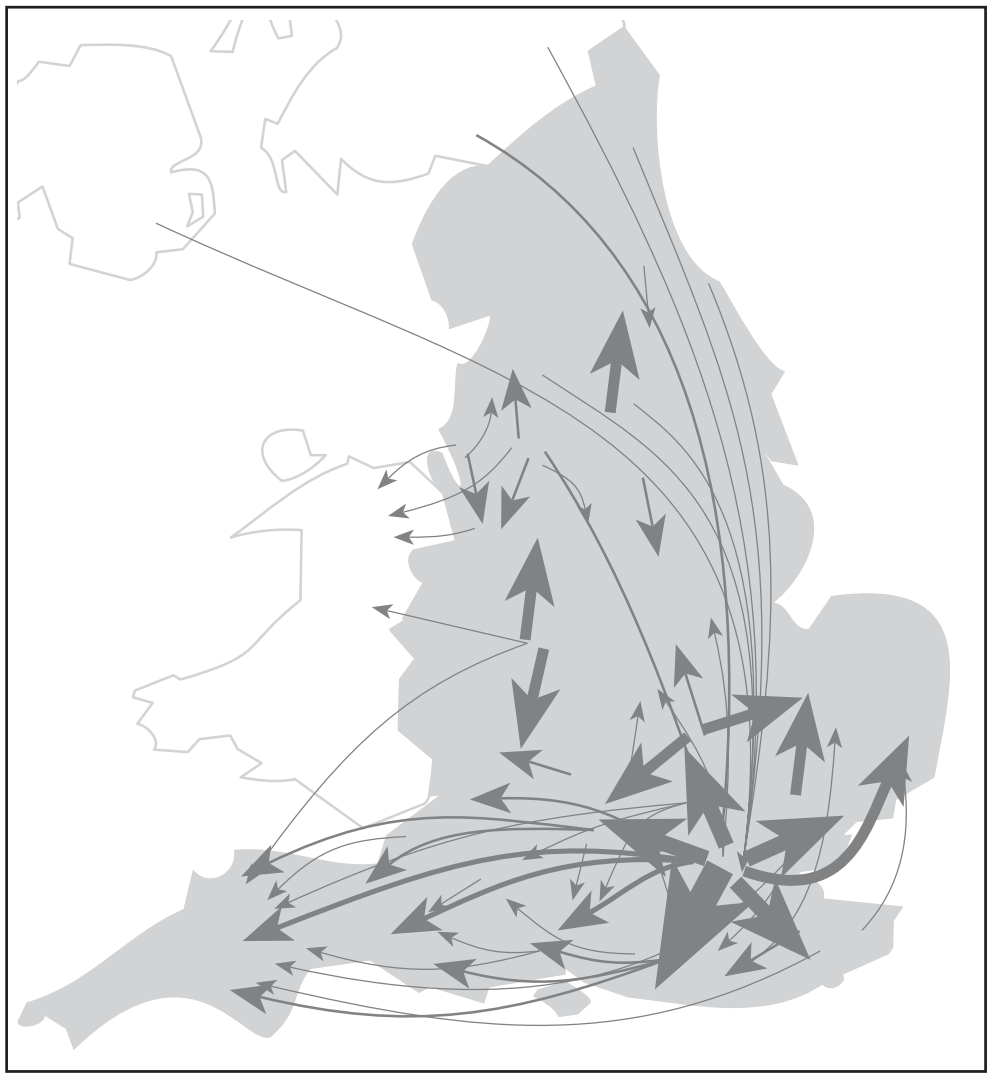
THE DETERMINANTS OF MIGRATION FLOWS IN ENGLAND: A REVIEW OF EXISTING DATA AND EVIDENCE

A report prepared for the Department of the Environment, Transport and the Regions



Tony Champion, Stewart Fotheringham, Philip Rees, Paul Boyle and John Stillwell

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Tony Champion
Stewart Fotheringham
University of Newcastle upon Tyne

Philip Rees
Paul Boyle
John Stillwell
University of Leeds

This book provides a comprehensive review of migration flows in England. Commissioned by the Department of Environment, Transport and the Regions from acknowledged experts at two northern Universities, as input to work on improving regional housing demand forecasts, the report covers migration data sources, migration patterns and trends, the determinants of migration and migration modelling. The authors conclude with a comprehensive blueprint for improving the migration inputs to subnational forecasts. It is an essential source book for anyone studying migration in England.

The Department of Geography
University of Newcastle upon Tyne
Newcastle upon Tyne NE1 7RU

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The Authors

Tony Champion is Professor of Population Geography at the University of Newcastle upon Tyne and Director of the University's Housing and Society Research Group.

Stewart Fotheringham is Professor of Quantitative Geography at the University of Newcastle upon Tyne and Director of the North East Regional Research Laboratory.

Philip Rees is Professor of Population Geography at the University of Leeds and Co-ordinator of the ESRC/JISC Census of Population Programme..

Paul Boyle is Lecturer in Geography at the University of Leeds and Director of Postgraduate Studies in the School of Geography.

John Stillwell is Reader in Geography at the University of Leeds and Chair of the Population Geography Research Group of the Royal Geographical Society (with the Institute of British Geographers).

EXECUTIVE SUMMARY

THE DETERMINANTS OF MIGRATION FLOWS IN ENGLAND: A REVIEW OF EXISTING DATA AND EVIDENCE

This research was commissioned by the Department of the Environment, Transport and the Regions with the aim of increasing the Department's understanding of the possibilities and problems involved in modelling migration flows as part of the assessment of demand and need for housing at regional and subregional levels.

The study was given *four objectives:*

- to identify the main sources of migration data and assess their value for monitoring past migration trends and their suitability for modelling future migration flows
- to review the statistical evidence on the patterns and trends in migration at regional and subregional levels in England over the past 20-30 years and assess the future tendencies
- to review the literature on the determinants of migration flows affecting the regional and subregional distribution of population and households in England
- to review alternative approaches to modelling migration and assess their relative merits and disadvantages in conceptual and practical terms.

At each stage, *three types of migration flows* were to be distinguished:

- migration within England
- migration between England and the rest of the UK
- migration between England and countries outside the UK

The *report* begins with a brief overview chapter. This is followed by four substantive chapters which address each of the four objectives separately. The final chapter draws together the main findings of the study for each of the three main types of migration. Reviews of 18 selected papers are presented in the Appendix.

Context

Migration flows are seen as being *important to two key areas* of the Department's work: the projection of household numbers and projecting the future need for social housing. The current projections of household formation produced by the Department are essentially *trend-based*, and there is a concern over how economic and social factors impinge on migration and household formation.

Recent trends have heightened awareness of the potential significance of migration in this context. One development concerns England's switch from a net emigration country

to one of *net immigration* in the early 1980s and, in particular, whether the acceleration of its international migration gains in the 1990s is likely to continue. Another issue relates to the *volatility of internal migration flows*, notably the contraction in both the north-south drift and the urban exodus towards the end of the 1980s and what importance to attach to widely-cited evidence of a 'back to the city' tendency.

Connected to these issues is the potential advantage which *explanatory models* have over trend extrapolation methods in terms of being able to explore the implications of alternative scenarios. Given the inherent uncertainties about the future, it can be extremely useful to be able to gauge how sensitive forecasts of migration are to specific levels of change in its various determinants.

Migration data sources

There is no single comprehensive source of information on migration to, from and within England and its constituent parts, not even on numbers of migrants let alone their characteristics and motivations for moving. As a result, it is necessary to try and build up the overall picture from a variety of sources that vary considerably in their coverage, detail and accuracy.

Information on the separate migration data sources gives some idea of the level of accuracy of the data. It is, however, very difficult to run checks on data accuracy because of the limited overlap between sources in coverage of migration and lack of consistency between them in definitions.

There is a strong case for a comprehensive assessment of data reliability, notably with respect to the International Passenger Survey data on international migration and to the Population Census as the single most important source of detailed data on internal movements.

In the context of considering the future need for social housing, perhaps the single most important weakness of migration statistics is the dearth of information on the implications of migration for households. At the same time, the relationship between migration and household change, not just in the population generally but over space especially, is so complex that, even were the appropriate data readily available, the household dimension of migration would still be extremely difficult to handle in subnational projections.

Migration patterns and trends

Migration is a major force for population change at all spatial scales in England:

- *At national level*, migration was adding more to population in the mid 1990s than was natural change, though its contribution had been running at about one-third of national population growth over the previous decade.

- Population redistribution *within England* is progressively greater at finer spatial scales, with most of the largest net population shifts arising from suburbanisation and urban deconcentration.

The relative importance of the three types of migration varies between geographical scales. Currently, at the level of the *standard region* (eight in England with Greater London being treated as part of the South East):

- International migration forms the principal contributor to the migration component of population change.

- Migration between England and the rest of the UK involves less than half the gross numbers of migrants participating in international exchanges and has produced very little net change in regional populations.

- Inter-regional migration within England involves far more people changing address than does international migration but produces less net redistribution between regions.

The role and relative importance of the main types of migration *varies considerably between standard regions:*

- The South West, East Anglia and the East Midlands normally gain from both internal migration and international exchanges (when the visitor switcher element is added in).

- The three regions of northern England normally lose people through internal migration while probably averaging very little net change through international movements (regional disaggregation of visitor switchers is needed to confirm this).

- The South East occupies a highly distinctive position in averaging substantial net out-migration to the rest of England while receiving the lion's share of England's net immigration from overseas, though the volumes of both have fluctuated considerably over the past decade.

- The West Midlands is closest to the South East type.

In relation to internal migration, the most important finding in relation to the 1990s patterns is the subdued scale of inter-regional shifts in population compared to previous experience. While this may be partly due to the stage reached in the economic cycle and the rather distinctive regional incidence of the latest economic recession, it contrasts with the trend in the net exodus from England's main metropolitan centres which quickly resumed its long-term average after a marked contraction in the late 1980s.

The largest inter-regional movements are between adjacent regions and, indeed, between adjacent counties on either side of regional boundaries. A substantial proportion of the shifts in population between standard regions is therefore likely to be due more to the types of determinants that govern shorter-distance moves (e.g. housing and environmental factors) than to the job-related reasons that are traditionally associated with long-distance migration.

There is clear research evidence of the various population movements being linked together to form a single national urban system, notably in the form of London's

pivotal role and in terms of the 'counterurbanisation cascade'. This is a system in which international migration appears to be playing an increasingly crucial role, with net immigration believed to be highly focused on London and a relatively small number of other places that in turn are losing population to other areas through internal migration.

Determinants of migration

The literature on the determinants of migration indicates two broad sets of factors that influence the likelihood of movement and the choice of destination: differential population composition and the circumstances at origins and potential destinations.

Population composition is a key determinant because migration propensities differ between population subgroups. *Age and stage in life course* are particularly important, and the life-course concept should be used to disaggregate any migration model into sub-models that apply to people in the same life course stage. In particular, the explanatory factors differ between young adults, families, retired couples and elderly people:

- The migration of young adults is affected by the distribution of places in higher education and first jobs in the labour market.

- The migration of families is driven by labour market factors and environmental factors influencing the type of area of destination choice.

- The migration of the retirement age group is conditioned by the state of the housing market and by environmental factors (pushing them out of large cities and pulling them into smaller places).

- The migration of the elderly is influenced by the provision of support and care based on the family, community and/or the state.

Migration activity also differs according to *social and cultural attributes*, notably people's employment status, occupation and ethnicity. Disaggregation of the population along these lines is recommended for groups with the highest dependence on social housing (e.g. the unemployed, social class V, Bangladeshis).

Amongst the circumstances at origins and destinations, *labour market factors* are of vital importance in stimulating longer-distance migration. The most important direct variables that should be included in a migration model are the flow of job creations and job losses by region. There is also increasing evidence that the relationship between employment change and migration can operate the other way round: consumption-led migration by families or retirees leads to the creation of service employment which attracts labour migration.

Housing factors form a critical element underlying migration patterns in the UK:

- Public-sector housing is seen as a barrier to longer distance mobility, as those moving into council houses tend to move shorter distances than those moving into other tenures, but this varies by region.

- Because of the dominance of owner occupation, migration is greatly affected by the state of the housing market and spatial variation in the availability and cost of housing.

- Privately rented property provides most flexibility for inter-regional migrants.

Environmental factors are relatively most important in accounting for intermediate-distance moves, especially between more urban and more rural areas. The evidence suggests that the English are, by and large, a nation committed to living in the countryside or as near as they can get to it. The corollary to this is that the main reason for leaving cities is that the latter fall short in social and environmental terms.

Relevant *public policy factors* include not only direct interventions such as through migration incentives and immigration policy but also indirect influences such as local taxes, defence spending and higher education expansion. Probably most important for more pressurised regions, however, is the supply of new housing which will be partly determined by planning controls and incentives for the recycling of urban land and property.

Finally, given that distance is the single most important factor influencing the rate of migration between places, it is essential to introduce a robust and accurate measure of *impedance* in migration modelling.

Migration modelling

Though it is difficult to categorise migration models because of the many kinds of models and their overlapping nature, *a four-fold framework* can be envisaged, based on whether migration is viewed from either a macro (aggregate) or a micro (disaggregate) perspective and according to whether models use either cross-sectional or time-series data:

- Aggregate (macro) cross-sectional models use aggregate migration data for one time period either for all migrants or for groups of similar migrants and are modelled in terms of a set of explanatory variables so that information is obtained on the determinants of migration.

- Disaggregate (micro) cross-sectional models are essentially the same as those applied to aggregate data but are applied to, and calibrated with, data on individual migrants as opposed to groups of migrants.

- Aggregate (macro) time-series models predict migration for future time periods through trend extrapolation while providing little, if any, explanation of current or past migration flows.

- Disaggregate (micro) time-series models introduce dynamics to the migration process at the level of individuals by simulating the behaviour of individuals under a variety of economic and social conditions.

Their relative value for forecasting migration depends on a number of considerations such as:

- data availability
- geographical scale of analysis
- length of forecasting period
- degree of economic and social stability in the system
- output needs, including whether it is considered important to 'explain' migration and/or to be able to explore the implications of alternative assumptions.

Data availability problems seriously offset the theoretical advantages of disaggregate migration models, not only in terms of implementing the models but also because of the relatively few successful applications of such models in the literature on inter-regional migration.

Key considerations concerning the relative merits of trend extrapolation methods and explanatory models include the following:

- Both methods are at their most accurate over short forecast periods, although trend extrapolation methods are more susceptible to short-term processes and explanatory models might retain their relevance over longer periods.
- Trend extrapolation methods are most accurate for large spatial units where the effects of unusual events are averaged out or dampened, whereas spatial interaction models are most powerful where spatial differentation is at its greatest, as found with small spatial units.
- There are problems with trend extrapolation methods when boundary changes occur between time periods.
- Trend extrapolation methods cannot capture unusual changes in migration behaviour caused by changing economic or social conditions.
- Explanatory models are better at investigating 'what if?' types of scenarios as an aid to policy formulation but are probably poorer at short-term forecasting than simple trend models.

Although the examples reviewed in this report seemingly support the contention that trend extrapolation methods are superior to spatial interaction models for short-term forecasting purposes, conclusive proof is hard to find.

As the evidence points to different migration behaviour across different cohorts of migrants, it would seem useful to disaggregate the forecasting technique by cohort and to aggregate the results for a picture of total migration.

Most applications of migration destination choice models are at a fairly detailed spatial scale with districts, wards and even enumeration districts being used as the origin and destination units.

Most migration models use individuals as the units of migration flows rather than households.

Recommendations for forecasting migration

Treatment of migration

Recommendation 1: It is necessary to give separate treatment to internal migration and to migration exchanges between England's sub-national areas (SNAs) and non-UK countries, but there is no similarly clear distinction to be drawn between within-England migration and migration between England's SNAS and the rest of the UK.

Recommendation 2: At present migration needs to be modelled for persons rather than households. Currently there is not enough data or understanding to handle households, not even to model the migration of households that do not change composition during the move let alone to model the impact of all migration on households. This is the case for all three types of migration affecting England's subnational populations.

Modelling within-England migration

Recommendation 3: On operational grounds, aggregate (macro) models are likely to provide a much more satisfactory basis than disaggregate (micro) models for forecasting migration flows between England's SNAs. This is mainly due to the limitations in data availability and complexities of data manipulation which have both hampered micro-level modelling of migration in England at this geographical scale.

Recommendation 4: Models which attempt to 'explain' migration decisions, such as spatial interaction models (SIMs) for destination choice and binary logit models for departure choice, are better than trend extrapolation methods at investigating 'what-if?' types of scenarios as an aid to policy formulation.

Recommendation 5: Tentatively, we suggest that, for a short forecasting time horizon and for a spatial breakdown into a small number of macro-level regions, trend extrapolation methods along the lines of those currently used by the ONS for subnational population projections will perform better than explanatory models, as long as sufficient data are available to establish trends with reasonable confidence and if obvious trends are present in the data. By contrast, if looking further ahead and dealing with a larger number of smaller and internally more homogeneous SNAs, explanatory methods of the SIM type are likely to produce the most reliable results, given the amount of urban and regional change normally occurring in England.

Recommendation 6: Even where forecasts are required for a small number of SNAs, there is a strong theoretical case for forecasting migration at a finer-grained spatial scale using SIMs and aggregating the results to the level required.

Recommendation 7: Assuming the adoption of an explanatory model, experimentation is required before a final decision is made on the most appropriate approach for any specific application in England. Particular attention should be given to the type and form of SIM and to the identity of the variables to be included in the models.

Recommendation 8: Whatever SIM is selected, model performance will be enhanced if the model is calibrated separately for each origin in the system.

Recommendation 9: Model performance will be enhanced if the determinants of migration included in the model, i.e. the levels of the SNA attributes, can be forecast accurately, either by inputting from a regional economic model run alongside the migration forecasting model or by having the latter fully incorporated in the former. 'What-if?' scenarios can be developed to gauge the sensitivity of migration projections to variations in the levels of determinants.

Recommendation 10: Whichever modelling approach is used, there is a need for the level of migration, i.e. the total number of relevant changes of address over a given time period, to be set exogenously.

Recommendation 11: Whichever modelling approach is adopted, it will perform more satisfactorily if it models separately population sub-groups that are distinctive in their migration behaviour and respond to different determinants, with special attention being given to distinctions by age, employment status and income. Two particularly distinctive groups are retired owner occupiers and full-time students.

Recommendation 12: Consideration needs to be given to whether it is both justifiable and feasible to include constraints into the migration forecasting model, such that limits be placed on the overall capacity of individual SNAs and account taken of all types of migration and of other aspects of housing demand simultaneously.

Modelling migration between England and the rest of the UK

Recommendation 13: There is a strong theoretical case for handling these exchanges within the model developed for forecasting within-England migration, using a similar spatial breakdown of the rest of the UK and - if shown to improve model fit - including dummy variables to represent the crossing of a national boundary.

Recommendation 14: In practical terms, it would seem unreasonable to devote substantial resources to the development of a completely separate, well-performing model for migration to and from the rest of the UK, given that the average annual impact of these exchanges on England's sub-national populations is much smaller than those of within-England migration and of migration exchanges with countries outside the UK.

Modelling international migration

Recommendation 15: International migration has emerged as such a significant contributor to England's population growth over the past decade that its impacts on the country's population distribution and composition merit much more detailed investigation than they have been accorded thus far, as do the interrelationships between the levels and patterns of international migration and those of internal migration.

Recommendation 16: In advance of such improvement in our knowledge and understanding, there is unlikely to be a significantly better way of allocating the total number of immigrants and emigrants to SNAs than the methods currently used by ONS

and GAD, but it would be useful to consult a group of experts from the Home Office, ONS and academia to consider ways of refining these techniques.

Recommendation 17: As regards forecasting the total number and composition of immigrants and emigrants to England, we recommend a combination of trend extrapolation and scenario writing. This can be used to gauge the likely range of effects on individual SNAs, with the impacts being by far the greatest for the South East, and especially London, but of much more limited significance for most of the rest of England.

Looking to the future

Recommendation 18: As a long-run goal the Department should be aiming for a model which integrates population migration and household change and matches it with housing supply in a dynamic temporal context.

The next steps

There are two basic ways in which progress can now be made towards the better forecasting of the migration flows that cause change to England's subnational populations:

- through experimentation with the recommended approaches in order to select the best-performing versions
- through further research designed to improve our knowledge of migration flows and their determinants.

In terms of ***experimentation***, it is particularly important to set up a feasibility study for refining the spatial interaction model needed for forecasting internal migration and comparing its performance with trend extrapolation methods. This will need to bear in mind data availability and the needs of the regional housing model, but the key aspects needing attention include:

- the choice of the form of spatial interaction model to be used
- the method of projecting the overall volumes of migration in the system
- the identification of the population subgroups to be modelled separately
- experimentation with calibrating models separately for each origin region
- the selection of the specific explanatory variables to be used in each model
- the exploration of the stability of model parameters over time
- the assessment of the feasibility of predicting the future values of the variables in the models
- examination of the possibilities of imposing constraints and handling interaction effects

The principal ***information and research needs*** identified by this study are the following:

- a comprehensive assessment of migration data reliability, especially with respect to the International Passenger Survey data on international migration and to the Population Census as the single most important source of detailed information on internal movements

- an examination of the geographical impact and characteristics of international migrants, especially asylum seekers and visitor switchers

- an investigation of the interaction effects between internal and international migration, especially possible links between rates of net immigration to London and certain other cities and net out-migration from these cities to the rest of England

- a study of the household dimension of both international and internal migration, especially the relationships between macro and micro levels of analysis

- research to identify the steps needed for developing micro-level models of migration behaviour, starting with the possibility of adapting models developed in other countries, notably the Netherlands.

CHAPTER 1: INTRODUCTION

1.1 Aim and background

The overall aim of the work reported here is to increase the Department's understanding of the possibilities and problems involved in modelling migration flows as part of the economic modelling of household formation and of the demand and need for housing at regional and sub-regional levels. These flows are seen as being important to two key areas of the Department's work: the projection of household numbers and projecting the future need for social housing. The current projections of household formation produced by the Department are essentially trend-based, and there is a concern over how economic and social factors impact on migration and household formation.

Migration flows are of interest in a number of policy contexts. Of particular importance are the issues raised by the extra households forecast in the latest official projections (DOE 1995), notably how likely it is that the national totals will be reached and how far the regional and sub-regional distribution of these households depends on factors which involve more than simply the extension of past trends. The Green Paper, *Household growth: where shall we live?* (Secretary of State for the Environment 1996), highlighted the potential importance of migration in these matters and raised questions about alternative ways of accommodating this growth in household numbers. There are also important issues concerning geographical variations in access to the private housing market, leading to questions about the degree to which problems of access prompt out-migration of lower-income people from more pressurised areas and the extent to which changes in the provision of social housing would help to ease local labour supply problems and combat trends towards social polarisation.

There is also concern about the extent to which past patterns and trends in migration can, or indeed should, provide the basis for forecasts. One aspect relates to England's switch from a net emigration country to one of net immigration in the early 1980s and, in particular, to whether the subsequent acceleration of its international migration gains is likely to continue into the future. Another aspect relates to the volatility of internal migration flows, notably the contraction in both the north-south drift and the urban exodus towards the end of the 1980s and what importance to attach to the widely-cited evidence of a 'back to the city' tendency. Linked to this is the issue of how much weight to attach to the latest levels of particular migration flows rather than being able to draw upon models which distinguish the effects of short-term perturbations from more deep-seated trends. There is also the question of the degree of 'circularity' in projections, such that for various reasons the latter may become 'self-fulfilling prophecies'.

Connected to this is the potential advantage which explanatory models have over trend extrapolations in terms of being able to explore the implications of alternative scenarios. Given the inherent uncertainties about the future – and this applies to the determinants of migration as much as to the migration flows themselves – it can be extremely useful to be able to gauge how sensitive forecasts of migration are to specific levels of change in its various determinants. In a planning context, particular interest centres on how far those determinants might be amenable to influence through government policy intervention.

1.2 Objectives of the study

This study was set three principal objectives. Firstly, it was required to review briefly the available statistical evidence on the patterns and trends in migration at regional and sub-regional levels in England over the past 20-30 years. This review should cover both internal and external migration flows, separately identifying within-England, other UK and international migration flows where possible. Future prospects for the patterns and trends in internal and external migration, as indicated by existing official projections, were also to be examined and assessed, focusing mainly on the next 10 years in line with the time horizon for official projections of the need for social housing.

The second objective of the project was to review thoroughly the literature on the determinants of migration flows affecting the regional and sub-regional distributions of population and households in England. This review should draw on both previous UK-based studies and, where relevant, the wider international literature and should highlight key differences in determinants for the three separate types of migration. So far as possible, the quantitative significance of each of the potential determinants of these migration flows were to be set out, based on the findings of existing rather than new empirical work.

The third objective was to draw out the implications and lessons of these reviews of trends and determinants for the economic modelling of household formation and the demand and need for housing at regional and sub-regional levels. In particular, an evaluation was required of the feasibility of formally modelling all or any of the three types of migration flows. This would involve a review of the alternative approaches to modelling migration and an assessment of their relative merits and disadvantages in conceptual and practical terms. One important consideration was the extent to which such methods could be integrated within an economic model of household formation and housing demand and need.

The study was also set the additional task of identifying the sources and assessing the accuracy of the data on the three types of migration flows. This ties in with all three main objectives, in that our knowledge of past patterns and trends of migration and their determinants can be only as comprehensive and accurate as the available data sources permit. These considerations will also affect decisions made about the terms to be included in migration forecasting models and assessments of the reliability of parameters calculated on the basis of past evidence.

1.3 Outline of the report

The remainder of this report is arranged into four main sections relating to the principal objectives. Because of its fundamental importance both in terms of our present knowledge and understanding of migration in England and in relation to designing and calibrating migration models, data availability forms the subject of the first substantive part of the report. Thus Chapter 2 documents the main sources of data on migration flows to, from and within England. For each source, a description is given of : the period of the data; its spatial coverage and level of geographical detail; and the nature of the migrations recorded and the characteristics of the migrants involved. Also for each one, an assessment is given of the reliability of the data in terms of comprehensiveness of

coverage and quality of the data collected. In addition, Chapter 2 reviews the past and current usage made of these sources for monitoring migration and for making official population and household forecasts.

Chapter 3 reviews current knowledge of migration flows affecting the geographical distribution of population in England and the way in which these have altered over time in volume, pattern and composition. It begins with an estimate of the overall amount of migration taking place in England and an assessment of its importance as a component of population and household change at national and subnational levels. It then examines the evidence on gross flows as well as net migration balances, explores what is known about the migrants' characteristics and highlights distinctive features of migration in respect of origin and destination areas. This is carried out separately for each of the three types of migration flows specified in the study's terms of reference, with most attention being devoted to within-England migration because of its sheer numerical dominance. The concluding discussion includes the question of the extent to which the separate migration flows relate to each other, leading to comments about the lack of research on the way in which international and internal migration may interact, but the main discussion of the factors affecting migration flows can be found in the following chapter. Also left for later in the report is the assessment of future trends in migration flows, apart from brief mentions of the trends anticipated in the official projections.

Chapter 4 reviews the extensive literature on the determinants of migration, concentrating on the results of analyses of migration affecting England but also drawing, where appropriate, on insights into migration processes provided by research on other countries. The determinants are categorised into six broad headings: demographic, cultural and social, labour market, housing, environmental and policy-related. The aspects covered under the first two headings largely comprise the characteristics of individual persons and households, with the review particularly demonstrating how these relate to the likelihood of change of address in a given time period but also noting where such changes give rise to distinctive geographical patterns of movement. The remaining headings refer mainly to the attributes and contexts of the places that form the origins and destinations of moves, showing how variations in these between places and over time help to fashion the volume and nature of migration flows. Within the chapter and in the selected reviews in the Appendix, attention is drawn to studies that have attempted to identify the separate contribution which each of these sets of determinants makes to migration patterns.

Chapter 5 provides a review and assessment of the main types of approach available for the formal modelling of migration flows affecting the distribution of population and households in England. Primary attention is focused on the applicability of four types of migration models: aggregate cross-sectional models, disaggregate cross-sectional models, aggregate time-series models and disaggregate time-series models. For each modelling approach, its main features are described, then its strengths and weaknesses are documented and an assessment is provided of its applicability, taking into account the limitations of the available data sources identified in Chapter 2. Particular examples of model applications are profiled in the reviews in the Appendix. The chapter also elaborates on the main issues affecting the applicability of the models to forecasting housing requirements.

The main discussion on the value of alternative methods of forecasting migration trends at regional and sub-regional levels is, however, left to the concluding chapter. Chapter 6 begins by outlining three alternative approaches to the handling of migration in a forecasting context and reiterates the key considerations which should be taken into account in selecting the most appropriate method(s). The main part of the discussion is structured around the three different types of migration flows, though it is stressed that there is a good case to be made for integrating the treatment of within-England migration and flows between England and the rest of the UK and though it is recognised that links may exist between international and internal migration. It is very evident from this review, however, that there is a huge gulf between international and internal migration in terms of the degree to which they are amenable to formal modelling, with the former suffering not just in terms of the accuracy and detail of past monitoring but also because of its proneness to essentially 'unpredictable' events. Given that international migration has recently emerged as the most important component of population change at regional level, this finding casts something of a shadow over the ultimate conclusions of the study. The summary of findings is more positive in relation to modelling internal migration and thus to producing forecasts for the spatially more disaggregate levels at which internal migration is relatively more important. The report concludes with a set of recommendations for achieving a better knowledge and understanding of all types of migration and their determinants.

CHAPTER 2: MIGRATION DATA SOURCES

2.1 Introduction

Ultimately this review is concerned with the possibilities for anticipating population movements that will influence future trends in the scale and geographical distribution of the need and demand for housing, particularly social housing. These possibilities are constrained by the availability and reliability of data on past trends in migration and by the validity of the conclusions drawn from these partial records about the factors determining the volume, nature and durability of these migration flows. A full appreciation of the significance of migration and a clear understanding of the processes involved depend on access to a range of reliable information about each migration, including the personal characteristics and circumstances of the migrant, the way in which these features change with the move, and the relevant attributes of the places of origin and destination at the time.

Previous reviews, notably Bulusu (1991), plus our own experience of studying migration in England and elsewhere, make us only too aware of the extent to which the data available can fall short of the ideal. Most countries, except perhaps a few with effective powers of enforcing registration of people's movements, have difficulty in tracking residential mobility on a comprehensive basis. Moreover, generally, basic demographic details tend to be recorded better than people's economic, social and housing circumstances. Even where the latter are collected, they relate mainly to the situation after the move and rarely indicate the position immediately prior to the move, despite the fact that it is the latter, together with the hope of improved circumstances, that often triggers the move. Similarly, it is often difficult to obtain information on the wider conditions prevailing at origin and destination at the time of the move, particularly where one of these lies outside the country under study. England is, unfortunately, no exception to these generalisations.

The following account examines the several different data sources which have been most commonly used in England for monitoring migration over the past 20-30 years and for projecting trends into the future. It examines data sources relating to all scales of population movement from international migration down to residential mobility within local areas, so as to provide information on both the context and the varied content of this component of subnational population change and to examine the opportunities and constraints relating to the modelling of inter-area migration flows.

The brief for this study requests a distinction to be drawn between three sets of migration flows: within England, between England and the rest of the UK, and between England and the rest of the world. Data availability, however, means that the second and third sets are normally subdivided for the purposes of migration monitoring and projection. Exchanges with Northern Ireland need to be treated somewhat differently from those with Wales and Scotland, while exchanges with the Irish Republic are not covered by the same monitoring system as those with countries beyond the British Isles. In practice, therefore, a five-fold distinction needs to be drawn in examining the migration exchanges affecting the individual sub-national areas (SNAs) in England:

a) with other parts of England;
b) with the rest of Great Britain;
c) with Northern Ireland;
d) with the Republic of Ireland; and
e) with other countries beyond the British Isles.

The main part of the review below is organised by data source. Greater detail is given for the four sources most commonly used in official monitoring and population projections: Population Censuses and datasets derived from these (used mainly for flow types (a) and (b) above, but also covering inflows for the other three types), the National Health Service Central Register (used for (a), (b) and (c) above), the International Passenger Survey (used for (e) above) and the Labour Force Survey (used for (d) above). Reference is also made to other more partial or emerging sources, drawing principally on the OPCS's 1991 review of migration data sources (Bulusu 1991) and commenting on subsequent developments. Each source is evaluated in terms of its temporal and spatial coverage and detail, its estimated accuracy in counting migrants and its range of information about migrants and about differences between their characteristics and those of non-migrants. Finally, the chapter examines the way in which the various sources are currently used by the official bodies in updating local population estimates and producing the subnational projections that form the basis of the household projections, commenting on the level of confidence which can be put in the migration component of these figures.

2.2 The sources of migration data

2.2.1 Census of Population

Censuses constitute the longest-established form of population counting, traditionally devised to assess military strength and tax-raising possibilities but nowadays concerned more with providing intelligence for service provision and policy decisions. There are several ways in which censuses can be used to produce information on migration. Successive censuses allow estimates to be made of net migration by deducting the net effect of births and deaths (where adequately recorded) from the overall population change indicated by two enumerations. 'Life-time migration' can be gauged be comparing location of a person at a census with information on birthplace, though inevitably this ignores intervening moves and information on birthplace may be limited to country of birth. Inter-censal movements can be identified where access is provided to individual records, as is possible after the elapse of 100 years in Britain, or where the anonymised results of record linkage can be accessed, as is possible for 1971-91 in relation to ONS Longitudinal Study members. Finally, individual censuses can provide direct information on migration through questions specifically being asked about a change in usual address over a given period before the census – in the case of Great Britain, with a question on usual address one year ago being asked at each Census from 1961 (and an additional question on address five years ago being asked in the 1966 and 1971 Censuses only). The following account concentrates on the one-year 'change of address' question, as this is by far the most commonly used Census-based measure of migration in Britain, and it will use the example of the 1991 Census, except where otherwise indicated.

The 'change of address' question

The 'change of address' question of the 1991 Census asks for details of a person's usual address exactly one year prior to the Census if it is different from the one which has been given for the time of the Census. The Census identifies as a 'migrant' any resident of Great Britain on Census night who indicates a different address a year earlier, irrespective of the distance of move. This information has been processed for all persons (cf. the 10% sample processed to provide journey-to-work information). Counts of migrants are provided by place of residence at the Census in the standard Census tabulations for England (Small Area Statistics for each enumeration district, Local Base Statistics for each Census ward, County Reports for local authority district and county levels, and National Report).

These standard tables provide a wealth of information on the characteristics of migrants as of Census night, together with a classification of moves by type of 'origin' – whether the move took place within a Census ward, within a local authority district, within a county, within a region and within Great Britain, and also whether the move was between neighbouring districts and between neighbouring counties. Most of the tables provide information on individuals, either all migrants or migrant heads of households (irrespective of whether other members of these households were migrants), but one table provides information about 'wholly moving households' (defined as a household in which all its Census-night members had moved from an identical address, even though not all those at the previous address may have accompanied them).

The census output most valued for the spatial analysis of migration is the Special Migration Statistics (SMS), the central feature of which is the crosstabulation of migrants by place of origin (i.e. usual address one year ago) as well as by place of usual residence on Census night. These machine-readable statistics comprise two datasets: Set 1 which for each Census ward provides information on the place of residence of migrants one year ago (Census ward within England and Wales, postcode sector within Scotland, and country or country group elsewhere) and Set 2 which for each local authority district gives the origin of migrants by district of Great Britain and country or country group for elsewhere. The SMS datasets therefore have the two supreme advantages of allowing the construction of origin and destination matrices of within-England ward-to-ward and district-to-district flows and of enabling the calculation of net migration balances resulting from these. They also allow the monitoring of gross and net migration exchanges with other parts of Great Britain and inflows from outside Great Britain.

The other important advantage of the SMS datasets is the information which they provide on the characteristics of migrants. Set 1 gives counts of individuals by sex and five broad age groups and counts of wholly moving households and the number of residents in them. Set 2 comprises (for England) ten tables giving breakdowns of individuals by sex, age, marital status, ethnic group, limiting long term illness and economic position and breakdowns of wholly moving households by tenure and by sex and economic position of household head. The information is, however, somewhat limited in that it does not include the full range of Census variables and also in that it does not employ such a detailed breakdown of variables as used in the standard tables. The information is also incomplete, in that the Set 2 data on all variables besides sex and age is subject to suppression in the many cases where migration flows between districts fall below a certain threshold: 10 migrants and more than one household for the tables on individual

migrants and at least ten households for the tables on wholly moving households. Fortunately, this suppression, designed to ensure confidentiality, does not apply to the 'marginals', i.e. the total numbers of those arriving in and departing from each district, so the breakdown of migration turnover and net migration can be calculated for each district. Furthermore, this latter information, together with the basic counts of inter-district flows by sex and age and the unsuppressed data, has been used by academics to generate an alternative unsuppressed version of the Set 2 SMS through a process of calculation and estimation (Rees and Duke-Williams 1995b).

As well as the standard area tables and the SMS, there are five other ways in which the 1991 Census 'change of address' data can be accessed. One is the printed Census topic volume on National Migration, which provides fuller analyses of migrants than the standard tables but for cruder geographical breakdowns. The Regional Migration Tables, available only in machine-readable form, do the same job but for a level of geographical breakdown intermediate between the National volume and the other output described so far. A further two forms of output allow users to produce their own tabulations by interrogating datasets derived from the Census. The Samples of Anonymised Records (SARs) include 'change of address' information but contain only a very crude geography: for the 2% Individual Sample, region of origin and SAR District of destination, and for the 1% Household Sample, region of both origin and destination. Similarly, the ONS Longitudinal Study (LS), an approximately 1% sample of the population of England and Wales drawn from the 1971, 1981 and 1991 Censuses by selected birth date, can be used to study one-year migration with customised tabulations, using potentially a more detailed geography but one that is subject to vetting to ensure confidentiality, but has the additional advantage of allowing the study of inter-censal moves because of the linkage of Census records for individuals. Finally, ONS offers customers the option of purchasing tables designed to their own specifications, subject to satisfying the confidentiality criteria.

Evaluation

Clearly, in one form or another, the 1991 Census yields a great deal of information about changes of usual address taking place in the year leading up to Census night. On the other hand, the information suffers from a number of general weaknesses over and above the limitations imposed by the format and rules pertaining to the individual output tables described above. Among these are three **definitional** issues:

- the Census contains no information on the characteristics and circumstances of migrants before their move (except for 'fixed' attributes such as sex, age or ethnicity), so it is not possible to measure confidently the effect on places of out-migration for those characteristics that can change in unpredictable ways over time, notably those often underlying the reason for the move, such as labour-market position and housing tenure, and thus it is not possible to gauge accurately the net-migration impact in these respects.

- the Census 'change of address' question cannot identify certain types of migrations, being unable to include people who died before Census night after changing their address, babies born during the year before the Census, people who have left Great Britain, people who moved away and back to their original address within the year and multiple changes of address by individuals during the year.

- the Census does not aim to record the movement of students from parental to termtime address because it enumerates students at the former, where relevant.

Beyond these 'definitional' considerations, there are significant problems of Census coverage and data quality which affect the accuracy of the picture which this source provides on migration. In relation to **coverage**, there are two somewhat separate issues affecting the 1991 Census:

- *underenumeration*: it is officially estimated that the 1991 Census's count of the population of Great Britain of 54,890,000 was 1,209,000, or 2.2 per cent, short of the most likely true figure. The equivalent figures for England are 47,055,000 and 1,061,000, also an undercount of 2.2 per cent. This undercount poses a particularly serious problem for migration analysis because it is estimated that the majority of the 'missing million' fell into the most migratory age groups (20-29 year olds) and were geographically biased towards London and other large cities.

- *imputation*: the Census 'count' itself includes 869,000 people (774,000 in England alone) who had to have their numbers and basic characteristics estimated because of the absence of Census returns from dwellings that were deemed to be occupied. The problem for migration analysis in this case is that, while their estimated Census records may be fairly reliable in indicating whether or not members of this 'imputed population' had changed address over the pre-Census year, the same cannot be said of the details of ward and district of the previous address. The spatial impact of this problem is, as with underenumeration, loaded most heavily on the larger cities because this is where the highest proportions of residents had to be imputed.

It is, virtually by definition, impossible to gauge with any degree of confidence the overall **quality** of the migration data in the 1991 Census, for while other migration data sources – notably the NHSCR – provide an opportunity for checking the Census-based migration data, they too suffer from a range of deficiencies (see below, especially 2.2.2). The only direct measure of quality is derived from the Census Validation Survey (CVS), a survey carried out after the Census which involved checking a sample of self-completed Census returns against the actual situation in the relevant households as established by interview. The CVS provides estimates of the accuracy of information provided by the approximately 94 per cent of the population who were enumerated on private-household Census returns, i.e. omitting people in communal establishments as well as the imputed population and the 'missing million'.

According to the CVS, the number of people changing address over the pre-Census year was subject to a net undercount of 9.8 per cent across Britain as a whole (ONS 1996, p.14). This means that, whereas the Census recorded 5.35 million migrant residents in Great Britain (or 9.7 % of the total population), the actual figure for those recorded in the Census should have been around 5.87 million (or 10.7 % of the population). This assumes that the imputed population had the same average migration propensity as the people who were recorded on Census forms. Beyond this, it is necessary to add in the number of migrants among the 'missing million'. If these had the same propensity for changing address as the rest of the population, allowing for their age/sex composition, this would produce an extra 194,000 migrants, though there must be a suspicion that their untraceability could be associated with higher than average residential mobility.

Adding these elements together gives an estimated 6,086,896 migrant residents for Great Britain, some 13.8 per cent more than the actual Census count including the imputed migrants; conversely, the Census figure is 12.1 per cent below our estimated level. This could be considered a conservative estimate, given that these calculations assume the same change-of-address propensities for the roughly 4 per cent of the population that was imputed or 'missing' as for those who were enumerated.

Finally, not all people who indicated that they had changed address over the pre-Census year gave sufficient information for the location of their previous address to be identified with confidence. Altogether, including the imputed migrants (see above), 325,630 migrant residents of Great Britain, or 6.1 per cent of all those counted as migrants, are listed as 'origin not stated'. In the 'type of move' classification used in the standard Census output tables, these have all been treated as moving within their ward of residence on Census night, but in the Special Migration Statistics they are kept separate from people changing address between specified wards and districts within Britain. As mentioned above, this is the dataset which is used for the majority of Census-based studies of migration flows and calculations of net internal migration. Obviously, however, it needs to be used with caution, in that the matrices of flows between identified places in Britain omit getting on for one in five migrants (on the basis of the Census definition of 'migrant') – the roughly 12 per cent undercount plus the 6 per cent of 'origin not stated' cases.

The Population Census clearly provides a huge amount of information on migrants, but equally clearly this information suffers from various problems of coverage and accuracy. It is therefore unfortunate that not more is known about the quality of the migration statistics and, in particular, about the geographical implications of under- and mis-recording for the study of migration flows between places and their net effects on population. This is not the only source of migration data, but the other sources suffer from similar problems of coverage and accuracy and are also more limited in certain other respects.

2.2.2 National Health Service Central Register (NHSCR)

The NHSCR is the main source available for the continuous monitoring of migration within the UK and has been used for this purpose since the 1970s. It is based on the registration of patients with doctors, with migration data deriving from the act of people switching from a doctor in one Family Health Service Authority (FHSA, formerly known as Family Practitioner Committee) area to a doctor in another. This information is collected centrally by the NHS in order to allocate funds between FHSAs, but is continuously interrogated in collaboration with the Office for National Statistics to produce quarterly statistics on population movement between FHSAs. For England, the latter currently comprise a total of 90 areas, made up of 16 groups of London boroughs, the 36 separate metropolitan districts and 38 'shire' counties (as defined 1974-96).

In more detail, the first trials of this source for migration monitoring date from the 1970s (see Ogilvy 1980). Initially, it was used to track inter-regional migration starting from the 1971 Census and the population estimates based on that Census. The results were sufficiently encouraging to prompt the release of data on flows between FPC/FHSA areas from 1975 onwards. The information drew on a 10 per cent sample of registrations up to 1983, but subsequently has been based on the complete dataset.

Traditionally, the migration data derived from the NHSCR has assumed a three-month time-lag between patient registration and the event being recorded centrally, but since the system became fully computerised in 1990, the notional time-lag has been taken as one month. The data relates to the sex and age of migrants. Only summary data are regularly published by ONS, but fuller details can be purchased from ONS or accessed under licence from the National Online Manpower Intelligence Service (NOMIS) based at Durham University.

Evaluation

Compared with the Census, the NHSCR has both advantages and drawbacks for migration analysis. On the **plus** side:

- It provides a continuous record rather than a one-year-per-decade snapshot and is particularly important in showing that the migration data from the two latest Censuses relate to periods of abnormally low residential mobility in 1980/81 and 1990/91.

- Its continuous nature means that it records all changes of doctor, thus enabling it to cope with multiple moves within a single year and to include the movement of those aged less than one year old.

- It is also, in theory, very comprehensive in coverage since people are allocated an NHS record at birth (or have inherited the number given to them in the National Registration of 1939) and since most people, even those in private health schemes, maintain their NHS registration as an 'insurance'.

Amongst the NHSCR's **drawbacks** compared to the Census is its lack of detail in terms of both geography and characteristics of migrants:

- Up to now, the only geographical information available from this source is the identity of the new and previous FHSA areas, which is a particular limitation in relation to the county-level areas in the shires.

- Secondly, the sex and age breakdown – while valuable for demographic analysis – falls a long way short of the range of characteristics provided in the Census output for migrants. A particular weakness in terms of housing needs analysis is the complete absence of information on households.

For basic migration monitoring, however, the chief drawback of the NHSCR-based data concerns weaknesses in its *coverage* of actual moves:

- The NHSCR excludes movements by certain groups such as prisoners and Armed Forces personnel and will not identify people as migrants until they have registered once and then re-registered with a doctor in a different FHSA area.

- Some people, notably younger adult males, may not register with a new doctor until they need to, which may be months or even years after a move or indeed may not happen at all before the next move – an aspect which is currently being

studied by ONS. While this may not be deemed a serious problem in the preparation of population estimates (on the assumption that people will re-register eventually and that these lags remain constant over time), it is likely to lead to the understatement of the total number of migrations made and to the overstatement of the age at which a move took place.

- There is likely to be spatial variation in the recording of moves, in that people who move home over short distances are more likely to remain with the same doctor than people moving over longer distances. Even though the NHSCR-based migration data refers only to movement between FHSA areas, it is likely that in the past this data will have omitted a certain number of people moving a short distance across an FHSA boundary, particularly given that according to the Census almost one half of all changes of address within Britain involve moves of under 5km (3 miles). In recent years, however, this problem has been tackled by FHSAs and Health Authorities cleaning up their lists and with GPs being encouraged to ensure that their patients come from within the correct area.

It is by no means easy to measure the coverage and accuracy of the NHSCR as a migration data source. Separate studies have been undertaken to compare the NHSCR-based migrations with those recorded by the Census change-of-address question for the pre-Census years of 1980/81 and 1990/91 (Devis and Mills 1986, Boden *et al.* 1992, Stillwell *et al.* 1996), but such comparisons are hampered not only by uncertainties about the accuracy of the Census data (see above) but also by operational and definitional problems:

- The year 1990 saw the completion of the computerisation of the NHSCR and led to some disruption in the arrival of change-of-doctor records, making comparisons with the Census data for 1990/91 somewhat problematic.

- Amongst the definitional differences are the NHSCR's ability to track all flows as opposed to a one-year change of address and its inclusion of students moving to places of higher education rather than being deemed to be living at the parental address, as in the case of the Census.

- Both sources face problems of under-recording, particularly of younger adult males. In the attempts to estimate the 1991 population following the 'missing million' problem of the 1991 Census, it was concluded that the 'rolled forward' estimates based on the 1981 Census and demographic records over the succeeding decade (including the NHSCR) provide a more accurate picture of the real situation in 1991 than the Census itself. As mentioned above, however, this conclusion refers to net changes in population rather than gross migration flows.

Finally, while the primary migration-related use of patients' NHS records up till now has been to track moves between FHSAs, the registers held for each FHSA by the NHS Executive also have the potential for monitoring both within-FHSA changes of address and international migration. The ONS is currently investigating whether, now that the postcodes of individual patients are being included on a central computer, the NHS records could be used to monitor movements within FHSA areas. This would not only help to overcome the problem of the underrecording of short-distance moves across FHSA boundaries, but would also provide data on migration between individual London

boroughs and 'shire' county districts (helping towards more accurate district-level population estimates) and yield a complete picture of changes of address more comparable with the Census.

As regards international movement, the NHSCR can already monitor immigration based on the act of initial registration of people aged over around 6 weeks (all younger ones are assumed to be UK-born babies), though it is important to distinguish international arrivals from those whose previous NHSCR records cannot be traced. Migration out of the UK is, however, not so accurately monitored, as people may leave without notifying their doctor, whether or not they intend to return at some future date.

2.2.3 International Passenger Survey (IPS)

The IPS is a major source of data on migration to and from the UK. Like the NHSCR and most other migration data sources, its primary purpose is not for migration monitoring, but in this case is to collect data for the travel account of the balance of payments. Beginning full operation in 1964, the IPS is based on interviews with a stratified random sample of passengers entering and leaving the UK by the principal air and sea routes, with (since 1979) more intensive sampling of people given permission to settle on arrival. On the basis of these interviews, grossed-up estimates are made of numbers of immigrants and emigrants by country of origin and destination respectively. Following UN recommendations, the migration data relates to people who are leaving after spending at least 12 months as residents of the UK and to arrivals who are intending to stay for at least 12 months. This source also provides information on migrants' sex, age, marital status, citizenship, country of birth, town of residence, reason for visit and occupation.

The IPS, as a means for monitoring international migration, has three major **shortcomings**:

- No information is collected on migrants in or out of the Irish Republic and the Isle of Man – a problem which also affects counts of longer-distance migrants entering or leaving the UK via the Irish Republic, notably Americans. Also, while movements to and from the Channel Islands are covered by the IPS, these are excluded from the main tables because of the way in which the UK is defined for these purposes.

- As the IPS is a voluntary survey, the raw data will be biased by any non-random non-response, though great efforts are made by IPS staff to overcome language barriers and in some cases missing data is imputed from known variables.

- The sampling fraction is very low, which means that the grossed-up migration figures are based on a very small number of migrants. Even in 1988, when the number of passengers involved was about 90 million people, the number of migrants among the 180,000-odd people interviewed was only 2,269. This problem has become greater over the past ten years because of rapid annual increases in passenger traffic and because of less effective separation of potential migrants in entry processing, prompting ONS to contribute in recent years to the costs of extra IPS staff in an attempt to reduce standard errors.

Reliability

It is extraordinarily difficult to assess the degree of accuracy of the IPS data because of the absence of reliable comparators. The most obvious approach is to compare the IPS data on exchanges with other countries with the independent records of those other countries, as carried out for flows in 1990 between EU member states by Poulain (1996). Taking the example of Belgium, the IPS suggested immigration of 2564 from there in that year, whereas Belgium's figures counted 5016 leaving for the UK, while the two sources respectively gave 1774 and 5761 as the number moving from the UK to Belgium. Differences of this magnitude were found to be not uncommon between country pairs across the whole EU dataset and are likely to say as much about the confidence that can be placed in other countries' monitoring systems as about the accuracy of the IPS.

A second approach is to compare the IPS data on immigration from other countries with the numbers revealed by other UK sources of data on migrants. In particular, as already mentioned, the Census provides data on residents who were living outside the British Isles twelve months earlier which can be compared with ONS estimates for 1990 based on the IPS and other sources: 308,000 and 317,000 respectively. This is a remarkably close fit, given that the IPS excludes Armed Forces personnel, the Census does not employ the 12-month rule and the two periods are not completely coincident. According to calculations for the 12 months leading up to the 1991 Census made by the DETR, there was also a close correspondence between the regional distribution of immigrants estimated from the IPS and that indicated by the Census.

Figures obtained from the IPS are subject to both sampling and non-sampling errors. As regards the latter, it is not possible to describe their scale and effects in detail since little official evaluation has been done (OPCS 1985, p. xi, ONS 1997). One source of potential bias occurs when passengers approached in the IPS cannot or will not be interviewed. Another may arise from contacts deliberately concealing their migration intentions from the interviewers. A further source may arise from flights taking place outside IPS shift times at the main airports, as these are not sampled and may contain a different proportion of migrants and different patterns of origin and destination countries from those on sampled flights (OPCS 1985, pp. xi-xii).

In practice, the main method of assessing reliability is through sampling theory. According to ONS (1997), the standard error for immigrants in 1995 – based on 1393 interviews – was 4.8 per cent, i.e. some 11,700 in relation to the grossed-up estimate of 245,500 arrivals, while that for emigrants – based on 752 interviews – was 4.8 per cent, or 9,300 in relation to the estimated total of 191,600 departures. In combination, these errors produce a large range around the net immigration figure, amounting to an overall standard error of close to 15,000 irrespective of the level of net migration in any year. For a 95 per cent confidence interval, this gives a range of +/- 30,000. While this is obviously small in relation to the UK population of 57 million, it is sizeable in relation to the estimated IPS-based net immigration figure for that year of +53,900.

These accuracy worries loom even larger for more detailed aspects of the data than the total number of flows:

- The data on the characteristics of migrants will be less robust than the overall

totals, with especially large effects on the net estimates where the composition of immigrants to the UK is substantially different from that of emigrants.

- Particularly important in identifying the geographical impacts of migration is the larger size of the standard errors for the areas within the UK in which immigrants settle and from which emigrants depart. Even at regional level the standard errors are quite large – over 20 per cent for most regions – but will be much larger again for county and district levels, given that with the small sample the estimate of migrants grossed up from a single interview can vary from about 50 to 2,000 (Bulusu 1991).

- Deficiencies may exist in the detail and accuracy of the information provided in the interviews, particularly that given by immigrants, many of whom have, at most, only an address for initial contact and no clear idea of their ultimate destination.

The significance of the accuracy of the IPS data, however, may perhaps not seem so great in the late 1990s as previously, at least in one sense. Since the mid 1980s there has been a huge increase in the number of asylum seekers, who are not defined as immigrants at the point of entry, and of 'visitor switchers', people who enter as short-term visitors and then apply to remain in the UK. Taken together with the estimated net migration with the Irish Republic, these extra groups produced net inward migration of around 34,000 people a year in 1986-89 and some 46,000 people a year in 1990-93. These figures are substantially larger than the net migration estimates from the IPS, the latter averaging 15,500 and 13,900 a year for the two periods and thus constituting only 31 and 24 per cent of estimated total net immigration respectively. Considerable confidence can be placed in the data collected on asylum seekers and visitor switchers, which includes information on age and sex, but these figures also contain an element of estimation for the poorly known numbers of people remaining in the UK illegally.

2.2.4 Labour Force Survey

The Labour Force Survey (LFS) is carried out by the Office for National Statistics for the Department for Education and Employment in parallel with similar surveys carried out in other European countries as required by EU regulations. Its main purpose is to provide national information on employment and unemployment and on the size and composition of the labour force. It includes a question on usual address a year ago and also one on labour market position a year ago, the latter being extremely valuable in analysing the causes and effects of migration. Principally due to its small sample size, it is judged to be less satisfactory at monitoring migration within Great Britain than the Census and NHSCR, while it is less satisfactory at recording overseas migration than the IPS because, by itself, it cannot readily trace departures.

On the other hand, it is the only regular source of data on in-migration from the Irish Republic and, when used in conjunction with the Irish LFS, can be used to estimate the volume and composition of migration exchanges between the two countries and the net population redistribution resulting from these. In addition, however, it has been used by academics to examine aspects of migration and population change within the UK; for instance, changes in migration rates between Censuses by characteristics not recorded

in the NHSCR (Owen and Green 1992) and the changing distribution of ethnic groups before the ethnic question was included in the Census in 1991 (Haskey 1991, Robinson 1993).

The first UK LFS was carried out in 1973 and since then has altered in several ways. From 1973 to 1983 it was undertaken biennially and from 1984 onwards it became an annual survey. For the period 1984 to 1991 the survey consisted of two elements: a quarterly survey of 15,000 private households in Great Britain conducted throughout the year, plus a 'boost' survey carried out in the March to May spring quarter which took the total sample for that quarter to over 60,000 households in the UK. A number of changes were made in 1992, the most important being the expansion of the sample size to around 60,000 households every quarter and the introduction of an element of sample overlap between the quarters, with each household being interviewed for five successive quarters and one-fifth of the sample (around 12,000 households) being replaced each quarter. At the same time, the sampling frame was widened to include students living away from home in halls of residence and NHS nurses' homes, greatly improving the coverage of young people in the survey. In addition, the sample became an 'unclustered' sample of addresses selected from a comprehensive Address File of private households, instead of being focused on a number of compact geographical areas.

The LFS in the Irish Republic, used by ONS to provide information on migration to there from the UK, is operated along similar lines. Surveys were held there biennially from 1975 to 1981 and have been made annually since 1983. The sample covers about 5 per cent of households. It is a rich source of information on migration stocks and flows, with every survey asking questions on nationality and country of residence one year before the survey, along with date and month of arrival in Ireland. Country of birth was first asked in the 1992 survey as was the year of taking up residence for people born outside Ireland. In addition, since 1985, Ireland's LFS has asked a question on emigration, currently phrased in terms of whether any person previously resident in the household is now living abroad. Checks, however, indicate that this understates the volume by around 25 per cent because of not being able to capture whole households that have left.

As a source of migration data, the LFS clearly has an important role to play in monitoring migration between the UK and Ireland, but both for this purpose and more generally, at the same time, it suffers from a number of **weaknesses**:

- The 'address one year ago' question does not provide data on international migration on the basis recommended by the UN, because none of the respondents who were living in Ireland a year before the UK survey will have been in the UK for a full twelve months and many of these may not intend to stay that long.

- It has limited value for examining migration at detailed spatial scales. Though the move to an unclustered sampling frame now makes possible the provision of subregional data, the small sample size makes for a rather high standard error, this being particularly large when dealing with such a small element of the population as annual arrivals from Ireland.

- It is impossible from either the UK or the Irish LFS to establish the place of origin of those leaving for Ireland.

- Migrants are more likely to be undercounted by the LFS than non-migrants, partly because the survey does not cover the full range of communal establishments and partly because non-response is likely to be higher for migrants than non-migrants. This undercount is likely to be greater for single migrants than for married people.

2.2.5 Other sources of migration data

There exists a variety of other sources of data on the population of England which provide some information on migration. In terms of monitoring migration flows that affect subnational population distribution, none is as comprehensive as the Census and NHSCR, nor does any plug a particular gap in the way that the IPS and LFS do. On the other hand, some of these other sources can be used to provide valuable insights into the micro-level processes of migration, including the nature of links between a migration and changes in people's household, labour market and other circumstances and the considerations which people take into account in their decision to move. These insights can be used to inform the modelling of migration, though in this context care is needed in applying results drawn from partial datasets and detailed case studies to a comprehensive modelling exercise.

One group of sources comprises **registers** of various kinds. These include electoral registers, local tax registers (currently the Council Tax which replaced the short-lived Community Charge or 'poll tax' at the beginning of the decade), the Inland Revenue, the Departmental Central Index of the DSS, telephone directories, TV licence records, driver licensing, bank and credit cards, and the utilities like water, gas and electricity suppliers.

The situation in relation to these has changed very little since the review by Bulusu (1991). In brief, the change in number of eligible voters indicated by the Electoral Register is currently used to gauge district-level net migration in the process of preparing the official mid-year population estimates, but the Register suffers from lack of coverage of people aged under 17, unevenness in the culling of lists, and problems in tracing the movements of individuals.

All the other sources listed are less comprehensive than the NHSCR and many are especially biased towards the better-off and/or the less migratory. Bulusu (1991) concluded that the DSS's Departmental Central Index offered the greatest potential for future development, but to date his recommendation has not been followed up. In recent years there has also been some discussion, so far inconclusive, about the possibility of introducing identity cards and about the practicality and ethics of compiling centralised records on individuals by drawing together their computerised records from a range of sources.

Other large-scale annual **surveys** besides the LFS contain information on change of address and have been used to obtain additional insights into migration behaviour in England, most notably the General Household Survey (GHS) and the Survey of English Housing (SEH). The GHS asks about frequency of move and the SEH about length of residence at current address and the main reason for moving from the previous one – all topics which are not covered in most other nationwide surveys – while both provide information on a wide range of movers' characteristics such as age, marital status,

household type, economic status and housing tenure. On the debit side, the sample sizes are considerably smaller than for the LFS, with the SEH interviewing 20,000 households and the GHS only around half this number – too small to yield reliable statistics on movement between standard regions or arrivals from outside England, given that in an average year these two processes affect only a very small proportion of England's residents, 1.3 and 0.7 per cent respectively.

Finally, **cohort and panel studies** have the potential to provide a great deal of useful information on migration and its correlates through their monitoring of individuals longitudinally over time, in some cases from birth. For instance, successive waves of the National Child Development Study, based on a birth cohort from 1958, have allowed the analysis of the household formation and migration behaviour of young adults, using data from the 1974, 1981 and 1991 waves including retrospective questions on the intervening periods (Ermisch *et al.* 1995). The British Household Panel Study (BHPS), launched in 1990, involves an annual survey of a nationally representative sample of households and can therefore monitor the experience of different sub-groups as economic and other circumstances change, as well as build up a longitudinal picture of individuals' life courses.

The great advantage of these types of sources is that people's residential behaviour and migration decisions can be related at micro level to other aspects of their lives including education, employment and housing. Because of small sample size – only around 5,500 households for the BHPS, for example – these sources, like the other sample surveys, cannot be used for comprehensive geographical studies of migration, but the insights gained from their analysis could potentially provide inputs into more aggregate models of population movements.

2.2.6 Summary appraisal of migration data sources

By way of a conclusion to this review, Table 2.1 attempts to summarise the main features of the four main sources of data on migation flows affecting England's population size and distribution. The upper panel lists all the types of migration distinguished earlier and indicates simply whether or not each source provides any relevant data. Thus, of the four, only the IPS has nothing at all to say about moves both originating and ending up in England. The Census can trace flows to England from all other parts of the world, but not outflows except to Wales and Scotland, while the UK's LFS – when used in conjunction with its Irish counterpart – covers all movements except those leaving the British Isles. Finally, the NHSCR allows the monitoring of all these types of movement through NOMIS, though paper-based publications from this source refer only to movement within the UK.

The lower panel provides a subjective evaluation of the migration data provided by the four sources, adopting essentially qualitative rankings on a scale of poor (1) to excellent (5). The Census scores particularly low on temporal coverage because its change-of-address question provides data for only one year in every ten – very different from the other three which either monitor migration continuously or survey it very frequently. By contrast, the Census provides very fine spatial resolution, with some of the output data being published at Enumeration District and ward levels, whereas data from the IPS is normally published only down to standard region level.

The scoring on migration coverage conflates the types of move included and the quality of coverage to give an overall score relating to the proportion of all the relevant cross-boundary moves, indicating that while the Census and the NHSCR try to capture most types of move and do so fairly reliably (recording at least 80 per cent of all relevant moves), the IPS and LFS both record only a small proportion of moves, being used as the basis for gross-up estimates with relatively high standard errors.

Table 2.1 Evaluation of four migration data sources

	Census	NHSCR	IPS	LFS
Types of flows recorded (Y=yes; N=no)				
Within England	Y	Y	N	Y
In from rest of Great Britain	Y	Y	N	Y
Out to rest of Great Britain	Y	Y	N	Y
In from Northern Ireland	Y	Y	N	Y
Out to Northern Ireland	N	Y	N	Y
In from Irish Republic	Y	Y	N	Y
Out to Irish Republic	N	N*	N	Y
In from rest of the world	Y	Y	Y	Y
Out to rest of the world	N	N*	Y	N
Features (5=excellent;1=poor;'-'=no data)				
Temporal coverage	1	5	5	5
Spatial resolution	5	3	1	2
Migration coverage	4**	4	1	2
Migrant attributes	3	1	2	4
Population coverage	4	-	1	1
Population attributes	4	-	-	3

Note: * Out-migration to Irish Republic and overseas is combined in NOMIS output.
** Assessed in relation to the pre-Census year only.

As regards the attributes of the migrants, the IPS provides a range of information about the characteristics of people as they enter or leave the UK. By contrast, the NHSCR scores poorly because it provides data on only sex and age. Meanwhile, the Census contains data on a considerable number of attributes, primarily for individual migrants and also some for 'wholly moving households'. The Census, however, is notably deficient on their pre-move characteristics – something which the LFS is rather better at, though not as good as the cohort and panel studies.

Finally, because it is often important to know about non-movers and useful to have a basis for calculating migration rates, a summary assessment is also made of the coverage of the total population and its attributes, which can also be aggregated to provide a profile of individual places. The Census provides very full coverage of the population (in 1991, 96 per cent from completed returns and 98 per cent after imputation of missed households) and a good range of details about individuals and their households. The LFS provides the same basic data on non-movers as it does on migrants, with similar problems over sampling error. The NHSCR, though it covers a large proportion of the population, is not normally interrogated for global population data, while the IPS is, by definition, restricted to data on those moving into and out of the UK.

2.3 Use of migration data sources in subnational estimates and projections

2.3.1 Subnational population statistics

Subnational population statistics produced by the official statistical agencies are regularly used by government departments and other organizations for a variety of purposes. Among the most important are the central allocation of resources to local government and health authorities on an essentially per capita basis using the latest mid-year estimates of population and the planning for future level of housebuilding using the population and household projections as the starting point. The annual updating of population estimates, providing data on population by sex and age for the individual local government areas and Heath Authority areas of England and Wales, is undertaken by the Office for National Statistics. The annual series for the local government areas which came into being in 1974 runs from 1961.

Subnational population projections have been produced for England since 1965 by the ONS and its predecessor, the OPCS, providing numbers by age, sex and marital status for London Boroughs, metropolitan districts and shire counties. They draw on the national projections prepared by the Government Actuaries Department (GAD) and on views expressed about the assumptions on internal migration by the Department of the Environment, Transport and the Regions (DETR) and the Department of Health (DH) following consultation with local authorities and health authorities. These population projections are then used by DETR as the basis for its household projections.

The national population projections are currently produced every two years, the latest being the 1996-based (Shaw 1998). Subnational population projections are prepared on a roughly three-yearly cycle, with the latest being developed initially on the basis of 1992 data and then adjusted to fit the 1993 mid-year estimates (OPCS 1995). The 1992-based set of household projections (DOE 1995) replaced the 1989-based version (DOE 1991).

Migration is only one of three components of population change, but seems to be the one which causes most problems in preparing both estimates and projections at subnational scales. Whereas births and deaths are recorded through a compulsory registration system with a high degree of accuracy over the date and location of the event, there is – as we have seen above – no single record kept of all migration events. This is partly due to the absence of an appropriate administrative structure, in contrast to some other EU member states, but it also reflects a definitional ‘greyness’ about migration as an event that is not the case for births and deaths.

The absence of such a structure is a serious limitation in population monitoring, because of the great importance of migration in population change nowadays. Even at the national scale migration is an important component, accounting for around one-half of overall population increase in the mid 1990s. It plays an even greater role at subnational level because of the uneven spatial incidence of overseas migration and because of the substantial amount of population redistribution that occurs through migration within England and exchanges with other parts of the UK. Population projections also need to take into account the volatility of migration over time, both in overall volume and in spatial patterning.

2.3.2 Estimates

The annual population estimates are important not only in their own right but also as a basis for the projections. The **methodology** remains essentially the same as that described in OPCS (1991); namely, that estimates are updated by adjusting the previous year's figures for each area by reference to data on births, deaths and migration, with these 'rolled-forward' estimates being 'rebased' after each Population Census. The data on births and deaths comes directly from the Registrar General's records. International migration is calculated from the results of International Passenger Survey interviews, together with estimates of migration exchanges with the Republic of Ireland derived from the UK and Ireland Labour Force Surveys, estimates of asylum-seekers and visitor-switchers provided by the Home Office and data on the movement of British and foreign Armed Forces personnel provided by the bodies responsible. Apart from movements of Armed Forces personnel and prisoners, the basic data on migration within England and between England and the rest of the UK is derived from the National Health Service Central Register. Since these flows are between FHSA areas (which are at full district level only in the metropolitan counties), those relating to shire counties and Greater London are broken down to district/borough level by reference to changes in numbers of people on the Electoral Registers. A similar process of disaggregation, plus some reaggregation of part-districts, is needed to produce updated estimates for health authority areas.

The need for the **rebasing** of population estimates in a Census year derives primarily from problems with monitoring migration. Equally, in theory, the extent of revisions required in producing the rebased estimates should give a clear indication of the accuracy of migration data used to update the estimates over the previous decade. It should be noted, however, that the production of a new population base in Census year for comparison with the existing series is not a straightforward exercise in itself. Allowance has to be made for the time difference between the Census and mid-year (usually about three months) and also for differences in population definitions (notably the counting of students at their termtime address for the annual estimates as opposed to the 1991 Census's use of parental address, but in 1981 also affected by the omission of absent residents from the standard Census tables). The checking process also needs to bear in mind the accuracy of the Census itself as a benchmark, especially in relation to underenumeration. The Census has traditionally undercounted infants and the very elderly, but in 1991, as mentioned above, there was a considerable undercount of other ages, notably young adults, even after imputing households whom enumerators suspected were missing from Census returns.

Official assessments of the **accuracy** of the rolled-forward estimates have been made for 1981 and 1991, assuming that the rebased estimates for the starting date are correct, and give a clear impression of the magnitude of errors that can arise over a decade in the population base used for projections. According to OPCS (1991), the difference between the rebased estimates for 1981 and the figures rolled forward from 1971 was under 1 per cent for nearly two-fifths of the local government districts in England and Wales (148 out of 403), but it was larger than 2.5 per cent for 116 districts, or nearly 3 in 10. At the very extremes, the rolled-forward estimates gave a 1981 figure that was 12.4 per cent too low for South Buckinghamshire and one that was 11.5 per cent too high for Oxford. From the general run of results, it appeared that the net movement of people from city to suburban and rural areas had been underestimated, and that districts with universities and military bases were given inflated populations.

In a similar exercise undertaken for 1991 (Armitage and Bowman 1995), it was found that the number of areas with differences of under 1 per cent had fallen to under a third (63 out of 403), while those with differences of over 2.5 per cent had risen to 156 or nearly two-fifths. In this case, the estimates most seriously understated the population of a number of more urban areas, including City of London, Kensington and Chelsea, Norwich, Brighton and Haringey (at least 8 per cent too low), and overstated that of some more rural areas as well as places with military bases, with Richmondshire, Rutland, Bracknell Forest, Purbeck and North Kesteven being given at least 8 per cent too many. In 1991 the average absolute error at district/borough level was 2.5 per cent, but the level of error was lower at more aggregate scales – 0.8 per cent for counties and 0.4 per cent for standard regions – reflecting both the smaller range of actual change rates and the compensating effect of errors for neighbouring districts. The scale of error was particularly large for the 85+ and 15-29 age groups, averaging 13.6 and 8.1 per cent respectively across the 403 districts of England and Wales – seen by OPCS (1995) as being caused principally by deficiencies in the estimation methodology at sub-FHSA level rather than arising from Census underenumeration in 1991.

2.3.3 Projections

Population projections are conceptually similar to the population estimates in that, like the latter, they start from a base year for which the situation is 'known' and then roll forward from year to year by adding births, subtracting deaths and adjusting for migration. The key difference, by definition, is that the levels of these three components are not observed but need to be calculated on the basis of assumptions made about their future patterns. In the projections for England, these patterns are derived by extrapolating past trends into the future in an essentially mechanical fashion, but the methodology allows scope for judgement in terms of choice of the length of the calibration period used, selection of the type of curve fitted to the past trend and modification of the trend in the light of changing circumstances including policy decisions already made.

The normal procedures behind the official projections for England involve three separate steps: projecting the national population for England, disaggregating this to produce the subnational populations and, finally, using the latter as the basis for estimating future numbers of households.

(i) National population projections began on an annual basis in 1954, moved to a biennial basis between 1979 and 1991, and started on a revised biennial basis in 1992. A new methodology for determining migration assumptions was adopted in 1991 and, with minor modifications, has been used in 1992-based, 1994-based and the forthcoming 1996-based projections. Details of the methods and assumptions for the 1994-based national population projections can be found in ONS (1996). In brief, the migration assumptions for the 40 years ahead are divided into three time periods: the medium-term (5-15 years ahead), the short-term (a run-in period from the latest recorded levels to the medium-term ones) and the long-term (the remaining 25 years).

The greatest attention is given to the *medium-term projections*. In relation to migration, the most sophisticated element is the development of assumptions about the international flows covered by the IPS. The latter source is used to identify trends in levels of immigration and emigration between the UK and four different groups of countries

(the Old Commonwealth and the USA, the New Commonwealth, the European Union, other countries), considered separately for British and non-British citizens. The resultant 16 time series are projected using exponential smoothing, together with judgements about the significance of outliers and about the likelihood of particular trends continuing indefinitely.

Allowance is then made for the main sources of international migration that the IPS does not cover. In the 1994-based projections (GAD 1996), it was estimated that the average annual exchanges with the Irish Republic would involve an inflow of 10,000 and an outflow of 5,000. It was also assumed that 'visitor switchers' would amount to an annual inflow of 20,000 persons. The projections also made an allowance for the return migration of UK Armed Forces from overseas, together with their dependants.

The next step in the medium-term projections is to split the projected international migration to and from the UK between England and the other three constituent countries. This is based largely on the past proportions as recorded by the IPS, with nearly all the visitor switchers being assumed to settle in England and with the current distribution of home-based Service personnel being used to distribute returning members of UK Armed Forces.

Finally, migration between England and the other three countries of the UK in the medium-term is estimated on the basis of the general run of past data on net inflows to England. Such extrapolations ignore outliers in the series, as in the case of the 1994-based projections where the rates of the mid 1980s were considered more likely indicators of future trends than those of the early 1990s.

As regards the rest of the projection period, the *first five years* are treated as a short-term 'run-in' from the latest year for which data are available to the levels adopted for the medium-term. For instance, as net international immigration to the UK in 1994 was much higher than that projected for 1999-2009, it was decided for the 1994-based projections to adopt a logarithmic (negative exponential) pattern for the intervening five years.

For the *long-term* (16-40 years from the base), the assumption has normally been made that net migration exchanges will reduce to zero, because of the feeling that it is impossible to say what the economic pressures and imbalances will be by then, either between different parts of the world or between the four countries of the UK. In the preparations for the 1996-based projections, however, the decision has been made to continue the medium-term projections through the whole period, reflecting the persistently strong net immigration to the UK of recent years (Shaw 1998).

(ii) The subnational projections break down the national populations projected for England for the first 25 of the 40 years of the national projection period. The latest published projections are the 1993-based version (OPCS 1995). At the time of writing (April 1998) ONS is preparing the 1996-based subnational projections which will form the basis of the next set of household projections.

The 1993-based subnational projection procedures generated annual populations for 108 local authorities to 2019 and for 145 district health authority areas to 2018, with

data being published for selected years up to 2016. Because these two sets of areas do not neatly nest inside each other, the main projections were undertaken for the local authority areas and, where necessary, the results were disaggregated to the smaller areas needed for reaggregation to produce the health areas. In the subnational projections currently under preparation and due for publication in 1998, the projections are being carried out at the level of the individual 'building bricks' that can be aggregated to either set. Because of the introduction of unitary authorities in the local government reorganisation of the mid 1990s, these projections currently require a total of 373 building bricks, though this number may fall if and when health area boundaries are revised in the light of the local government changes and other considerations.

The treatment of migration in the 1993-based subnational projections was very similar to that developed originally for the 1981-based projections, except that for the first time students and Armed Forces personnel and their dependants were treated separately, giving four broad components altogether. The first component is the allocation of migration to and from England between the subnational areas. For civilian international migration, this was apportioned to areas using a five-year (1988-1992) average of IPS data for flows from England to outside the UK and 1991 Census data for flows to England from outside the UK. For the area allocation of flows to and from England and the other three countries of the UK, a three-year (1990-92) average of NHSCR and Census data was used. The 'visitor-switcher' element of international migration was distributed by reference to the Census, its composition being guided by Home Office data on past visitor switchers by origin country group and age. Adjustments were made to cover net movements of Armed Forces personnel and their dependants into England.

Assumptions on internal migration within England – the second component – are the responsibility of a committee on which the DETR and DH as well as ONS are represented, and also take into account the results of consultation with local and health authorities. The initial assumptions are produced using a mathematical model of the implication of projecting forward current migration patterns. The model begins by estimating the number of movers out of each area, by age and sex, principally by reference to the 1991 Census migration results but modified for migration recorded by NHSCR data for 1979-93. The out-movers produced by this stage are then assigned to destinations using a matrix of origin/destination movement patterns constructed from 1991 Census results by sex and three broad age groups. The final stage involves summing the numbers moving into each area to produce total gross in-migration for each area and these figures were disaggregated to single years of age using in-migration age profiles derived from the 1991 Census data 'in most cases' (OPCS 1995, p.12).

The other two components of migration in the subnational projection methodology are students and Armed Forces personnel and their dependants, being treated separately for the first time in the 1993-based projections, as mentioned above. The assumption is made that the number and age structure of both these groups remain constant over the projection period at their mid-1992 level. As this means that individuals from the rest of the population will be moving into and out of these groups, adjustments have to be made to the rest of the population to allow for this in calculating the migration rates of the latter.

The results of these four components are added together to give a preliminary set of migration projections which DETR and DH then distribute to local authorities and the

NHS for comment. The guidance notes stress that the projections are not seen as targets for planning purposes but represent a view of the most likely future on the basis of past trends. Authorities seeking changes to the preliminary migration figures are thus asked to provide details of information sources and methods that they have used to draw up alternative projections. They are also advised that changes proposed for one authority might affect the net migration of another. In the 1993-based projection round, according to OPCS (1995, p.12), 'Many comments were received and as a consequence many changes were made ... before the assumptions were finalised'.

(iii) The 1992-based household projections contain projected household numbers covering the period up to 2016 for England as a whole and for the same 108 local authority areas as for the subnational population projections, namely regions, counties, metropolitan districts and London boroughs. The 1992-based projections distinguish cohabiting couples for the first time and, in all, recognise five types of household: married couples, cohabiting couples, lone parent, other multi-person and one person. Projected numbers of concealed couples and concealed lone parents are also given.

As outlined in DOE (1995, Annex B), the household projections are compiled by applying projected household representative rates to a projection of the private household population, derived from the subnational population projections and disaggregated by age, gender and marital/cohabitation status, and summing the resulting projections of household representatives. This technique was developed from the headship rate method first used in England and Wales by the Registrar-General in the Housing Report of the 1931 Census.

A technical description of the current methodology is given in Corner (1992) and DOE (1995, Annexes). In brief, the resident population of each area for each projection year is given a marital/cohabitational status, the institutional population is projected and deducted, the remaining 'private household population' is disaggregated by age, sex and marital/cohabitational status and multiplied by the household representative rates projected from historical data for the appropriate groups, and the results are controlled to fit within the figures produced independently at higher geographical scales, following a 'top-down' procedure.

(iv) The validity of the projections is extremely difficult to assess. In theory, they can be evaluated in two completely different ways: firstly, by examining the methodology and the assumptions made and, secondly, by comparing the projections with the observed patterns as events unfold.

In relation to the methods used in the population and household projections for England, it can probably be concluded that they are the best available with our present level of understanding of the processes involved and within the limitations of the data available for identifying past patterns and trends. Over time, various refinements have been made to the methods and it can be assumed that, if there were obvious ways of making further improvements, they would have been explored.

Moreover, any differences found between projected and observed patterns cannot necessarily be attributed to inadequacies in the projections themselves. Most obviously, events may occur which lie completely outside past experience and cannot be anticipated

in advance, but beyond this the projections themselves could possibly lead to a policy response designed to combat a projected outcome. Equally, the adoption of plans to accommodate the projected changes may lead them to be self-fulfilling at local level and thus make them appear more 'accurate' than they might really have been (see, for instance, Bramley 1995).

Over the decade, there have been at least three attempts at assessing the reliability of past population projections at either national or subnational levels. Field (1990) compared the actual population of England and Wales in particular years with the population which had been projected twenty years before. The performance varied from the underestimation in 1951 of the 1971 national population by 6.5 per cent and the overestimation in 1966 of the 1986 population by 11.3 per cent. The biggest percentage errors were found for the youngest and oldest age groups, arising primarily from the 1960s 'baby boom' experience and the unexpectedly strong fall in mortality rates among the very elderly in the 1970s and 1980s.

Even at national level, however, it was observed that, 'Migration is at present the most difficult of the population projection variables to handle, partly because migration, either international or internal, always tends to be a subject of controversy, but also because it fluctuates according to economic and political circumstances, which are themselves largely unpredictable' (Field 1990, p.28). Whereas nil net migrants into England and Wales were projected for 1951-71, the actual number was 630,000 over the 20-year period, while the projection of 770,000 made for 1961-81 was more than four times the actual number of 180,000. These errors, however, have less conspicuous impacts on the age structure, as migrants are spread more evenly across the ages than are the effects of variations in births (by definition) and deaths.

Shaw (1994) examined the accuracy of past projections for the UK from a different standpoint, looking at how successfully the actual 1991 population was anticipated in each of the biennial projections from 1971 onwards. He observed that the overall size of the population has generally been forecast fairly accurately, apart from at the beginning of the 1970s when the number of births considered likely to occur was much larger than actually occurred. On the other hand, he also showed that to a certain extent this accuracy was the fortunate consequence of compensating errors in the projections of births, deaths and migration. Fertility had tended to be overestimated, mortality assumptions had been too pessimistic, and net migration into the UK had consistently been underestimated since 1971.

Shaw went on to examine the sensitivity of national population growth over the 1992-based projection period to 2032 to what he considered to be the likely range between high and low variants in projection assumptions for the three change components. The mortality variants produced the smallest range around the principal projection, around three-quarters of a million people and with the greatest percentage effects on the numbers of most elderly. The fertility variants produced the biggest range of some 3.5 million, but well over half this range impacted on the 0-15 age groups, i.e. outside household-forming age. In between, the migration variants involved a range of around 2 million people, relatively evenly spread in their impact on the 2032 population across the ages 0-59 and thus having a more important impact on the number of people at risk of forming households than either fertility or mortality.

Capron (1994) has evaluated the performance of the subnational forecasts made in 1979, 1981 and 1983 by comparing the population numbers which they projected for 1991 with the population estimates made for that year in the light of the 1991 Census results. Given that the total population forecast for England understated the actual 1991 population by nearly 2 per cent, it is not surprising that most of regional projections were lower than the observed figures. Capron's general conclusion in relation to the full subnational dataset of 108 shire counties, metropolitan districts and London boroughs is that the projections made about ten years earlier 'were fairly successful in predicting 1991 population', as 'projections for about 80 to 90 per cent of areas were within 5 per cent and about 15 to 20 per cent within 1 per cent' (Capron 1994, p.49).

Looking at the different types of areas, Capron concluded that the projections had been most accurate for metropolitan districts and least accurate for the London boroughs, with the shire counties in the middle, but he reckons that the relative success for the metropolitan districts may 'have been a fortuitous effect of predictive errors in the national projections' (Capron 1994, p.49). Migration was observed to be the most difficult component to project, and the introduction of a new model for handling internal migration in the 1981-based round was found not to have produced any significant improvement in the accuracy of projection of migration for the following decade. In particular, there was found to be a tendency for projections of migration to be overconservative in areas with high net inward migration.

There have been no similarly comprehensive assessments of the performance of past household projections, with their success normally being judged on the extent of changes made between each successive forecasting exercise. The most conspicuous feature of the last three exercises has been the substantial increase in the total number of households forecast for England for particular years – mainly the result of taking account of faster than anticipated increases in household representative rates and of stronger than expected national population growth. The household projections, however, involve no further input of migration considerations beyond those already embodied in the population projections themselves and so in this respect will have the same level of reliability as the latter, but the published household projections do usefully provide breakdowns of population's contributions both to household change and to the revisions since the previous projections.

Together, these evaluations of past projections provide ample testimony to the view that forecasting is an imprecise science. In general, projections prove more reliable for short time horizons, where any inadequacies in methodology and assumptions have less scope for compounding themselves, and for larger geographical areas, within which more localised events may have self-compensating effects. In addition, much also depends on the stability of the system, and there are also the questions of how accurate the observation of past patterns and trends has been and thus of how much confidence can be placed in these as a basis for modelling and extrapolation.

All population forecasting studies comment on the considerable challenges posed by the migration component. They cite the variety of data sources that need to be used for formulating migration assumptions and highlight the year-to-year instability of both gross and especially net migration flows. They also note the great importance of migration compared to fertility and mortality in affecting the 'middle' age groups that are most at risk of forming new households.

These findings raise issues about the scale of variations in the volume and nature of migration, the identity of the factors which are responsible and the extent to which they can be formally modelled in quantitative terms – the topics addressed in the next three chapters.

2.4 Conclusions

The aims of this chapter have been to identify the sources of data on internal and external migration affecting the size, composition and distribution of population in England and to review the evidence concerning their accuracy. To do this:

- it has described in some detail the four main migration data sources used in the preparation of the official population estimates and projections, indicating their nature, strengths and weaknesses, and has provided briefer comments on the other types of sources

- it has then described the methods of monitoring migration for the mid-year population estimates, which provide important input to projections in terms of base population and the projection assumptions

- it has outlined and evaluated the three stages involved in the preparation of household projections, namely the national population projections, the subnational population projections and the household projections themselves.

The following are the main **conclusions** drawn from this review.

1. There is no single comprehensive source of information on migration to, from and within England and its constituent parts, not even on numbers of migrants let alone their characteristics and motivations for moving. As a result, it is necessary to try and build up the overall picture from a variety of sources that vary considerably in their coverage, detail and accuracy.

2. Information on the separate migration data sources gives some idea of the level of accuracy of the data. It is, however, very difficult to run checks on data accuracy because of the limited overlap between sources in coverage of migration and lack of consistency between them in definitions. There is a strong case for a comprehensive assessment of data reliability, notably with respect to the International Passenger Survey data on international migration and to the Population Census as the single most important source of detailed data on internal movements.

3. Given the difficulty of reconciling the various data sources, the only systematic way of assessing the reliability of the overall picture of migration generated from them is to compare the 'rolled-forward' population estimates with the revised population figures prepared at the end of an inter-censal decade. Yet this becomes problematic if the quality of the Census count itself falls, as was the case in 1991.

4. Until the accuracy of the key migration datasets can be measured with greater confidence, forecasts based on these sources must draw attention to the possible effects of deficiencies in the population estimated for the base year and in the rates used for the migration assumptions.

5. In the context of considering the future need for social housing, perhaps the single most important weakness of migration statistics is the dearth of information on the implications of migration for households. This being so, it is understandable that the official household projections make no attempt at estimating the future movement of households, but merely 'paint' a household perspective on to population projections based on the movements of individual persons. At the same time, the relationship between migration and household change, not just in the population generally but over space especially, is so complex that, even were the appropriate data readily available, the household dimension of migration would still be extremely difficult to handle in subnational projections.

6. The accuracy of projections is also affected by the instability of migration. It is clear that the volume of migration – both internal to England and external – is rather volatile in the short term, while revealing that in the longer term sizeable shifts can occur in the geographical patterning of migration flows (see Chapter 3 for further details).

CHAPTER 3: MIGRATION PATTERNS AND TRENDS

3.1 Introduction

The purpose of this chapter is to review current knowledge of migration flows affecting the geographical distribution of population in England and the way in which these have altered over time in volume, pattern and composition. It examines the evidence on gross flows as well as net migration balances, explores what is known about the migrants' characteristics and highlights distinctive features of migration with respect to origin and destination areas. It looks separately at international migration, migration between England and the rest of the UK, and internal migration within England, devoting most attention to the last of these three because of its sheer numerical dominance.

The rest of this chapter is organised into four main sections. The next section examines the importance of migration as a set of demographic events and assesses the magnitude of the process of changing address. The following three sections look successively at the three separate types of migration affecting the distribution of England's population. The final section highlights the main findings, emphasising the importance of migration for subnational population trends but also stressing the fact that its significance and nature alter according to the scale of analysis chosen as well as varying over time and differing between areas. This complexity poses major challenges for both explanation and forecasting.

3.2 The importance of migration in population and housing changes

Migration is an extremely important demographic event in numerical terms for England. The 1991 Census recorded 4.6 million residents in England living at a different usual address from that 12 months earlier – a figure that, as seen in the previous chapter, is believed to be an underestimate by at least 13.8%, giving a real total of some 5.25 million people changing address. This compares with 534,000 births and 529,000 deaths in 1990/91, and can also be contrasted with the 625,000 people marrying (first-time and remarriages), 290,000 people divorcing and 166,000 abortions in 1990.

While the difference in volume between migration and these other types of events is clearly colossal, it is also worth bearing in mind that the 1991 Census was conducted at a period of historically low residential mobility, with the migration rate then being 15% below that in 1988 and 6% below that in 1994. Moreover, the Census excludes certain types of migration, notably emigration, multiple moves within a single year, and moves made by children under twelve months old, people dying during the year and students moving to and from their places of study. The Census, by collecting information on usual address only, will also exclude temporary moves away from home, but these are not directly relevant to the present study.

In terms of housing-related events, the impacts of migration are double these figures, in that migration of each person comprises two elements (like births and deaths in natural change): leaving the previous address and taking up residence at the new one. The parallel with births and deaths is closest with movements into and out of England, because for every 100 persons entering the country during the year, there is a broadly

similar number of people leaving – by definition, not the same people (though the IPS could, in theory, record arrivals intending to stay 12 months but leaving before the end of the calendar year). But similarly for each internal migration, there will be a departure from the previous address and an entry to the new address. Altogether then, in 1990/91 exits and entries totalled some 10.5 million, although a proportion of each will have occurred outside England and a further number will have involved moves into, out of or between communal establishments rather than 'private household spaces'.

On the other hand, a fair proportion of people move as part of a larger household, reducing the total number of individual addresses affected to well below this 10.5 million level. According to the 1991 Census, 2.77 million people lived in 1.22 million households where all the residents had moved from the same previous address, with 1.83 million migrant residents of England making other types of moves, giving a total of 3.05 million separate migration decisions and 6.1 million addresses involved. In practice, this will overstate the real number of separate 'decisions' for at least two reasons: firstly, some of the 1.83 million 'other ' migrants will have moved because of the dissolution of multi-person households and, secondly, others of them will have moved with one or more other people but joined existing households or parts of them. It is not possible to measure the extent of such moves from the 1991 Census, just as the proportion of households experiencing no change in membership (through migration or more generally through births and deaths as well) during a given year is not recorded on a comprehensive basis by this or any other source.

In terms of the net number of separate addresses involved, the impact of migration is smaller than indicated so far, because the majority of people will be moving to the previous address of other people moving in the same year and, vice versa, the majority of addresses quitted by migrants will be re-occupied by new migrants. While there are several ways in which this turnover of people does not occur, they are numerically quite small in relation to the total number of housing exits and entries. For instance:

- only a relatively small number of dwelling units are added to the housing stock in any one year (averaging under 150,000 in England in the 1990s), while very few (currently to be numbered only in hundreds) are withdrawn from the housing stock through demolition or change of use and thus not recycled.

- some existing dwellings will be released by the death of the last occupant(s) rather than by out-migration, but the number will be very much smaller than the total number of deaths.

- though there are over 0.5 million unoccupied dwellings at any one time, relatively few of these will be re-occupied after a long vacancy (say, 12 months or more) as opposed to more immediate turnover of occupants.

- relatively few dwellings will see the occupant(s) arriving and departing in a single year, given that under 10 per cent of people average more than one move every three years according to the Working Lives Survey (Green *et al* 1997).

Taking all these factors into account, the number of separate addresses in England experiencing a change of occupant(s) in the pre-Census year 1990/91 as a result of

residential mobility is likely to have been in the range of between 3.1 and 3.4 million on the basis of Census records, or – taking account of the estimated 13.8% undercount, between 3.5 and 3.9 million, i.e. around one in five of England's 19.5 million housing units at that time.

This 1-in-5 figure of addresses experiencing the effects of residential mobility in 1990/91 is clearly something of a guesstimate, but if anything is likely to err on the conservative side for an average year, given the low level of migration at the beginning of the decade. It certainly indicates the great potential that migration has for producing change over time in the composition of subnational populations and the matching of households to the housing stock at regional and subregional scales. On the other hand, it could be argued that the effects are far smaller than these calculations indicate – for two reasons: firstly, much of this movement takes place within a given geographical area and thus does not alter its total population or its basic demographic composition and, secondly, much of the movement that does cross a boundary between areas will be offset by movement in the opposite direction.

The review of migration trends that follows gives most attention to the volume and characteristics of *gross* migration flows affecting the population of England at subnational levels. At the same time, where appropriate and possible, it examines the *net* effects of these movements for subnational areas, not just in terms of the impact on total numbers of people resident in each but also in terms of the changes which are produced in the composition of an area's population. In addition, it is important to bear in mind the *within-area effects* of between-area movements, in that newcomers to an area are not likely to fill exactly the housing spaces that are being vacated by those leaving that area but can be expected to interact with the effects of residential movements internal to that area. Consideration of the latter is made all the more necessary because no clear distinction in terms of types of migration exists between within-area and between-area moves, not least because the degree of areal disaggregation can be altered and in any case the precise delineation of boundaries between areas is often rather arbitrary in relation to patterns of movement. The proportion of within-England moves that are considered to be internal or external to subnational areas will vary according to how England is divided up: at one extreme, into just two regions (say, South and North) or into several hundred (say, the 366 local government units) at the other.

3.3 International migration

For the purposes of this section, international migration is taken to refer to the movement of people into and out of England involving countries outside the United Kingdom, with these other countries officially including the Channel Isles and Isle of Man as well as the Irish Republic. In practice, however, data availability imposes certain restrictions on this task. As outlined in the previous chapter, not all flows are equally well documented, and the various sources are subject to a number of drawbacks in relation to accuracy and detail. Also problematic in the present context is that most of the published data on the characteristics of migrants relates to movements into and out of the UK (or England and Wales) as a whole, with flows to and from the standard regions of England being disaggregated only by sex, age and citizenship. There are also conceptual difficulties in comparing the statistics provided by the different sources, particularly the fact that, while international migration data from the Census and Labour

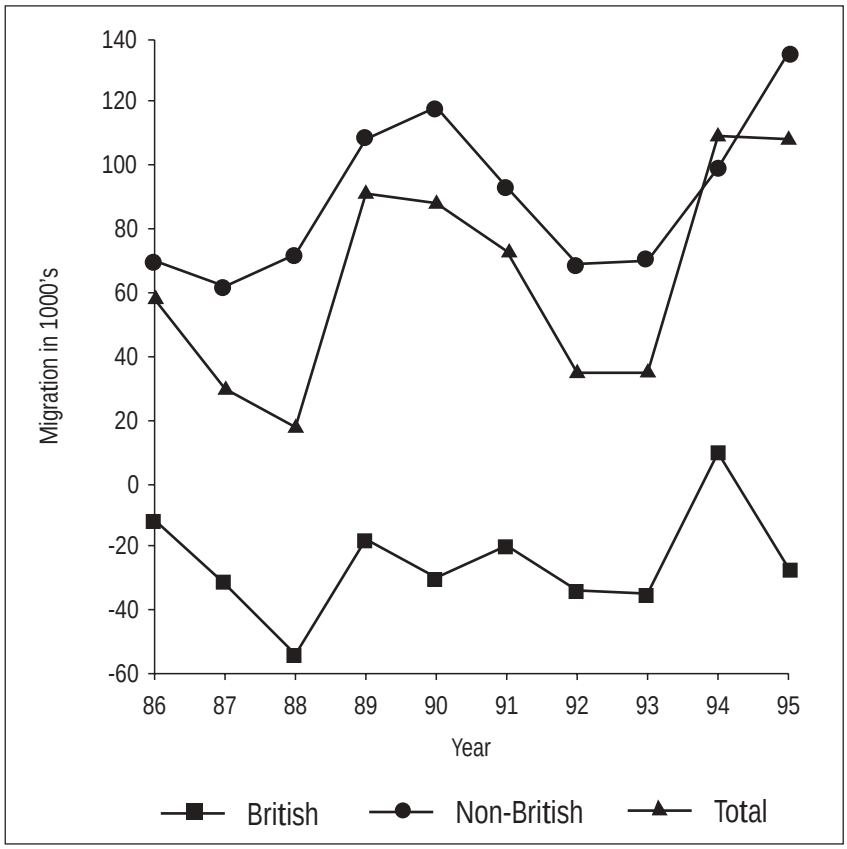
Force Survey (LFS) is based on change of address within the previous twelve months, the International Passenger Survey (IPS) provides migration data on the basis of people's intention to change country of residence for more than twelve months.

This account deals first with estimates of the total volume of migration and how it varies over time and then goes into more detail about the movements recorded by the IPS.

3.3.1 Volume of international migration

Figure 3.1 shows the estimated net international migration affecting the UK over the past decade. In 1995 an estimated 109,000 more people migrated to the UK than from the UK. This net figure masks the broad distinction between the net loss of almost 27,000 British passport holders and the net gain of some 136,000 non-British citizens. The latter most notably comprises net gains of 52,000 citizens of New Commonwealth countries and almost 50,000 from other countries besides the Commonwealth and European Union (EU).

Figure 3.1 Net international migration, by citizenship, UK, 1986-95, thousands



Source: ONS (1997), page ix, Table A. Crown copyright.

Figure 3.1 also suggests that the overall level of the UK's net migration gain varies greatly from year to year. The figure for 1994 is the same as for 1995, but this level is the highest since records began in the mid 1960s. The previous high point was a gain of 91,000 in 1989, but in several of the past ten years, the net gain has been around 35,000, or lower, and the overall average for the late 1980s and early 1990s was around 50,000 and 60,000 respectively. There is considerable year-to-year variability in both British

and non-British components, with the former ranging from a net loss of 54,000 in 1988 to a net gain of 10,000 in 1994 and the latter's rate of loss spanning a range of nearly 74,000 between the levels for 1987 and 1995. On the other hand, it is difficult to know how much to read into these annual fluctuations, given that the small sample size of the IPS-based part of the total net flow means a 95% confidence interval of 30,000 above and below the estimated figure.

Table 3.1 Net international migration, by data source, UK, 1986-95, thousands

Year	Total	IPS-based	Other
1986	+58.2	+36.9	+21.3
1987	+30.1	+2.2	+27.9
1988	+17.8	-21.3	+39.1
1989	+90.9	+44.3	+46.6
1990	+88.3	+36.0	+52.3
1991	+73.3	+27.6	+45.7
1992	+35.0	-11.1	+46.1
1993	+35.3	-2.5	+37.8
1994	+108.9	+62.4	+46.5
1995	+108.8	+53.9	+54.9
Annual averages			
1986-90	+57.1	+19.6	+37.4
1991-95	+72.3	+26.1	+46.2
1986-95	+64.7	+22.8	+41.8

Note: IPS = International Passenger Survey; 'other' refers to asylum seekers, visitor switchers and migration with the Irish Republic (see text).

Source: Calculated from ONS (1997), page ix, Table A, and page 4, Table 2.1. Crown copyright.

Table 3.1 breaks down the UK's net international migration gains into the component that is calculated from the IPS and the rest, which comprises asylum seekers and persons admitted as short-term visitors who are subsequently granted an extension of stay for other reasons (so-called 'visitor switchers') together with the estimated net migration between the UK and the Irish Republic. It can be seen that, if the IPS-based figures are taken at face value, this component accounts for barely one third of the UK's international migration gains over the past ten years, averaging a bit under 23,000 compared to the almost 42,000 a year generated by the 'rest'. As regards this latter component, it is estimated that the net migration with the Irish Republic was averaging a net gain to the UK of nearly 14,000 people a year in the latter half of the 1980s and a net loss of just one thousand people in the first half of the 1990s. Meanwhile, the asylum seekers and visitor switchers component has doubled in size from under 24,000 to over 47,000 between these two periods.

The geographical impact of international migration on England's population needs to be pieced together from the separate sources, as no single source gives the full picture. We have not been able to identify any published figures showing how net migration with the Irish republic is split between England's eight standard regions. As regards asylum-seekers, a sample survey of refugees who applied for asylum in the period 1983-91 found that the vast majority (85 per cent) were living in London at the time,

with a further 3 per cent in the rest of the South East and barely 1 in 10 in the rest of the UK (Home Office, 1995).

By contrast, the regional impact of the migration covered by the IPS is published on an annual basis. The results for 1995 are shown in Table 3.2. It can be seen that virtually all of the UK's IPS-based net gain of 53,900 (from Table 3.1) accrued to England, while within England the South East accounted for 95% of this in net terms and Greater London alone for almost two-thirds (Table 3.2). By comparison, the impact on the other regions of England is very small, with the largest two being the net gain of 6,000-odd by the West Midlands and the net loss of 4,000 by the South West. The balances for the other regions, however, tend to be very unstable over time, not just between single years but also judging by the five-year averages calculated for 1984-88 and 1989-93 by Champion (1996a). The only reasonably stable features of the IPS-based component are the concentration of net gains in the South East and particularly in London and fact that the the other English regions together have been averaging a small net gain of up to 5,000 each year.

Table 3.2 IPS-based estimates of international migration flows and rates, by standard region, England, 1995

Region	Thousands			Rate per 1000 people		
	balance	Inflow	Outflow	Balance	Inflow	Outflow
England	+52.1	224.1	172.0	+1.1	4.6	3.5
North	+0.4	3.2	2.8	+0.1	1.0	0.9
Yorks & Humb	+1.6	13.2	11.6	+0.3	2.6	2.3
East Midlands	-0.9	9.5	10.4	-0.2	2.3	2.5
East Anglia	+2.7	10.9	8.3	+1.3	5.1	3.9
South East	+49.4	140.7	91.3	+2.7	7.8	5.1
Greater London	+32.8	82.6	49.8	+4.7	11.8	7.1
Rest of South East	+16.6	58.1	41.5	+1.5	5.3	3.8
South West	-4.0	14.9	18.9	-0.8	3.1	3.9
West Midlands	+6.2	15.6	9.4	+1.2	2.9	1.8
North West	-3.4	16.0	19.4	-0.5	2.5	3.0

Source: calculated from ONS (1997), page 11, Table 2.8. Crown copyright.

In terms of gross flows estimated from the IPS, however, the picture is somewhat less concentrated (Table 3.2). In 1995 the South East accounted for around 63% of the gross inflows to England estimated from the IPS, and Greater London just over one third, while the outflows were even more broadly spread across England, with shares of just over half and just over a quarter respectively. Nevertheless, even these latter shares are still considerably more than would be expected from their respective population shares of 37 and 14%.

The level of regional population turnover produced by the IPS-based migration flows is shown in the final two columns of Table 3.2. There is clearly a sharp decline in the level

of turnover away from London. Inflows to the South East in 1995 represented a rate of nearly 8 per thousand residents, while the outflow rate was around 5 per thousand, and the equivalent rates for London were around 12 and 7 respectively. The only other cases with rates above the England figure were inflows and outflows for East Anglia and outflows for the South West. At the other extreme, the Northern region appears to be hardly touched by international migration, with rates only about a quarter of England's and a tenth of London's.

Table 3.2 also shows the impact of IPS-based migration on regional populations by expressing the net balance as a rate, again in terms of persons per thousand for the year, equivalent to percentage change for a full decade if the rates stayed the same. The highest regional rate in 1995 is, as expected from what has already been said, the South East, at +2.7 per thousand, and within it London's rate is equivalent to a +4.7 per cent change in population over a full decade, with the Rest of the South East considerably lower but still above the England rate. The only other regions above the England rate in 1994 were East Anglia and the West Midlands, but as mentioned before, these and other regions outside the South East exhibit great volatility from year to year.

International migration clearly has a sizeable impact on the population of the whole country and particularly on certain regions and localities. It is therefore a great pity that its geographical impact is not monitored on a more comprehensive basis. On the other hand, breakdowns of total net international migration have to be made by ONS each year for the purpose of updating the local area population estimates. This greater detail is essential for projections of subnational populations and anticipation of their housing implications. The forthcoming 1996-based population projections assume that England's net international migration gains will be running at an average rate of 65,500 a year, equivalent to an extra 2.62 million residents over the 40-year projection period, so for subnational projections it is vital to know their likely geographical distribution.

3.3.2 Characteristics of international migrants

For the same reasons, it is important to know the composition of international inflows and outflows in terms of the personal characteristics of the migrants and the net impact which these flows have on regional and local population profiles. The published IPS-based tables provide regional-level details for age/sex and citizenship. Additional information is collected from migrants by the IPS and, though the results are published only at the national-level (UK and England & Wales, but not England alone), they give an indication of the aspects which are likely to have greatest impact on housing. These tables cover marital status, usual occupation, main reason for migration, country of birth and country of last or next residence. This section summarises the main features of these statistics for 1995 – observations which should be interpreted in the light of the fact that they are based on interviews with just 1,393 immigrants and 752 (see ONS 1997, Table 3.20, for the standard errors involved on each data item). Some information is also available on the characteristics of people applying for asylum in the UK.

Table 3.3 IPS-based estimates of international migration flows, by migrants' characteristics, England (E) or England & Wales (EW), 1995, thousands

Variable	Characteristic	Inflow	Outflow	Balance
Sex (E)	*Total*	*224.1*	*172.0*	*+52.1*
	male	118.5	92.4	+26.0
	female	105.6	79.6	+26.0
Age (E)	*Total*	*224.1*	*172.0*	*+52.1*
	under 15	24.2	27.0	-2.8
	15-24	81.6	47.4	+34.3
	25-44	97.2	76.1	+21.2
	45-64/59	19.2	16.2	+3.0
	65/60 and over	1.9	5.4	-3.5
Marital status (EW)	*Total aged 15 and over*	*205.9*	*149.8*	*+56.0*
	single	121.0	90.8	+30.3
	married	76.1	52.8	+23.3
	widowed or divorced	8.8	6.3	+2.5
Usual occupation (EW)	*Total*	*232.0*	*176.8*	*+55.2*
	professional/managerial	81.9	58.2	+23.7
	manual/clerical	43.6	39.1	+4.6
	students	55.8	37.0	+18.8
	housewives	15.6	9.1	+6.5
	other adults	5.9	6.3	-0.4
	children	29.2	27.1	+2.1
Main reason for migration (EW)	*Total*	*232.0*	*176.8*	*+55.2*
	work-related	49.7	64.2	-14.6
	accompany/join	53.2	42.3	+10.9
	formal study	56.0	7.6	+48.4
	other	59.5	45.1	+14.4
	no reason stated	13.6	17.6	-4.0
Citizenship (E)	*Total*	*224.1*	*172.0*	*+52.1*
	British	81.1	104.1	-23.0
	Non-British	143.0	67.9	+75.1
	European Union 15	38.3	17.9	+20.4
	Old Commonwealth	25.3	15.6	+9.7
	New Commonwealth	33.5	9.5	+23.9
	Other foreign	45.9	24.9	+21.0
Country of birth (EW)	*Total*	*232.0*	*176.8*	*+55.2*
	UK	66.9	101.2	-34.3
	European Union 15	39.1	18.8	+20.3
	Old Commonwealth	27.0	17.4	+9.6
	New Commonwealth	43.5	14.3	+29.2
	Other foreign	55.6	25.1	+30.4
Country of last or next residence (EW)	*Total*	*232.0*	*176.8*	*+55.2*
	European Union 15	68.8	51.3	+17.5
	Old Commonwealth	39.6	45.8	-6.2
	New Commonwealth	53.8	21.4	+32.4
	Other foreign	69.9	58.4	+11.5

Note: data may not sum due to rounding.

Source: ONS (1997), various tables. Crown copyright.

Table 3.3 gives the gross and net IPS-based flows for all the variables published at national level for 1995. The main features are as follows.

- The turnover for males was higher than for females, but the net figures were identical.

- Four out of every five immigrants were aged between 15 and 44, only 1 in 10 was under 15 and virtually none were of pensionable age, indicating a strong loading on the economically active and household-heading age groups.

- Emigrants also had a 15-44 year old peak, but the proportion of 15-24 year olds was significantly lower than for immigrants and those for children and the elderly were larger, leading to net emigration for these two groups.

- Three of every five immigrants were single and few were widowed/divorced, with a very similar pattern for emigrants and net immigration.

- Employed people made up around 55% of both inflow and outflow and professional/managerial personnel dominated both but were relatively more significant among the immigrants than the emigrants, giving a much larger net gain for these workers than for the manual/clerical group.

- Students were considerable more strongly represented among the inflows than the outflows, leading to a substantial net gain.

- A significantly higher proportion of the outflow was work-related and a much lower proportion was for formal study, suggesting that the majority of emigrant students were returning to their home country rather than moving away for study purposes.

- Over half the emigrants were UK-born, but more than two out of every five were returning to their country of birth or moving on to a third country, whereas only just over a quarter of immigrants were returning to the UK, with the largest net gains being of those born in New Commonwealth and 'other foreign' countries – a similar pattern to that indicated by the data on citizenship.

- As regards country of last or next residence, inflows were fairly evenly distributed across the four groups identified, but the Old Commonwealth was significantly more important as a destination than as an origin and the New Commonwealth much less important, giving a net loss of residents to the former and a large net gain from the latter.

As observed earlier, at regional level the impacts of this annual turnover will be felt mainly by the South East and, at more local scale, especially by London. Table 3.4 illustrates this in respect of the three variables for which regional breakdowns of flows are published. The main features are:

- the broad similarity in scale of net migration by sex, bearing in mind the large standard error at regional level, with the principal contrasts indicated for this year being a male dominance in flows to Yorkshire & Humberside and a female dominance in flows to the Rest of the South East

- the absence of net changes in size of age groups greater than 2,500 for any regions besides the South East, apart from a 3,700 gain of 45-64/59 year olds for the West Midlands

- the relatively large net loss of British passport holders sustained by the North West and South West regions, and the biggest net gain of Old Commonwealth passport holders made by London and gains of New Commonwealth and 'other foreign' citizens by London, the Rest of the South East, the West Midlands and Yorkshire & Humberside.

Table 3.4 IPS-based estimates of net international migration, by sex, age and citizenship, by standard region, England, 1995, thousands

Charact-eristic	Eng-land	North	Yorks & Humb	East Mids	East Anglia	South East	*of which* London	South West	West Mids	North West
Total	+52.1	+0.4	+1.6	-0.9	+2.7	+49.4	+32.8	-4.0	+6.2	-3.4
Sex										
Male	+26.0	+0.4	+2.5	+1.4	-0.8	+22.6	+17.8	-4.4	+5.0	-0.8
Female	+26.0	-	-0.9	-2.3	+3.4	+26.8	+15.1	+0.4	+1.2	-2.6
Age										
under 15	-2.8	-0.1	+0.9	-1.1	-1.1	+1.0	+1.0	-1.1	+0.5	-1.8
15-24	+34.3	+0.5	+2.4	-0.1	+1.9	+24.5	+15.9	+1.5	+1.9	+1.7
25-44	+21.1	+0.9	+0.2	+1.2	+1.2	+21.3	+15.6	-1.7	+0.2	-2.3
45-64/59	+3.0	-0.9	-1.8	-0.5	+0.7	+3.4	+0.9	-1.2	+3.7	-0.5
65/60+	-3.5	-	-	-0.5	-0.1	-0.8	-0.6	-1.6	-	-0.5
Citizenship										
British	-23.0	-1.3	-4.3	-3.6	-0.4	+1.9	-3.1	-5.8	-2.4	-7.2
Non-British	+75.1	+1.7	+6.0	+2.7	+3.1	+47.5	+35.9	+1.8	+8.6	+3.8
EU 15	+20.4	-	+0.9	-0.6	+1.4	+17.1	+12.1	-1.4	+0.8	+2.3
Old CW	+9.7	-0.3	-0.2	+1.9	+1.3	+8.5	+7.6	+0.4	+0.3	-2.0
New CW	+23.9	+1.3	+3.8	+1.2	+0.7	+8.8	+6.1	+1.4	+4.8	+2.0
Other foreign	+21.0	+0.7	+1.4	+0.3	-0.3	+13.1	+10.2	+1.4	+2.7	+1.6

Note: '-' denotes nil or less than half the final digit shown. Data may not sum due to rounding.

Source: ONS (1997) Tables 3.7 and 3.14. Crown copyright.

On the basis of the evidence of Table 3.4, the absence of regional breakdowns of other variables is perhaps not too serious a problem. It is clear that in net terms it is the South East that is responsible for the lion's share of England's, and indeed the UK's, net gains of international migrants estimated from the IPS, so the net change by population characteristic will be following the national profile pretty closely. For most other regions, the net impact of this international migration is so small that the standard error looms large in interpreting the significance of any figure. It is, of course, possible that the regional averages mask particular concentrations of immigrants and emigrants and that these may not be the same places for both nor involve a similar profile of personal characteristics at each place, but any such result from a more disaggregated analysis could not be stated confidently without a larger sampling factor.

Beyond this, one serious deficiency in relation to housing studies is the absence of information on the household context of migrants. From the data collected from the IPS, it is difficult to estimate the number of separate households involved or the extent to which individual migrants comprise separate households or are joining or leaving existing or continuing ones. It is not even known whether what proportion of married persons are migrating with their spouses rather than joining them or leaving them behind. On the other hand, this sort of information is virtually impossible to collect on a meaningful basis, particularly for immigrants who may undergo a period of adjustment before settling down in a semi-permanent arrangement.

Finally, as mentioned before, the IPS-based data provides only half the picture of the net impact of international immigration in 1995 and only a third of it in an average year, because it does not cover visitor switchers and exchanges with the Irish Republic. The Home Office's (1995) survey of asylum seekers in 1983-91 indicated that the majority were male and under 40 years old, half were married while 42 per cent were single never-married, one third were part of 3 or 4 person households while nearly one third lived on their own, and over one third had attended a university-level course. Unfortunately, this source excludes accompanying household members. ONS is currently (April 1998) considering using data from London boroughs on payments made to asylum seekers to distribute asylum seekers within London in the 1996-based subnational projections and in future population estimates. As regards exchanges with Ireland, we are not aware of published data on their net effect on the composition of regional and local populations in England, though the demographic chatacteristics of the gross inflows from Ireland can be traced from the Census and the NHSCR.

3.3.3 Summary

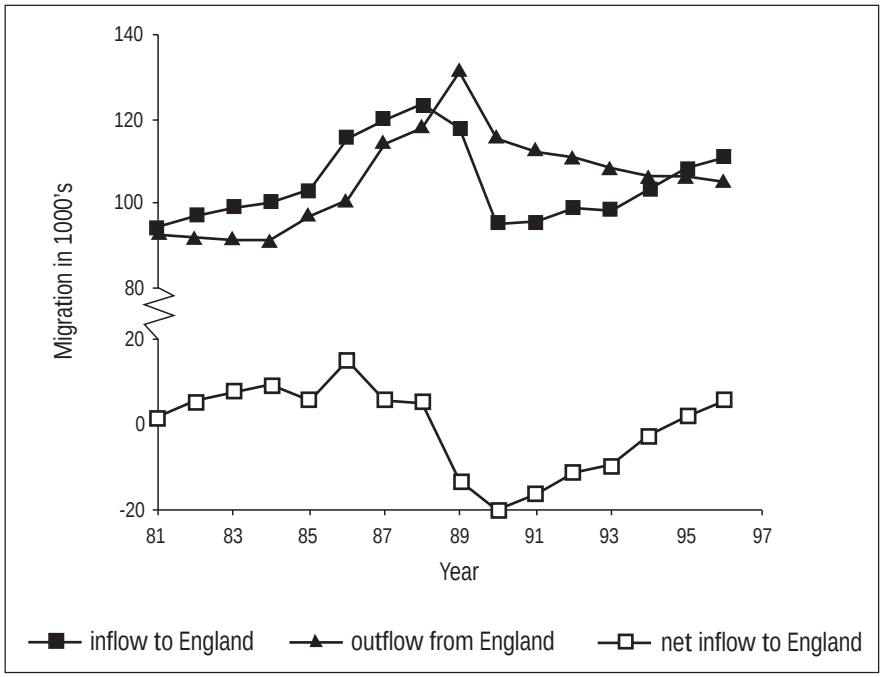
International migration is nowadays a major force to be reckoned with in terms of England's population change. During the 1990s it has been responsible for over one-third of the country's population growth on average and in the mid 1990s it was contributing more than natural increase. Its significance is increased by its distinctive features. Firstly, in both gross and net terms international migration is highly concentrated into the 15-44 age range, with direct implications for household numbers immediately and over the decade following arrival. Secondly and very importantly, international migration is highly concentrated in terms of its regional incidence, not only in terms of gross inflows and outflows but even more so in terms of the net balance being almost entirely accounted for by the South East and especially London.

3.4 Migration between England and the rest of the UK

As noted in the previous chapter, migration between England and the UK's other constituent countries is better recorded than international migration beyond the British Isles. The whole of the UK is covered by the National Health Service Central Register, so movements between England and the rest of the UK (RUK) are continuously monitored, subject only to the limitations of this source outlined in Chapter 2. The Population Census of Great Britain provides much detail in terms of the geography of exchanges with Wales and Scotland during the twelve months leading up to census night and of the characteristics of migrants involved in these flows, plus similar details

for people moving into England from Northern Ireland apart from their origin locality within the latter, but by definition does not cover migrants who have left England for Northern Ireland. The separate Northern Ireland Census counts the number of people who moved from England to Northern Ireland over the previous year, but provides no breakdown of area of origin within England. The account below is based largely on the published NHSCR-based data for 1994, as the pre-Census year 1990/91 seems to have been rather untypical of the long-term volume of net movement.

Figure 3.2 Gross and net migration flows between England and the rest of the UK, 1981-96, thousands



Source: calculated from NHSCR data. Crown copyright.

The overall picture of exchanges between England and RUK is shown in Figure 3.2. The 1994 pattern was one of some 103,400 people moving into England and around 106,000 moving out to RUK, giving a net flow of between 2,500 and 2,900 out of England (the precise figures vary between published sources, presumably because of differences in the treatment of rounding). This volume of gross turnover is either somewhat more than half or somewhat less than half of those involved in the international migration exchanges examined in the previous section, depending on whether the 'visitor switcher' component of the latter is excluded or included, but the net impact in terms of overall numbers is negligible by comparison with the scale of net inflow from international migration.

These 1994 volumes of net and gross movement are broadly similar to the longer term picture shown back to 1981 in Figure 3.2. Over this period the volume of moves into England from RUK has fluctuated between around 95,000 (at the start of both decades covered) and 123,000 (in 1988), while the volume of outflows to RUK has ranged from around 91,000 (in the early 1980s) to 131,000 (in 1989), with the overall average being around 105,000 in both directions. The average annual net balance for 1981-95 is around -1,250 for England, reflecting this evenness of flows across England's RUK borders, but the net figure varies much more from year to year. The general pattern for the 1980s

was of net gains by England, with a particular peak in 1986, contrasting with the even larger net losses of the early 1990s. The one-year period covered by the 1991 Census change-of-address question clearly coincided with the unusual situation of below-average inflows to England and above-average outflows – a pattern which is not likely to have been significantly affected by NHSCR computerization in 1990, judging by the pattern for adjacent years.

Table 3.5 examines in more detail the geography of these exchanges, focusing on the apparently typical year of 1994. The region most affected in absolute terms by the gross turnover is the South East, with around 36,000 moving in from RUK and an almost identical number moving in the opposite direction, but unlike with international migration, this is almost exactly in proportion to the South East's share of England's total population. For the other regions of England, the gross exchanges with RUK are of the same order of magnitude as the IPS-based international flows shown in Table 3.2, but the net effects for these other regions are even smaller than for international migration, with the largest (the net outflow from the North West) not even reaching 2,000.

Table 3.5 Migration flows between England and the rest of the UK (RUK), by standard region and other country, 1994, thousands

Region	Inflow from RUK	Outflow to RUK	Net inflow from RUK	Net from Wales	Net from Scotland	Net from Northern Ireland
North	6.8	7.5	-0.7	-0.1	-0.7	+0.1
Yorks & Humb	8.1	8.4	-0.3	0.0	-0.3	0.0
East Midlands	7.2	6.8	+0.4	+0.1	+0.2	+0.1
East Anglia	4.1	3.9	+0.1	+0.1	0.0	0.0
South East	36.3	36.6	-0.4	+0.2	-0.1	-0.5
Greater London	14.0	14.1	-0.3	+0.2	+0.1	-0.6
Rest of South East	22.3	22.5	-0.1	0.0	-0.2	+0.1
South West	14.0	13.0	+1.1	+0.5	+0.5	+0.1
West Midlands	11.2	12.2	-1.0	-0.7	-0.2	-0.1
North West	15.7	17.6	-1.9	-1.8	-0.7	+0.6
England total	103.4	106.0	-2.5	-1.5	-1.4	+0.4
Gross to England	103.4	..	..	48.4	45.9	9.1
Gross from England	..	106.0	..	50.0	47.3	8.6

Note: '..' not applicable. Data may not sum due to rounding.

Source: VS/PP 1994, pages 74-76, Tables 5.2a, 5.2b and 5.3. Crown copyright.

For the record, Table 3.5 shows separately the net exchanges between England and each of the three other countries of the UK. It is clear that the low overall net figures are not the result of a high net inflow from one constituent country being offset by a high net outflow to another. The table also shows the contribution of each country to the gross turnover affecting England in 1994. Wales and Scotland were just about equally involved, both with inflows and outflows of 46,-50,000, though these volumes mean more for Wales (about 1.7 per cent of its population) than for Scotland (0.9 per cent). Northern Ireland contributed less than a tenth of RUK's exchanges with England, with

the two flow rates being 0.5 per cent of the province's population. Meanwhile, from England's perspective, the gross flows of just over 100,000 each way across its UK borders represent a turnover rate of 0.2 per cent of total population.

Finally, information on the composition of migration flows between England and RUK, derived from the NHSCR and Population Census, indicates that there are larger effects than suggested by the relative balance of the flows. In particular, England gains more young adults (16-29 year olds) than it loses, but it experiences significant net losses of older working age people and small losses of children and the elderly. In the pre-Census year 1990-91, England experienced net gains of people in employment, especially females, but more of the people leaving England for RUK were unemployed on Census night than of the people moving in the opposite direction. England also recorded net losses of retired people and women not in the labour force. Fewer people moving into England than leaving it ended up in households containing one adult of each sex, with or without dependent children, while England was a net gainer of non-whites. The regional and local impact of these exchanges (apart from outflows to Northern Ireland) could be explored by reference to the 1991 Census Regional Migration Statistics, but no studies of this dataset has so far been published.

In sum, the whole picture is one of a very even balance in terms of absolute numbers. This is a pattern which is expected to continue into the future, with the Government Actuary's Department assuming an average net flow of just 500 people per year from England to RUK over the next 40 years (Shaw, 1998). The only situations in which these exchanges could be significant in forecasting population changes and their housing implications would be if the inflows to individual regions were very different in their local incidence from the outflows and/or if they involved very different types of people from the outflows, but neither seems at all likely over a prolonged period, while over a short period the absolute numbers involved would be very small, particularly by comparison with the scale of population changes produced by migration within England.

3.5 Migration within England

3.5.1 Introduction

Internal migration dwarfs the other types of migration examined so far, being known to account for 3.94 million of England's 4.60 million migrant residents enumerated by the 1991 Census and being believed to account for the vast majority of the further 0.29 million who are classified as 'origin not stated', i.e. over 90%. The significance of this large number for subnational population distribution and composition, however, depends on the reasons for studying population trends, most notably on whether or not changes of address within any individual geographical unit need to be considered alongside movements which cross statistical boundaries. Logically, the larger the geographical units (e.g. standard regions as opposed to local government districts), the fewer are the residential movements that cross boundaries between units but, at the same time, the more necessary it is to examine the nature and implications of moves taking place within those areas. For the sake of comprehensiveness, the following account adopts the broadest definition of migration permitted by the available data sources.

As outlined in the previous chapter, there are two principal data sources for studying migration within England: the Population Census and the NHS Central Register (NHSCR). Both have the advantage of full national coverage, so both the origin and destination areas can be identified for any migration. Where they differ is in their time coverage, their geographical detail, their detail about the characteristics of migrants and, most importantly, on the types of migration included. In relation to the review below, it is especially important to remember that the NHSCR provides no data on movements within FHSA areas (groupings of London boroughs, districts of the six metropolitan counties and counties elsewhere) and no details of origin or destination within these areas. Also, while the NHSCR is a continuous monitoring system, the Census provides data on only one year per decade, except where the linked Census records in the ONS Longitudinal Study permits a ten-year change of address to be derived. The two sources are therefore, in many ways, complementary to each other and can together be used to build up a reasonably comprehensive picture of internal migration for England.

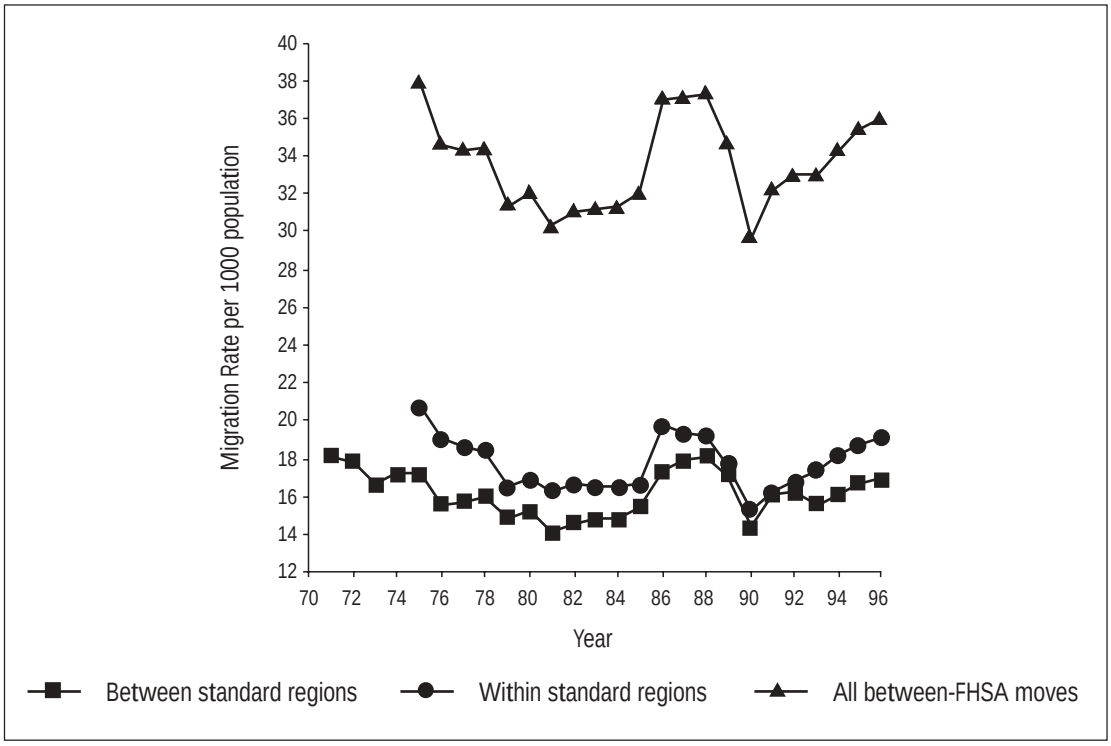
The account below uses these two data sources to document the main features of the volume of internal movement within England, the extent to which this varies over time and the way in which it is made up in terms of distance of move. Subsequently, the principal geographical dimensions of movement are examined, with particular reference to their net effects on population distribution. Finally, a closer look is taken at the composition of migration flows, including an assessment of the implications of internal migration for regional and local population profiles.

3.5.2 Volume and nature of migration within England

Internal migration rates vary over time, as shown by NHSCR data for the whole UK (Figure 3.3). As regards migration between standard regions, the highest rate is 18.1 per thousand, recorded in 1971 (the first year for which this data is available) and in 1988. After these two peaks troughs occurred, with the lowest rates in 1981 (at 14.1, 22% below the 1971 peak) and in 1990 (at 14.4, 20% below the 1988 peak though the 1990 figure is affected to an unknown extent by NHSCR computerisation). In the early 1990s the rate has been running fairly consistently around 16 per thousand, i.e. roughly the midpoint between the previous peaks and troughs, though it had edged up to nearly 17 by 1996.

The NHSCR data on migration within regions is, as previously mentioned, restricted to moves between FHSA areas and has been recorded from 1975. The trend over time follows that of between-region moves pretty closely, with 1975 itself being the highest year on record so far with a rate of 20.7 per thousand. The rate fell to a low of 16.3 in 1981, 21% below the 1975 level, rose to a peak of 19.7 in 1986 (two years before the between-region peak) and fell to a low of 15.3 in 1990, 22% below the 1986 peak but again affected by NHSCR computerisation. Subsequently it has risen progressively to reach 19.1 per thousand in 1996. Combined with between-region migration from 1975, the pattern of highest and lowest years are: 1975 37.9, 1981 30.3, 1988 37.3, 1990 29.7 and (as far as 1996) 1996 36.0. Broadly speaking, therefore, the records show a range of around 8 per thousand from highest to lowest, or some 12% around a middle-range figure of 33-34 per thousand, with the fluctuations being attributable to between- and within-region migration in fairly equal measure.

Figure 3.3 Between-FHSA migration rates, UK, 1971-96, per 1000 population



Source: NHSCR-based data supplied by ONS. Crown copyright.

The majority of internal migration, however, is over short distances and is therefore not captured by the NHSCR-recorded moves between FHSA areas, except where such short-distance changes of address involve moves across a boundary between adjacent FHSA areas. The precise picture provided by the 1991 Census varies according to whether 'origin not stated' migrants are included in within-ward moves (as in the Census area tables) or are excluded entirely, but the general proportions are broadly similar (Table 3.6). Almost 3 out of every 5 moves within England observed in the pre-Census year did not involve crossing a district boundary, while between one-fifth and one-quarter (depending on the treatment of 'origin not stated') were moves within the same Census ward. At the other extreme, 1 in 8 moves were between the eight standard regions of England. Finally, around one-quarter of within-England moves took place within regions but between districts, fairly even split between those which involved crossing a county boundary and those not doing so. In cumulative terms, around three-fifths of within-England moves took place within districts, three-quarters within counties and seven-eighths within standard regions. As a corollary, one-eighth of moves crossed a standard region boundary, one-quarter crossed a county boundary and two-fifths crossed a district boundary.

The Census also classifies moves by straightline-distance between origin and destination. As shown in Table 3.7 for within-Britain migration, almost half of all changes of address involve moves of less than 5 km (roughly 3 miles), 3 out of 5 less than 10 km, and three-quarters less than 50 miles. At the other extreme, 1 in 8 moves involve distances of 200 km (roughly 125 miles) or more. Note that similar data is not readily available for moves just within England, because tabulations for England's migrant residents include those moving from Wales and Scotland (though not outside Great Britain because of the absence of a precise origin point to measure distance from).

Table 3.6 Within-England changes of address, by type of move, 1990-91

Type of move	Known origin only		Incl origin not stated	
	%	cum %	%	cum %
Within Census ward	25.3*	25.3	19.8	19.8
Between ward within district	38.2	63.5	41.0	60.8
Between district within county	13.5	77.0	14.5	75.3
Between counties within region	11.4	88.4	12.3	87.6
Between standard regions	11.6	100.0	12.4	100.0

Note: * includes all 'origin not stated' migrants; cum = cumulative

Source: calculated from 1991 Census Great Britain, Migration Part I, Tables 1 and 3, and Great Britain National Report, Table 15. Crown copyright.

Table 3.7 Within-Britain changes of address, by distance of move, 1990-91

Distance of move (km)	%	Cumulative %
0-4	47.1	47.1
5-9	13.2	60.3
10-49	14.4	74.7
50-199	12.4	87.1
200+	12.9	100.0

Source: calculated from 1991 Census. Crown copyright.

Table 3.8 Within-England migration, by region and type of move, 1990i91

Standard region	Migrant residents	Within region	Into region	Out of region	Net for region	In-migrants as % of migrant residents
North	236.6	208.4	28.2	27.2	+1.0	11.9
Yorks & Humb	397.8	346.8	51.0	51.8	-0.9	14.7
East Midlands	318.5	259.1	59.4	53.2	+6.2	18.6
East Anglia	195.0	152.1	42.9	31.5	+11.4	22.0
South East	1,506.5	1,378.3	128.2	160.6	-32.4	8.5
South West	443.2	360.8	82.4	61.7	+20.7	18.6
West Midlands	377.1	328.2	48.9	50.3	-1.3	13.0
North West	463.3	414.9	48.3	53.0	-4.7	10.4
England	*3,937.8*	*3,448.5*	*489.3*	*489.3*	*0.0*	*12.4*

Note: all data relate to migrants with a known origin within England. Data in thousands, except for final column. Data may not sum because of rounding.

Source: calculated from 1991 Census Great Britain, Migration Part I, Table 1. Crown copyright.

Table 3.8 provides a regional breakdown of the Census-recorded within-England migration for 1990/91, omitting the 'origin not stated' moves. This reveals the predominance of within-region migrants among each region's migrant residents, though the proportion of in-migrants varies considerably, mainly according to the size of the

region (larger regions having more within-region moves) and the scale of net migration gains (gaining regions have more in-migration than losing regions). The proportion of in-migrants is largest for East Anglia, at 22%, followed by the South West and East Midlands, and is lowest for the South East, at 8.5%.

Table 3.8 also shows the gross turnover of between-region migrants in the pre-Census year and the level of net population change which these produced for each region and England as a whole. In all, just under half a million (489,000) people were recorded as moving between regions in that twelve month period. (Note that this makes no allowance for the underenumeration of migration and omits migrants with no stated origin, which together would add an extra 106,000 migrants on the assumption of these two elements being evenly spread across the recorded migrant population). The biggest absolute effect of this movement in net terms was a loss of 32,000 people by the South East. The other large absolute changes were the gains by the South West, East Anglia and the East Midlands. Elsewhere the net change produced was nowhere greater than 5,000 people. The aggregate redistibution of population came to 78,600 people – calculated as the sum of the net changes ignoring the signs.

The NHSCR data permits similar analyses to be carried out for each year, giving an indication of how much both the gross and net levels of inter-regional migration vary over time. Table 3.9 presents the results for three years: 1988 (the most recent peak year of mobility), 1991 (close to the trough of 1990 and not affected by NHSCR computerisation) and 1994 (the latest year with an overall level of migration close to the long-term average). Among the main features shown by this table are the following:

- the somewhat lower volatility of between-region than within-region (between-FHSA) migration, with a particularly small upward shift between 1991 and 1994

- the relative consistency of regional levels of gross migration across the three years, with the 1991 level usually being lower than the other two years

- the main exceptions to this generalisation being the low level of in-migration to the North in 1994 and the low level of out-migration from the South East in 1994

- the marked reduction in the South East's level of net out-migration between the three years, and the apparent stabilisation of net in-migration at lower rates than in 1988 for East Anglia, East Midlands and the South West

- the acceleration or re-emergence of net loss for all other regions in the 1990s.

A similar analysis can be undertaken using a full regional matrix to compare the volume of flows between individual regions and how these fluctuate from year to year. Initial exploration of data for the single year 1994 indicates that the largest absolute flows are of two sorts: firstly, between the large South East region and each other region and, secondly, between adjacent regions, such as between the North West and Yorkshire & Humberside, between Yorkshire & Humberside and the East Midlands, and between the West Midlands and the South West. A net flow matrix could also be generated to show the net direction of migration between pairs of regions and to identify the role of other regions in producing gains or losses of people for each region. Such an analysis

could also be disaggregated to the subregional geography available in the NHSCR dataset as a prelude to the formal modelling of migration flows.

Table 3.9 Within-England migration, by region and type of move, 1988, 1991 and 1994, thousands

Standard region	Year	In & within	Within	In	Out	Net
North	1988	74.8	31.6	43.2	48.6	-5.4
	1991	73.1	29.8	43.3	42.0	+1.3
	1994	72.3	32.8	39.5	44.8	-5.3
Yorks & Humb	1988	144.8	58.6	86.2	80.8	+5.4
	1991	130.6	53.0	77.6	76.8	+0.8
	1994	137.1	57.7	79.4	83.5	-4.1
East Midlands	1988	129.7	29.8	99.9	82.9	+17.0
	1991	108.1	25.0	83.1	74.4	+8.7
	1994	117.4	28.2	89.2	79.3	+9.9
East Anglia	1988	77.6	12.9	64.7	49.9	+14.8
	1991	66.0	11.6	54.4	43.7	+10.7
	1994	68.8	12.4	56.4	46.8	+9.6
South East	1988	796.2	583.0	213.2	274.1	-60.9
	1991	690.8	502.6	188.2	221.7	-33.5
	1994	767.3	566.2	201.1	216.1	-15.0
South West	1988	182.3	51.3	131.0	94.2	+36.8
	1991	152.8	44.9	107.9	85.9	+22.0
	1994	163.9	50.3	113.6	90.9	+22.7
West Midlands	1988	151.2	74.8	76.4	82.0	-5.6
	1991	141.1	68.9	72.2	75.8	-3.6
	1994	147.3	73.7	73.6	82.8	-9.2
North West	1988	189.2	103.1	86.1	88.4	-2.3
	1991	167.2	90.7	76.5	82.7	-6.2
	1994	173.7	95.0	78.7	87.2	-8.5
England	*1988*	*1745.8*	*945.1*	*800.7*	*800.7*	*0*
	1991	*1529.7*	*826.5*	*703.2*	*703.2*	*0*
	1994	*1647.8*	*916.3*	*731.5*	*731.5*	*0*

Source: calculated from NHSCR data. Crown copyright.

Two further features derived from Table 3.9 merit comment. First, the volume of inter-regional turnover in 1991, at 703,200, is substantially higher than that recorded by the Census (489,000 in Table 3.8). This can be attributed to three factors – the undercounting and 'origin not stated' elements of the Census (which, if allowed for, would have raised the Census figure to around 595,000); the difference in periods covered (with the likely increase in residential mobility during the last three quarters of 1991 after the Census); and the difference in coverage of migration (with the Census including Armed Forces but excluding students moving to and from a termtime address, children under 1, migrants who die and multiple moves in the year).

Secondly, even using the larger volumes of migration indicated by the NHSCR, the level of net inter-regional population shifts generated by within-England movement in the 1990s is probably somewhat less than that produced by external migration. The sum of regional population change effects produced by between-region migration in 1994 (ignoring the signs) comes to 84,300. By contrast, the total net regional impact of international migration in 1994 was well in excess of 100,000, comprising 60,400 for the IPS-based element and a large proportion of the UK's 54,900 visitor switchers. On this basis, in the middle of the 1990s, the various elements of international migration have been having a more important impact on standard-region population numbers than migration within England or, indeed, migration within the UK, since the regional population shifts caused by migration between England and the rest of the UK summed to less than 6,000 in 1994.

This point is, however, less valid in terms of gross turnover in 1994-95, with international migration comprising around 450,000 arrivals and departures altogether, migration with the rest of the UK around 210,000, and migration between the eight standard regions around 1.46 million (counting each of the 731,500 within-England moves twice as an exit from an address in one region and an entry to an address in another). Finally, the point becomes less valid as the geographical scale of analysis is moved from regional to subregional level, for while international migration's role in producing population change probably increases only slightly at finer scales, internal migration's role increases enormously. For this reason, in the following reviews of the patterns and the characteristics of within-England migration, all geographical scales are included.

3.5.3 Geographical dimensions of internal migration

This section draws mainly on two previous surveys: the migration section of *Urban Trends in England*, an Urban Research Report prepared for the DOE by Atkins *et al* (1996), which was very largely based on 1991 Census data, and the article on migration prepared as part of ONS's latest 'Population Review' (Champion, 1996a), which also included analyses of NHSCR data to 1994 – which remains the latest year for which the most detailed published data on migration flows between regions and counties are available.

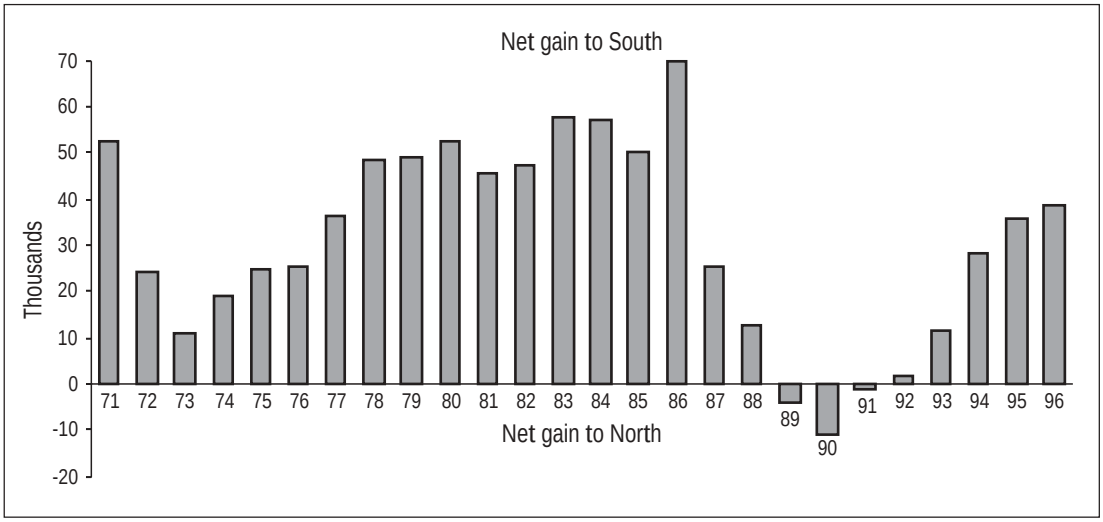
The account below identifies three main dimensions of net population redistribution produced by internal migration – north-south drift, urban-rural shift and local urban decentralisation – and goes on to examine the nature of the national migration system which is based on the country's major urban centres notably London. Some of the analyses relate to England & Wales or to the whole of Great Britain, but England so dominates the overall picture that this will not affect the conclusions drawn; England-specific data would, however, be needed for insertion into any modelling work, subsequent to the current project.

(i) North-south drift

The long-term trend of southward drift has continued over the last couple of decades. The net gains made by the south (defined as the four standard regions of South West,

South East, East Anglia and East Midlands) from its migration exchanges with the rest of the UK totalled 465,000 between 1981 and 1996, an annual average of around 29,000 over this 16-year period. On the other hand, the level has fluctuated over time as indeed has the direction of the net balance (Figure 3.4). In particular, there is a sharp contrast between the peak inflow of 69,600 to the south in 1986 and the four years of virtually no net redistribution in 1989-92, including two years with a net transfer from south to north. The resurgence of the southward drift after 1992 clearly indicates the pre-Census year 1990/91 are being untypical in both geographical pattern of flows as well as overall volume of movement, but it is too early to suggest that this portends a re-run of the experience of the mid to late 1970s.

Figure 3.4 Net migration between the South and the rest of the UK, 1971-96

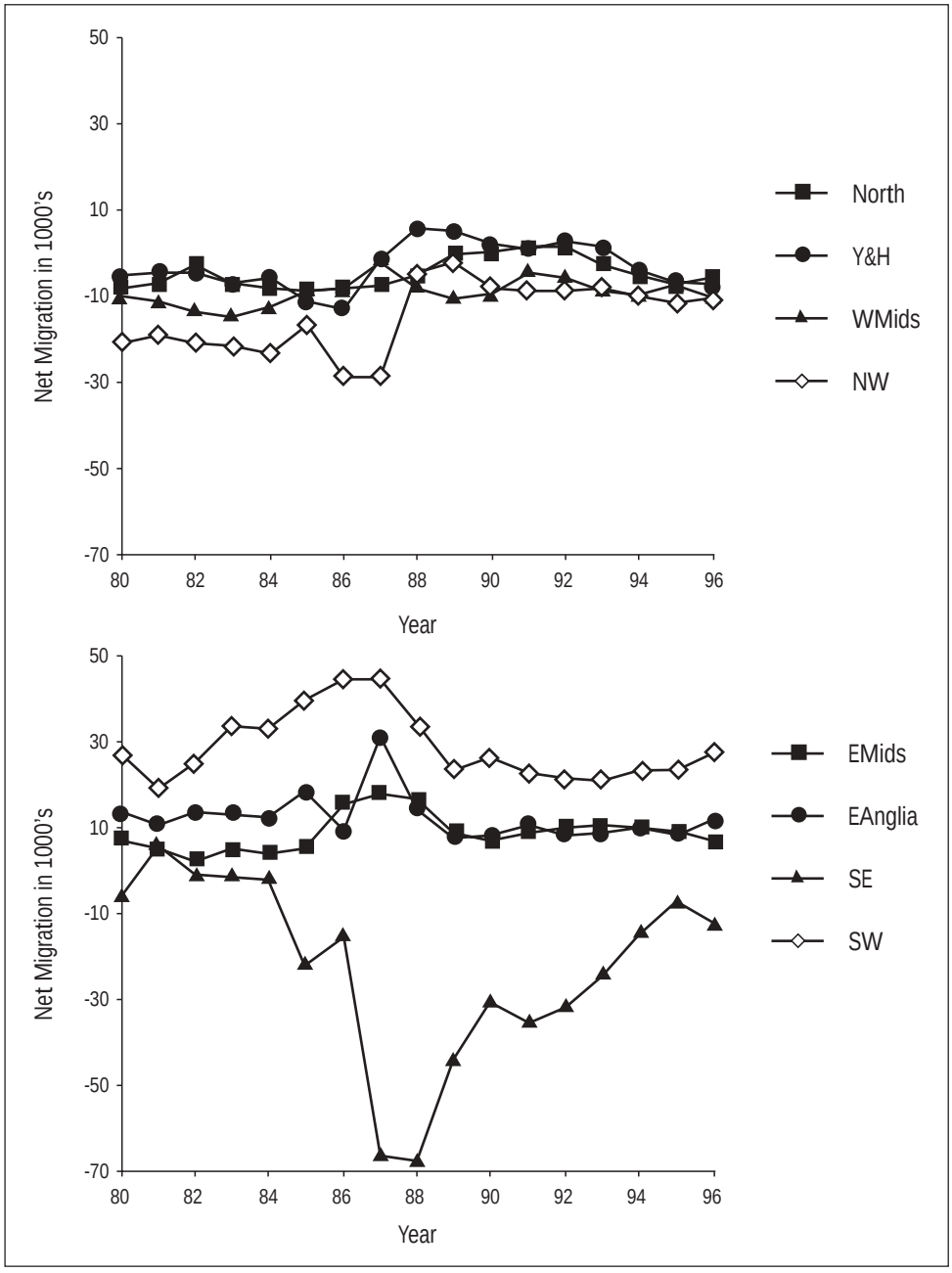


Source: calculated from NHSCR data. Crown copyright.

The experiences of England's eight standard regions are compared in Figure 3.5. In absolute terms it is clear that the largest shifts of population through net migration with the rest of England and Wales have been taking place in the southern half of the country (lower panel), with the South East recording net loss in all but one of the 15 years shown and the other three regions gaining throughout the period. The South West saw a sustained increase in net gains from 19,000 to 44,000 between 1981 and 1987, but the level has subsequently fallen back to 20,-25,000 a year. East Anglia and the East Midlands have recently been averaging gains of around 8,-10,000 a year, following a relatively short-lived surge in 1986-88. The dominant feature, however, is the trend of the South East, with the sudden and massive rise in its net exodus after 1984 and its slow but fairly steady return to lower rates of loss since 1991.

By contrast, the other four regions (Figure 3.5, upper panel) have followed trajectories with much less range both between each other and over time. The latter half of the 1980s, however, seems to split the period into two, with an upward shift in net migration in all its four regions – most marked in the North West and Yorkshire & Humberside and least so in the West Midlands. These changes shifted the North and Yorkshire & Humberside into net gain for the first part of the 1990s, but by 1994 all four regions were back to the more familiar pattern of net losses – at levels similar to those of the early 1980s, apart from the still much reduced volume of loss in the North West.

Figure 3.5 Net migration with the rest of England and Wales, 1980-94



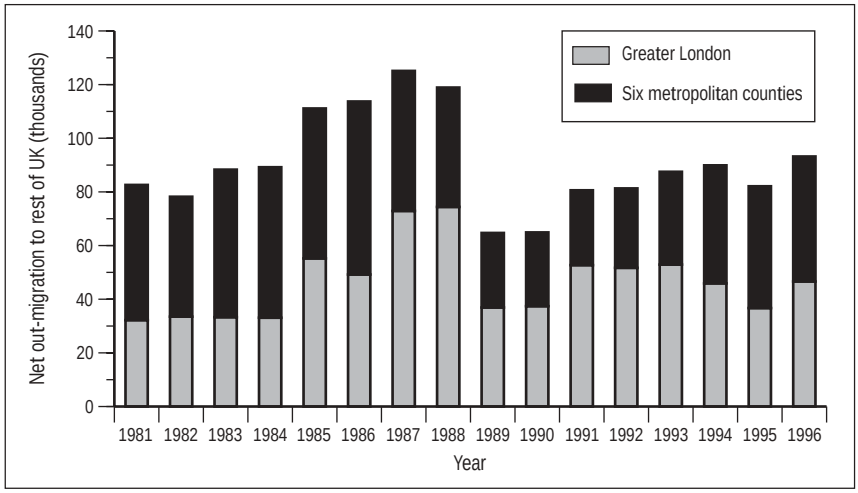
Source: calculated from NHSCR data. Crown copyright.

(ii) Urban-rural shift

Net migration out of England's metropolitan areas (including Greater London) has proved somewhat steadier than the north-south drift and involves substantially larger numbers of people. In the period 1981-94, the six metropolitan counties and Greater London together recorded a net loss to the rest of the UK of nearly 1.5 million people, an average of over 90,000 a year (Figure 3.6). Of the total, almost half (727,000) was generated by London alone and 740,000 by the others combined. The peak rate of overall metropolitan loss in 1987 was almost twice the levels of 1989 and 1990. On the other hand, the fact that across all seven counties and the 14 separate years there was only one instance of net gain (an increase of just 189 people for Greater Manchester in

1989) is indicative of the widespread and persistent nature of this dimension of population redistribution.

Figure 3.6 Net within-UK migration, 1981-96, for metropolitan England, thousands



Source: NHSCR data supplied by ONS. Crown copyright.

Further evidence of the importance of the urban-rural shift is provided by the analysis of Census-based net migration rates for a classification of local government districts arranged on an essentially urban-to-rural continuum, though admittedly districts are difficult to classify on a meaningful basis and there may be more diversity within district types than between them. Despite this and the fact that the year leading up to Census night in April 1991 featured abnormally low net outflow from metropolitan areas (from Figure 3.6), there was a very clear contrast between district types at this time, as shown in Table 3.10. All six of the metropolitan and city district types registered net migration losses to elsewhere in Great Britain, and net gains were recorded by all seven of the less urban categories. Moreover, in terms of the actual rates of net loss, there was a close relationship between rates of migratory change and metropolitan/urban status, with the 'most remote rural' category gaining at the highest rate and with the highest rates of loss being incurred by London (notably Inner London) and the other principal cities of metropolitan Britain.

The prevalence of net internal migration shifting population down the urban hierarchy is demonstrated even more impressively by analyses which examine net exchanges of migrants between all possible pairings of the 13 district types, 78 in all. Champion and Atkins (1996) found that the vast majority of these net exchanges were positive, signifying net migration from higher up the hierarchy to further down. A fair proportion of the 12 exceptions were between district types that are adjacent to each other in the urban hierarchy, probably reflecting a rather indeterminate relationship on the wider urban-rural scale. This overwhelming emphasis on down-the-hierarchy shifts prompted them to label this phenomenon the 'counterurbanisation cascade', though the analogy is not so much with water pouring successively from one level to the next as with a more diffuse pattern with each level supplying almost all the lower ones to some extent. Thus, at the base of the hierarchy, the Most Remote Rural category was found to be a net gainer from all 12 higher levels, while at the other extreme Inner London was a net supplier to all other categories except the Principal Metropolitan Cities (the largest northern cities) and the Large Non-metropolitan Cities.

Table 3.10 Net within-Britain migration, 1990-91, by district types

District type	Population 1991	Net migration 1990-91	%
Metropolitan Britain	*19,030,230*	*-85,379*	*-0.45*
1 Inner London	2,504,451	-31,009	-1.24
2 Outer London	4,175,248	-21,159	-0.51
3 Principal metropolitan cities	3,922,670	-26,311	-0.67
4 Other metropolitan districts	8,427,861	-6,900	-0.08
Non-metropolitan Britain	*35,858,614*	*85,379*	*0.24*
5 Large non-metropolitan cities	3,493,284	-14,040	-0.40
6 Small non-metropolitan cities	1,861,351	-7,812	-0.42
7 Industrial districts	7,475,515	7,194	0.10
8 Districts with new towns	2,838,258	2,627	0.09
9 Resort, port & retirement	3,591,972	17,736	0.49
10 Urban/rural mixed	7,918,701	19,537	0.25
11 Remote urban/rural	2,302,925	13,665	0.59
12 Remote rural	1,645,330	10,022	0.61
13 Most remote rural	4,731,278	36,450	0.77

Note: 'metropolitan' includes the Central Clydeside Conurbation.

Source: Champion and Atkins (1996). Originally calculated from 1991 Census SMS and LBS/SAS (ESRC/JISC purchase and Crown copyright).

Moreover, the 'counterurbanisation cascade' is not just a national-scale process dominated by London, but is equally a feature of population redistribution within separate parts of the country. Within southern England (East Anglia, the South East and the South West), 45 of the 55 pairings of district types represented there were characterised by net down-the-hierarchy migration flows, 81.8% of the total. The equivalent figures for the Midlands & Wales were 42 out of 55 (76.4%) and for northern England 35 out of 45 (77.8%).

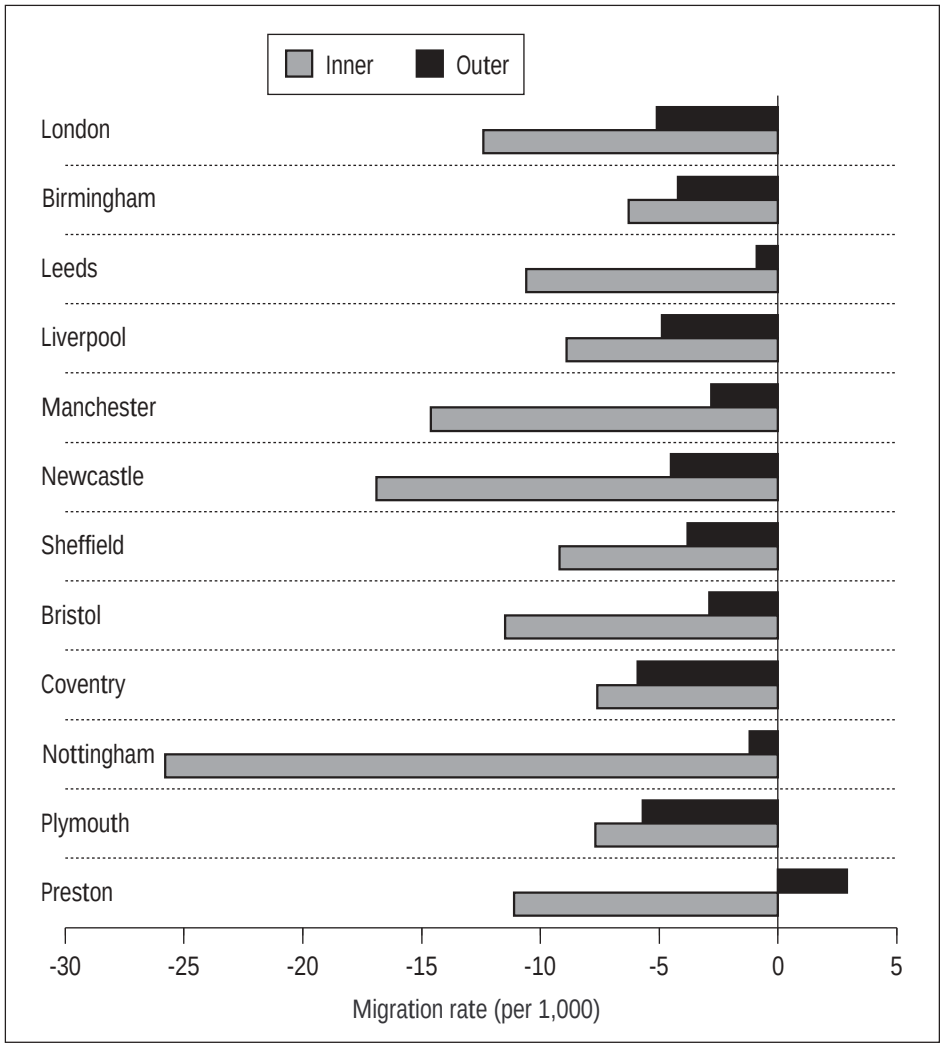
(iii) Inner city decline

The inner areas of Britain's larger cities have been losing population through suburbanisation for decades. This could be viewed as just one element in the wider process of population redistribution between settlements as discussed under the label of 'counterurbanisation cascade'. Nevertheless, it is worth focusing on this separately because of the generally localised nature of this part of the process and the fact that it has had such high policy salience for the past two decades. It also provides a particularly good example of situations in which short-distance movements, while being excluded from statistics on regional population change, can produce substantial geographical redistribution of population and be associated with big changes in housing occupancy and needs.

Evidence from the 1991 Census, which allows migration flows to be detected between parts of individual local government districts as well as between them, indicates that this process continues despite the efforts made by successive governments since the mid 1970s to regenerate these areas. It has already been seen (from Table 3.10) that Inner London boroughs lost the equivalent of 1.24% of their total population through net out-migration to the rest of Great Britain in the pre-Census year. Figure 3.7 shows that this experience is

very common across urban England, with the Urban Priority Areas of all six Principal Metropolitan Cities and five other large cities registering net out-migration to the rest of Britain. Moreover, in all but one case (Preston), the remainder of these eleven local authority districts were also losing population through these migration exchanges but all at lower rates than for their inner cities, indicating a relative decentralisation process (ignoring the effects of international migration and natural increase).

Figure 3.7 Net migration rates, 1990-91, for the inner and outer areas of twelve cities



Source: Atkins et al (1996). Originally calculated from 1991 Census Special Migration Statistics (ESRC/JISC purchase and Crown copyright).

(iv) Sub-regional patterns of population turnover and net migration

In between the level of the standard region at the upper end of the scale and the patterns of suburbanisation and local decentralisation that are most prominent within individual districts, or sometimes counties, there is the sub-regional level. This is represented in a variety of different ways according to purpose and data availability. In analytical terms this is the level used for identifying market areas in terms of commuting and high-order retailing. For population analysis and housing provision, the county is the basic unit outside metropolitan England, as this forms the lowest level at which official population

and household projections are produced and which provides the basic framework for central government strategy on the distribution of new housebuilding needs. County-level patterns of migration tend to reflect the dominant dimensions of movement described above. This section highlights a small selection of features.

The most familiar feature is the county-level pattern of population change produced by net within-Britain migration. As shown in Champion (1996a Figure 6 (c)), this primarily bears the imprint of counterurbanisation, with Greater London as the heaviest net loser, with losses also being experienced by the other metropolitan counties and a small number of others – Berkshire, Bedfordshire, Cleveland, Kent, Leicestershire and Nottinghamshire in 1990/91. Generally, it is the less heavily populated counties in the South West, East Anglia and the Midlands that have experienced the fastest relative rates of population increase through internal migration, but in most years it remains the shire counties around the edge of the 'Greater' South East which have experienced the highest absolute migration gains.

Less well known perhaps is the scale of population turnover resulting from migration between counties, particularly the fact that some of the highest rates of gross out-migration occur for the fastest-growing counties. The highest rates found from 1991 Census data were for the large block of counties on the western side of the South East, stretching from Hampshire to Warwickshire and Cambridgeshire and from Wiltshire to Surrey and Hertfordshire. Rates of out-migration less than half their level occur in Cleveland, Greater Manchester, Humberside, Merseyside, and West Yorkshire (Champion 1996a, Figure 6 (b)). Basically, areas of long-term net out-migration tend to be left with higher proportions of less migratory people and older age structures than fast-growth areas which are attractive to young, mobile people with a greater tendency to move on again.

London, and the South East region generally, plays an extremely important role within the national migration system, not just because of its size but also because of its key role in the country's life. Most other urban centres supply more migrants to the London region than they do to any other single county or city, except perhaps to their immediate neighbours. In return, London is often their major supplier of in-migrants, though migration from London tends on average to be more concentrated on other parts of the 'Greater' South East than the pattern of movement to London.

At the same time, the high level of out-migration from London appears to be related to some extent to external migration (see sections 3.3 and 3.4). Over the period 1987-94, while London was losing around 55,000 people a year through migration with the rest of England and Wales, it gained around 2,000 a year from the rest of the UK and over 37,000 a year through net immigration from the Irish Republic and overseas, reducing the overall migration deficit to just under 18,000 a year. Though it is difficult to prove, it is presumed that the high level of out-migration is either caused or at least facilitated by the large net immigration gains, meaning that anticipation of future patterns of internal migration should try to bear in mind the likely scale of international migration affecting London.

Finally, though net in-migration is a major source of population growth for much of England outside London and the metropolitan counties, it is important to recognise that many non-metropolitan counties are also seeing their populations grow through natural

increase and that the latter is the more important source of population growth for some, particularly counties like Berkshire and Oxfordshire where earlier in-migration has led to a large second-generation population entering family-building age. At the other extreme, there are several counties, most notably those associated with retirement in-migration along the South Coast, which require the continuation of quite high levels of in-migration merely to offset their high natural deficits.

3.5.4 Selectivity of internal migration flows

Within-England migration, just as much as international migration and movement between England and the rest of the UK, tends to be a highly selective process. Some types of people are on average much more likely to change address in a given year than others, while the composition of flows between pairs of places can often be skewed toward certain groups. Sometimes the flow in one direction is significantly different from that in the opposite direction, giving rise to a marked net effect on the two places. Such uneven impacts can, in some cases, maintain or even reinforce an already unbalanced population structure, while in others they can cause a marked modification of population profiles. In this review examples are given of each of these features, with Chapters 4 and 5 following up with explanations and modelling implications.

The most basic and important example of people's differential propensity to move home is that of age. Almost half of all moves within England are undertaken by people aged 16-29 despite the fact that they make up under one-fifth of the total population. The mid 20s forms the most mobile age group of all, with three times the under-16s' average chance of moving and six times that of those aged 40 and over. As examined in more detail in Chapter 4, this is a well-established international phenomenon, as also are the higher migration propensities of professional and managerial workers, those with higher education qualifications and people living in private-rented accommodation, while the picture is less clear cut for the unemployed and non-white ethnic groups. Furthermore, between-group migration differentials alter with distance of move; for instance, with young adults and retirees being the groups most disposed to long-distance migration and young families and the very elderly to short-distance moves.

In geographical terms, selectivity manifests itself in a variety of distinctive streams of migration, particularly over longer distances. Movement of Armed Forces personnel and their dependents between military bases traditionally stands out in Census-based analyses of migration between counties and smaller units, forming clear outliers in modelling exercises, though their effect is less noticeable if standard regions form the unit of analysis or if attention is focused on people aged 30 and over. Similarly, certain ethnic minority groups tend to follow distinctive migration paths that reflect their concentrated geographical distribution between and within regions and the fact that their members tend to move between the places where they are already well represented (see Chapter 4 for more details).

University students form another distinctive group, notably in analyses of NHSCR-based migration data, though their effect is also apparent in Census data despite the intention of recording students at their parental address (see Chapter 2). Students show up particularly strongly among flows to areas with 'campus' universities set in essentially rural regions where there is little in-migration of other young adults and also where

large universities dominate their towns; for example, Oxford, Cambridge, Canterbury, Durham and Exeter. In the largest cities, notably London and the largest provincial cities, however, these migrants merge with the general inflow of other school leavers and young adults seeking jobs, independence and 'bright lights'.

Retirement migration gives rise to another highly distinctive set of migration streams. It is different from the two just mentioned because of its unique spatial patterning. Whereas Armed Forces personnel migrate between a small number of points and student movements involve a focusing of moves from a wide area into relatively small number of places, most retirement-related migration originates from a quite small number of more pressurised metropolitan regions and spreads itself across a wide range of rural and/or coastal locations, albeit with the South West being the single most popular destination. A second distinctive feature is that retirement migration – much more than any other type – tends to be a one-way process. Very few people around retirement age tend to move in the opposite direction and indeed there is rather little return movement by the retirement migrants themselves in later stages of their lives. This process, therefore, is considered highly 'efficient' in the jargon of migration theory and will have significant impacts on the population profiles at both ends of the flows but particularly on those relatively small towns and villages on the receiving end. On the other hand, once these migration streams have been in operation for a while, further arrivals of retirees will serve to maintain the altered population size and structure as the previous arrivals grow older and die.

By far the largest type of migration stream, however, is that of suburbanisation and longer-distance metropolitan decentralisation, or 'counterurbanisation'. This is distinctive in both its demography and its social and cultural characteristics, predominantly involving better-off families headed by 25-44 year olds who can afford to buy their own homes and seeing rather little participation by low-paid workers and members of ethnic minority groups, though the latter have in recent years become more significant among flows to the older suburbs. As mentioned earlier in the chapter, this is nowadays by no means a purely local process, as substantial numbers of 'counterurbanisers' cross county boundaries and, at some times more than others, also cross regional boundaries, most notably into the 'Greater South East' from London and the Home Counties.

These examples are sufficient to emphasise that the modelling and forecasting of within-England migration must handle the characteristics of the migrants as well as the overall volume of movement. Among the main features which these tasks need to take into account are the following.

- Net migration from north to south involves mainly young adults coming from professional and managerial families and destined for occupations similar to those of their parents.

- Those leaving the larger cities are primarily wealthier White families with children, with a secondary group of home-owning couples in their 50s and early 60s who tend to move longer distances into remoter and less heavily populated localities.

- Migration within England, to a large extent, forms a single system of flows which interact over space and time and which are dominated by London and the South East in what Fielding (1993) terms the 'regional escalator' effect (see Chapter 4).

- Separate groups of people are characterised by distinctive migration behaviour, such as Armed Forces personnel and university students, while other groups have very little involvement in long-distance migration.

3.6 Conclusions

This chapter has examined the main features of migration affecting the regional and local distribution of population in England. Where possible, it has attempted to differentiate the international component from internal migration and from exchanges between England and the rest of the UK. Throughout the chapter, bearing in mind the ultimate goal of anticipating future changes in regional populations and their housing implications, particular attention has been given to the scale of the standard region, reporting on observations made from customised analyses of data published by ONS. At the same time, it is clear that some major changes are taking place in population distribution within standard regions which cannot fail to be closely linked to changes in housing provision and housing needs.

The principal findings from the above review include the following. In the first place, migration is nowadays a major force for population change at all spatial scales in England. At national level migration added more to population in 1994/95 than natural change, though its contribution had been running at about one-third of national increase over the previous decade. Its contribution to population redistribution within England becomes progressively greater at finer spatial scales, because the vast majority of residential moves takes place over relatively short distances and most of the largest net population shifts produced by migration are those arising from suburbanisation and longer-distance urban deconcentration, involving mainly redistribution within or around individual urban areas or between settlements within the same standard region.

Leading on from this is the extent to which the relative importance of the different types of migration varies between geographical scales. If the focus is on the scale of the standard region (eight in England with Greater London being treated as part of the South East), then it is clearly international migration (exchanges with countries outside the UK) that in the 1990s has formed the principal contributor to the migration component of population change. Migration between England and the rest of the UK has involved less than half the gross numbers of migrants participating in international exchanges and has produced very little net change in regional populations, while inter-regional migration within England involves far more people changing address than does international migration but produces less net redistribution between regions. By contrast, internal migration continues to play a much more important role than international migration at more disaggregated spatial scales.

Going beyond nationwide generalisation, however, it is important to note that the role and relative importance of the three main types of migration varies considerably between standard regions. Table 3.11 summarises the regional changes recorded by the continuous monitoring procedures for 1994. It should be noted that these three sets cannot be summed to give each region's total migratory change because the figures omit the significant component of net immigration that is not counted by the IPS as well as certain elements of internal migration, notably movement of prisoners and Armed Forces personnel and their families (see Chapter 2). On this basis, it can be seen that the South West, East

Anglia and the East Midlands normally gain from both internal migration and international exchanges (when the visitor switcher element is added in), the three regions of northern England normally lose people through internal migration while probably averaging very little net change through international movements (regional disaggregation of visitor switchers is needed to confirm this). Meanwhile, the South East occupies a highly distinctive position in averaging substantive net out-migration to the rest of England while receiving the lion's share of net immigration, though the volumes of both have fluctuated considerably over the past decade. Finally, the West Midlands is closest to the South East type. As mentioned previously, the exchanges with the rest of the UK are minor compared with within-England movements and generally follow the same net pattern as the latter.

Table 3.11 Recorded migration, by region, 1994

Region	IPS-based international migration			NHSCR-based migration within England			NHSCR-based migration with RUK		
	in	out	net	in	out	net	in	out	net
North	6.1	4.8	+1.3	39.5	44.8	-5.3	6.8	7.5	-0.7
Yorks & Humb	12.5	9.8	+2.7	79.4	83.5	-4.1	8.1	8.4	-0.3
East Midlands	12.4	8.3	+4.1	89.2	79.3	+9.9	7.2	6.8	-0.4
East Anglia	14.8	8.0	+6.8	56.4	46.8	+9.6	4.1	3.9	+0.2
South East	127.7	105.6	+22.2	201.1	216.1	-15.0	36.3	36.6	-0.3
South West	14.3	12.2	+2.0	113.6	90.9	+22.7	14.0	13.0	+1.0
West Midlands	17.9	9.9	+8.0	73.6	82.8	-9.2	11.2	12.2	-1.0
North West	16.8	11.3	+5.5	78.7	97.2	-8.5	15.7	17.6	-1.9
England	*222.4*	*169.8*	*+52.6*	*731.5*	*731.5*	*0.0*	*103.4*	*106.0*	*-2.6*
*Net redistribution**			*52.6*			*84.3*			*5.8*

Note: IPS-based counts exclude net immigration of asylum-seekers, visitor switchers and exchanges with Irish Republic (46,500 for UK). Data may not sum because of rounding.

* Net redistribution refers to sum of net changes ignoring sign.

Source: calculated from ONS series MN and VS/PP1. Crown copyright.

In relation to internal migration, the most important finding in relation to the 1990s patterns is the subdued scale of inter-regional shifts in population compared to previous experience. While this may be partly due to the stage reached in the economic cycle and the rather distinctive regional incidence of the latest economic recession, it contrasts with the trend in the net exodus from England's main metropolitan centres which quickly resumed its long-term average after the late-1980s cutback, leading to the resumption of strong migratory growth in the shire counties of southern England and of similar pressures on the suburban and outer city areas around most of the country's other large urban centres.

It is also important to bear in mind that a substantial proportion of the shifts in population between standard regions, at least as far as the gross movements of people are concerned, is likely to be due more to the types of determinants that govern shorter-distance moves (e.g. housing and environmental factors) than to the job-related reasons that are traditionally associated with long-distance migration. Certainly, the level of migration into the South West and East Anglia fluctuates over time in a manner very similar to the volume of net flow between Greater London and the rest of the South East. Moreover, elsewhere in the country, the largest inter-regional movements are between adjacent

regions and, indeed, between adjacent counties on either side of regional boundaries. Beyond this, there is clear research evidence of the various population movements being linked together to form a single national urban system, notably in the form of London's pivotal role and in terms of the 'counterurbanisation cascade'. This is a system in which international migration is increasingly being seen to be playing a key role, with net immigration believed to be highly focused on the inner areas of London and a relatively small number of other places that in turn are losing population to other areas through internal migration.

This, then, provides the context for our discussion of the determinants of migration flows and the modelling of migration. It is clear that migration is a complicated process, in which one type of migration overlaps spatially with other types. In particular, inter-regional movements can include intermediate- and short-distance moves between adjacent regions as well as long-distance migration, so modelling needs to be able to embrace all these elements and their separate determinants simultaneously. There is also the possibility that one type of migration can be related to other types causally, as happens when it leads to population pressures which prompt a response from a different type of migration. Therefore, migration can be understood and modelled successfully only if it is acknowledged that the inflows to and outflows from particular places comprise a variety of types of migration and that one part of the migration system cannot readily be studied in isolation from the others.

CHAPTER 4: DETERMINANTS OF MIGRATION

4.1 Introduction

This chapter reviews the literature on the determinants of migration, concentrating on the results of analyses of migration affecting England and drawing, where appropriate, on work carried out on other countries. The determinants will be categorised as follows: demographic factors, social and cultural factors, economic factors, housing factors, spatial and environmental factors. Attention will be drawn to the influence of public policy on these determinants. It should be stressed that in most situations these factors play simultaneous roles of differing significances, depending on the context in space and time. Ideally, when constructing models of the migrations made by individuals and households, all of these factors need to be taken into account though it is rarely possible to do so. In this overview section we consider briefly some general frameworks that have been used to guide analysis of migration determinants internationally before plunging into the more specific findings of the empirical literature in subsequent sections.

Lee (1966) in his classic paper 'A theory of migration' conceptualises migration as involving origins, destinations and the links between them. The characteristics of the origin act to 'push' the individual into migration, while the attributes of the destination serve to 'pull' the migrant to a particular location. The separation between origin and destination imposes a cost on the migration either directly, as in the removal cost or cost of searching for a job or home, or indirectly through affecting the amount of information available about a destination at an origin. Some links have barriers on them which limit migration (e.g. a national border or differences in language between origin and destination) while other links have channels which smooth migration (relatives or friends who have gone before, common language or history or culture). This conceptual framework leads naturally to the development of macro models of the spatial interaction type which are discussed in detail in Chapter 5.

The push and pull characteristics of the origins and destinations include the attributes of their housing markets, job markets, educational 'markets', and residential, amenity and climatic environments. These attributes, however, are perceived and acted upon in varying ways by different population sub-groups. A persistent theme in the studies of migration is a search for and explanation of individual or household attributes which increase or decrease the propensity to migrate. The origin and destination attributes are evaluated very differently by, for example, young adult migrants and migrants around retirement age (Rees *et al.* 1996, Warnes and Ford 1995).

Cadwallader (1989) has outlined a conceptual framework that links individual (micro) characteristics and the characteristics of places through perceptual filters that will mean that behaviour will be different to that predicted using the aggregate attributes of origins and destinations. For example, researchers used to be puzzled why there was not more migration from low- to high-income regions, but surveys of individuals revealed that they were very aware of cost of living differences between such regions, which reduce the economic returns from migration. Thus, studies of the determinants of migration at the individual level can help improve the specification of aggregate variables to be included in the macro models used for predicting the volume of migration between

places. In reviewing the factors affecting migration we present some evidence for relevant population group differentials and draw out the macro implications of such differentials for places as well.

Two issues need to be addressed when the significance of each determinant is assessed. The first is the extent to which the role of time has been taken into account. The majority of studies of migration behaviour are cross-sectional, that is, they examine migration behaviour for one period in time. However, the factors affecting migration vary significantly over time and an understanding of temporal trends, cycles and variability is vital. We review important pieces of work in North America which look at migration behaviour over time in different ways (Pandit 1997 on cohort size effects and Milne 1993 on business cycle effects).

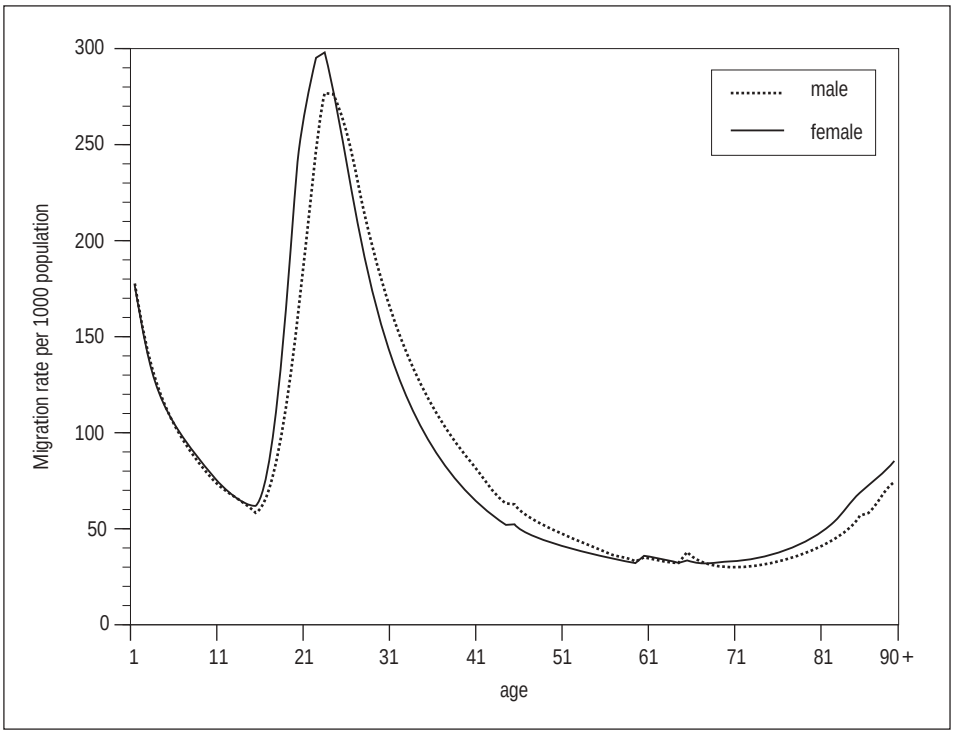
The second issue relates to whether it is individuals or households that are the actors in the migration process. Most studies examine the behaviour of individual migrants but many migrants will make the decisions and undertake the move as household groups rather than as individuals. However, only a part of migration involves the relocation of whole households. Migration often is the consequence of the transition of individuals between households: for example, two young people may leave their parental households to form a new couple, living in a new household. The relationships between household transitions and migration is a complex one and we review two modelling attempts to capture these processes (Duley and Rees 1989, Nijkamp *et al*. 1993). Our conclusion, however, is not encouraging. The data available at regional scale are simply not good enough to make feasible, at least in the short term, the construction of a full simulation model linking household transitions and migration behaviour.

4.2 Demographic factors

4.2.1 The role of age

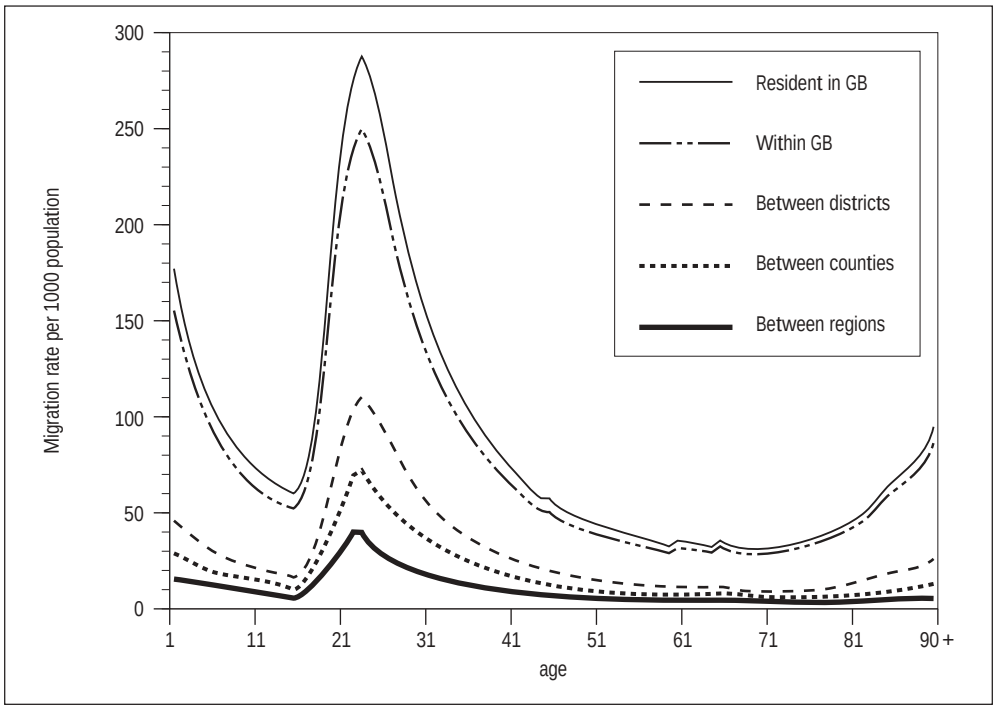
The main characteristics which are considered demographic are age and sex/gender. Age is a determinant which changes for the individual in a regular and irreversible way, while gender is fixed at birth and persists, in most cases, throughout life. Migration varies in a regular way with age in most developed countries at all scales from local to national. Figures 4.1 and 4.2 plot migration rates against age using data from the 1991 Census by gender and by spatial scale. Migration rates are high for young children, decline to a minimum at age 15, rise from age 16 to peak at around age 22, decline to a minimum in the 60s apart from a small rise around retirement for selected origin-destination flows and then rise in the 70s and 80s. These differences in migration rates by age have implications for the overall level of migration in a population as its age structure changes. Other things being equal, we should observe an increase and then a decrease in the level of mobility as a baby boom cohort passes through the ages of peak migration. This is may explain in part the rise in mobility in the late 1980s, when those born in the peak baby boom years (1962-67) were passing through the peak mobility ages (21-27). Table 4.1 shows that mobility is highest between 16 and 34.

Figure 4.1 Migration rates for migrants resident in Britain by gender, 1990-91



Source: Stillwell, Rees and Duke-Williams 1996 from 1991 Census, National Migration Tables, Crown Copyright

Figure 4.2 Migration rates by age for a variety of spatial scales, Great Britain, 1990-91



Source: Stillwell, Rees and Duke-Williams 1996 from 1991 Census, National Migration Tables, Crown Copyright

Table 4.1 Migration rates by age group, GB, 1986-87

Age group	Total population in age group (000s)	Intra-regional migrants (%)	Inter-regional migrants (%)
0-15	11,350	8.0	2.5
16-24	8,067	15.7	4.8
25-34	8,082	13.2	4.6
35-49	10,822	6.3	2.0
50-65	8,890	3.5	1.1
65+	8,431	2.9	0.8
All	*55,644*	*8.1*	*3.9*

Source: Table 2.6 in Owen and Green (1992) from the 1987 Labour Force Survey

4.2.2 The life course

Biological age, by itself, has no direct influence on the ability of a person to migrate. Rather, age is a surrogate indicator of a covarying set of conditions which has been termed the life cycle (now largely superseded), the life course (the most general concept) or the life career (a combination of family, work and other activity careers). The migration curve needs explanation from age 16 onwards; before that age childhood migration rates parallel those of their parents. Warnes (1992) has very usefully set out the life-course transitions and their associations with housing needs, distance of move and ages, though he stresses that the transition sequence should not be regarded as a description (or prescription) of everybody's life (Table 4.2).

Warnes and Ford (1995) have studied in some detail the migration behaviour and motivations of people in late life in south-east England. They show that the young-old and old-old have very different concerns about residential location and aspirations. Despite a depressed housing market in the year before the Census, there was evidence of the continuing elaboration and extension of long distance retirement age moves from the London Metropolitan Area (e.g. to Lincolnshire and Powys). Housing costs and locality factors dominate these migrations. For the older elderly proximity to carers and relatives is the main motivation for migration and the burdens of a garden also constitute a significant push factor. Urban decentralisation does occur but more diffuse and over shorter distance than for the retirement age migrants. One feature not previously recognised was the migration of late working age and early retired migrants to high status inner London Boroughs. There was no evidence of substantial return flow to the metropolis. The efficiency of elderly migration (high ratio of net flow to gross flow in any stream) was also noted by Rees *et al.* (1996, Table 17).

It is important to stress that there are significant differences in the age profiles of migration dependent on the distance of move which are not immediately apparent when plots such as those in Figure 4.2 are examined. Stillwell, Rees and Duke-Williams (1996) showed that persons in the working ages were significantly over-represented in inter-regional flows compared with the national standard and children and especially the older elderly significantly under-represented. These groups confine their migrations to shorter distances and remain within more local housing markets, as Warnes (1992) suggests (Table 4.2).

Table 4.2 Life-course transitions associated with household changes and migration

	Life-course transition	Housing needs and aspirations	Distance of moves (repeat frequency per year)	Ages (years)
1.	Leaving parents' home	Low-cost, short tenancy, central city, often share	Short and long distance; high frequency (1+)	16-22
2.	Sexual union	Low/medium-cost, tenancy few years	Short distance; medium f (0.3)	20-25
3.	Career position	Low-mortgage flat or house	Many long distance; medium f (0.5)	23-30
4.	1st child (good income)	Medium-mortgage 2+ bedroom house	Short distance; (long suburban move in large cities)	23-30
5.	1st child (low income)	Local authority flat or house	Very short distance	21-28
6.	Mid-career promotions or inheritance	Higher-mortgage, larger house	Many long distance; low (0.1)	30-55
7.	Divorce	Low-cost, short tenancy	Short distance	27-50
8.	Cohabitation and second marriage	Medium-cost rental or low-mortgage	Short and long distance; low (0.1)	27-50
9.	Retirement	Buy outright medium or low-cost house	Many long distance to periurban areas	55-68
10.	Bereavement or income collapse	Low-cost, rental or share in well serviced areas	Short distance or return migrations	70+
11.	Frailty or chronic illness	Low-cost, rental, share, congregate or institutional	Short distance; medium f (0.3)	75+

Source: Warnes (1992), p.184

Empirical illustration of the importance of the life course can be extracted from the case study of internal migration and regional population dynamics in the United Kingdom by Rees *et al.* (1996). Table 4.3 shows the net migration in hundreds into or out of areas grouped in terms of their density (persons per square kilometre).

Table 4.3 Net migration totals (100s) for wards/postcode sectors grouped into population density bands, male migrants, Great Britain, 1990-91

Ages	Destination density band (persons per sq.km)						
	0-<100	100-<500	500-<1000	1000-<2000	2000-<4000	4000-<6000	6000+
All	299	374	205	128	-153	-362	-492
1-15	49	57	19	20	-15	-46	-84
16-29	-40	-83	27	42	-8	-2	27
30-44	83	81	27	27	-35	-72	-109
45-PA	49	31	13	-1	-20	-33	-38
PA+	3	18	14	15	-6	-18	-26

Notes: PA = Pensionable age (65 for men in 1991, 60 for women)

Source: Table 17 in Rees et al. (1996).

The general relationship is for high density areas to lose migrants while low density areas gain migrants Table 4.3). This relationship applies to the family and later working

ages (1-15, 30-44 and 45-pensionable age). It applies to a lesser extent to males of pensionable age (65+) where there are only small gains to the lowest density areas. However, the relationship is very different for the age group 16-29, where there are migrant losses in the two lowest density bands and gains in the highest. There is a large outflow of late adolescents from rural, exurban and low density suburban areas to neighbourhoods in close proximity to higher education institutions which are usually of high population density. The age group also includes some families who migrate to the medium density suburbs and towns. These patterns confirm, by and large, the synthetic picture painted by Warnes (see Table 4.2).

4.2.3 Models of the age pattern of migration

The relationship between migration rates and age has been modelled in detail by the American geographer Andrei Rogers and collaborators (see Rogers *et al.* 1978, Rogers and Castro 1981, Rogers and Willekens 1986). The model decomposes the schedule of migration rates by age into five components: (1) a childhood component, (2) a labour force component, (3) a retirement component, (4) an old age component and (5) a base level. The first component is modelled by a negative exponential function of age and the fourth component by a single positive exponential function of age. The second and third components are modelled by double exponential with a parameter that positions the resulting peaked curve on the age axis. Finally, the base level is a constant reflecting the minimum level of migration. These components can be combined in various ways depending on the complexity of the empirical schedule being predicted. The simplest model represents components (1), (2) and (5) only and involves 7 parameters. Fitting the parameters requires a multi-dimensional search algorithm and single year of age data.

The Rogers-Castro model of the migration-age schedule has been widely used for smoothing erratic data, interpolation of missing values and disaggregation from broad to narrow ages. It has been employed in the Sub-National Population Projection model for England following a design by Bracken and Bates (1983) and Bates and Bracken (1987). This fits model schedules to observed age-specific out- and in-migration rate schedules: the resulting parameters were then fed into a cluster analysis, with areas being grouped into seven clusters in order to achieve spatial smoothing as well as age smoothing (Boden, Stillwell and Rees 1991). Model migration schedules were used at the destination as well as the origin to achieve adjustment of the migration flow to fit the in-migration profile given that only three broad age bands were used to distribute migrants from origin to destination.

The use of model migration schedules has been dropped from the revised Sub-National model being prepared by MVA Systematica and the London Research Centre (1996) in favour of 25 aggregated age group assignment matrices. It would have been fairly simple to have used either model migration schedules or national migration probabilities by single year of age to make estimates of the single year of age assignment probabilities. In certain age ranges, particularly 15-24, the destinations selected can change radically from one single year to the next. The MVA/LRC methodology does, however, allow the user of the software to select a certain number of single year age bands to capture this effect.

The Sub-National Population Projection Model recognises the importance of life course in determining the selection of destinations. In Chapter 5 we discuss experience with

different regional projection models in European countries and report the finding of Van Imhoff et al. (1997) that an 'OPCS-like model' capturing some origin-destination-age interdependency performed well compared with alternative formulations. The new MVA/LRC model goes further along the road to being a full multiregional model which captures all origin-destination-age interdependencies.

4.2.4 Gender differences

Differences between males and females have been noticed since Ravenstein (1885, 1889) wrote his important papers on migration in the nineteenth century. However, to say that women are universally more migratory than men was incorrect. It is necessary to standardise for age. Figure 4.1 shows that male and female rates are indistinguishable until age 16; female rates then rise faster and earlier to a slightly younger peak, declining below male rates in the late 20s and staying slightly lower until retirement. After retirement female rates exceed male rates again. These gender differences can be interpreted as a consequence of (1) men and women living together in families until leaving home, (2) women leaving home one to two years earlier than men and marrying/cohabiting with men about two years older and (3) men dying earlier and so escaping some of the migrations consequent on spousal death. The larger female population in the elderly ages when migration is rising probably tips the balance to give women a slightly higher crude migration rate. However, for the most part the differences are small because men and women migrate together for the majority of their lives.

However, even given this fact the question can still be asked about whether it is the man or the woman in a partnership who is the principal motivator in the migration. When one of the couple is an employed earner and the other is not, then relocation consequent on job change is the main motivation and has mostly been male led. However, dual career families are becoming more important and face difficult choices when matching two sets of career opportunities and residential locations. Green (1997) has studied the key factors influencing the location and mobility strategies of a small sample of dual career families with at least one partner employed in Nottingham. A good deal of trading-off of objectives is carried out by each couple, though if one person is in the primary labour market and the other in the secondary, the former's objectives usually take precedence. Dual career couples seek locations which give the partners maximum locational choice of jobs: accessible semi-rural locations close to motorways are favoured and partners are prepared to commute long distances by car in order to live in such areas. This strategy of fixing the preferred residential location and accepting long commutes is also important in the Netherlands where it is possible to live in the centre of the country and commute to any of the major job centres (Rees *et al.* 1997).

4.2.5 Differences by marital status or cohabitation status

Devis (1983) noted differences in the migration age profiles of the single, married, widowed and divorced groups: non-married profiles tended to flatter and lower because one of the principal reasons for migration in early adult life is first marriage. Grundy and Fox (1985) found from the retrospective fertility and migration history contained in the 1971 Census record in the Longitudinal Study that migration at or soon after marriage was nearly universal. 'Marriage' migrants made up 25% of all intra-county movers in the year before the Census and 20% of inter-regional migrants among women aged 16-29.

Re-marriage is also becoming an increasingly important reason for migration, though the effect may be less than for first marriages as in many cases only one of the couple migrates. Such migrations are far more likely to be intra-regional than inter-regional (Owen and Green 1992, quoting Murphy 1986). Grundy (1985) has studied the relationship between geographic mobility and marriage termination and remarriage using the Longitudinal Study. Remarried women had high rates of mobility and there seemed to be an excess of migrations around the time of remarriage, shortly after the end of first marriage. There was a suggestion also of a peak in movements after widowhood but no indication of additional moves at the time of legal divorce, which may well follow the locational separation of spouses after some considerable time interval.

4.2.6 Differences by household type

As people move through the life course the households they live in change and many of the transitions between household types are associated with migration. However, the sequence of types may vary between individuals. Owen and Green (1992) report evidence from the Labour Force Survey for 1986-87 that having children does depress migration activity. It is important, however, to control for the ages of household members. For instance, 17.5% of one adult households aged 16-59 moved within regions in the year, compared with 3.2% of one adult households aged 60 and over. The equivalent figures for inter-regional moves were 5.7% for the younger persons and 0.5% for the older. The relationship between demographic events, household transitions and migration is a complex one.

It is difficult to gain a comprehensive picture of what is happening across regions because the Census does not measure many of the associated transitions. Panel and longitudinal data must be used to estimate the transition probabilities and these can then be used in models of the process. In Chapter 5 the microsimulation approach to such processes is discussed. An alternative is to carry out a detailed survey of households asking about key transitions over a time interval and to use the results to produce a dynamic household model. Many Dutch researchers have taken this route (e.g. Hooimeijer and Heida 1994) and in the Appendix we review one example by Nijkamp, Van Wissen and Rima (1993). They model household dynamics using the methodology of multidimensional demography but linking it to the housing market in an innovative way. They obtain very impressive results for the municipality of Amsterdam from their aggregate simulation model and claim that it can be used as a tool for predicting future paths of urban housing market demand.

4.2.7 The issue of duration dependence

A body of past work claims that migration is a decreasing function of duration of residence: that is, the longer you stay in a place the less likely it is that you migrate. More recently, however, a problem has been found with this generalisation, in that it was based on merely the distribution of a population across duration categories. What was needed was an analysis of probability of migration in a time interval conditional on duration of residence up to that point, allowing for the effect of censored observations (duration spells which have not ended at the current time of observation are under-estimated). This work has established that duration dependence is largely absent when the age of migrants is controlled for (Plessis-Fraissard 1979, Courgeau 1984) but there

are significant differences between housing sectors (Withers 1997). The hazard of moving is a function of duration of residence for renters only.

4.2.8 The age-period-cohort perspective on migration

Most migration research has used observation data from a single period in time. However, for forecasting purposes it is essential to analyse time series of migration flows. In the UK pioneering descriptive work using the National Health Service Central Register is contained in the volume edited by Stillwell, Rees and Boden (1992) and Stillwell (1994) summarises the main features of the recent ups and downs of British migration.

In the USA they have moved on from description to explanation: Plane and Rogerson (1991) have borrowed the relative cohort size hypothesis from fertility studies (Easterlin 1980) as an explanation of the fluctuation of migration levels. Baby boom generations experience crowded conditions on entry to the labour market and hence low real wages and fewer job opportunities, which depress their migration levels compared with preceding and following baby bust cohorts.

The assumption of this hypothesis is that the economic cycle does not disturb this effect or is itself driven by it. Pandit (1997) has recently carried out a set of careful time series tests for US inter-regional migration of the efficacy of the relative cohort size hypothesis and the business cycle hypothesis. He interprets his results as favouring the demographic rather than the economic factors (see the review of his paper in the Appendix).

Researchers at the Universities of Leeds and Adelaide are shortly to begin a set of analyses of time series of UK and Australian migration that will test these hypotheses but also take into consideration the subtle regional effects of the business cycle as documented by various authors in the Stillwell, Rees and Boden (1992) volume (see section 4.4.5, below).

4.2.9 Demographic factors at origins and destinations

So far we have discussed how the life course fundamentally influences the level of migration for individuals. It also affects the way in which the characteristics of origins and destinations are assessed by migrants. It is clear that each of the life course stages has a different pattern of migration, as discussed above and in Chapter 3. For example, families (persons aged 30-45 plus children aged 0-16) seek locations with secure jobs, spacious housing, good play groups, nurseries and schools and so select suburban neighbourhoods where there are other families like themselves.

At origins, the volume of gross out-migration will be influenced by the population's age-sex composition: youthful areas with growing populations have high out-migration rates (and even higher in-migration rates) and areas with older populations have lower out-migration rates (Champion 1996).

At destinations, the age-sex composition of the population reflects, in part, the cumulative effect of past migration decisions. So, for example, areas with a high concentration of retired populations attract retirement migrants who seek the facilities and environment that attracted similar migrants in earlier years. However, the population mix by itself

probably does not play the most important part because most recent retirement migration streams are directed, in southern England, to suburban or small town/village locations and not to the neighbourhoods with the oldest populations.

4.3 Cultural and social factors

This section of the review of determinants examines what is known about the influence of cultural and social factors on migration. These individual level determinants will have their influence at subnational scales through the different cultural and social mixes of regional and local populations. For example, any differences between ethnic groups in their propensity to migrate will be most important for the South East of England, given that this region contained 56% of the ethnic minority population of Great Britain in mid-1991 (Rees and Phillips 1996, p.79).

4.3.1 Differences between ethnic groups

Owen and Green (1992) report the mobility rates for ethnic group in 1986-87: these are shown in Table 4.4.

Table 4.4 Migration rates (annual) by ethnic group, 1986-87

Ethnic group	Total population in ethnic group (000s)	All moves (%)	Intra-regional moves (%)	Inter-regional moves (%)
White	51,535	10.5	7.9	2.5
West Indian/Guyanese	483	11.4	10.3	1.2
Indian	761	9.6	6.9	2.7
Pakistani	391	14.4	11.8	2.6
Bangladeshi	115	22.5	17.6	4.9
Chinese	122	20.4	12.5	7.9
African	115	15.5	11.6	3.9
Arab	63	33.5	14.8	18.7
All	*56,076*	*10.5*	*8.0*	*2.5*

Source: 1987 Labour Force Survey quoted in Owen and Green (1992), p.29

Ethnic minority migration rates are higher than those for Whites, except for Indians. However, the figures are boosted for comparative purposes by the younger age structures of the ethnic minority groups and by the higher probability of members of some of the minority groups being recent international migrants. The least mobile group at the intra-regional scale are Indians, while West Indians migrate least between regions. Otherwise both intra-regional and inter-regional migration rates for ethnic minority groups are higher than those for whites. When age and recent immigration is taken into account, Champion (1996b) concludes that, age for age, minorities move house less frequently on average than Whites. There are, however, considerable variations between ethnic groups, with migration rates for Chinese and Black Africans being twice the rates for Indians, Black-Caribbeans and Pakistanis. The Chinese migrated over longer distances than Whites, while Blacks and Bangladeshis moved over shorter distances. These differences are linked to the degree of concentration of the minority groups (Rees and Phillips 1996, Table 2.3).

Migration rates also vary more between different parts of the country for ethnic minorities, with the turnover (arrival and departure rates) in small communities in peripheral areas being higher than in the areas of established ethnic minority concentrations (the big and medium sized cities of the London-Midlands-North West-Yorkshire and Humberside belt).

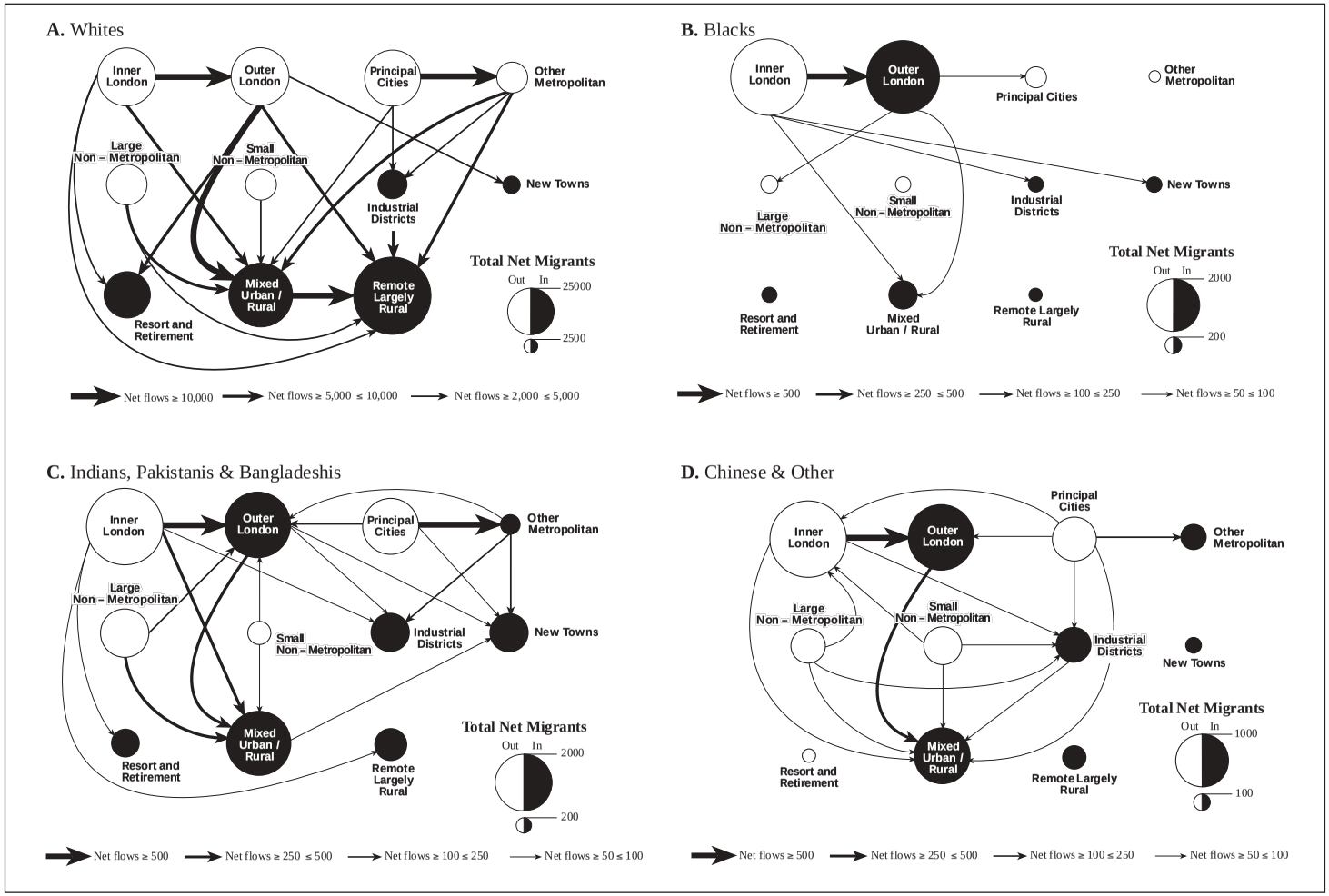
In volume terms the biggest net impacts of ethnic minority migration in the year before the 1991 Census were experienced in south-east England and in the more urbanised areas elsewhere. The largest net losses occurred in Greater London, West Yorkshire, West Midlands and Lancashire, while the largest gains were experienced in a belt of counties from Suffolk to Dorset (Champion 1996b, p.172). This pattern broadly resembles that of Whites but more detailed analysis by Rees and Duke-Williams (1995a) suggest that the net effect of ethnic group migration is to concentrate minority residents in the outer areas of cities, particularly London, where concentrations are already high. Figure 4.3 organises information on the net migration flows between district types for the four ethnic groups that can be distinguished in the Special Migration Statistics and is based on a reconstruction of the missing flows in this database (Rees and Duke-Williams 1995b). The district typology was produced by OPCS and captures functional and urban size variations between local government districts.

All groups lose migrants from Inner London, the Principal Cities within metropolitan counties (such as Birmingham, Manchester, Leeds, Newcastle, Sheffield) and Large and Small Cities within non-metropolitan counties. All groups show migrant gains to Districts with New Towns, Resort and Retirement Districts, Mixed Urban/Rural Districts and Remote, Largely Rural Districts.

The main difference in the flow patterns of ethnic groups concerns the position of the Outer London boroughs. Whites experience substantial losses from this district type, while Blacks, the Indian-Pakistani-Bangladeshi group and the Chinese and Other group show net inflows to Outer London. Whites are leaving these boroughs while ethnic minority families from Inner London are moving outwards to the Outer London boroughs. This pattern of suburbanisation is also evidenced by the transfer of migrants from Principal Cities to Other Metropolitan Districts. Within the ethnic minority groups, which are broadly similar in population size, the level of migration among Blacks is much lower than for South Asians. For this latter group the net flow of migrants to Mixed Urban/Rural districts is much more important. It is probable that the Indian population is leading this migration from London and other large cities to this category of non-metropolitan district.

These migration patterns have considerable implications when taken together with the rapid rate of new household formation and high natural increase rates among some ethnic minorities. All districts in England, even the remotest, will experience a shift in their ethnic composition. Nationally, this is anticipated to shift from a 5.5%/94.5% mix of ethnic minority/White mix in the mid-1990s to 15%/85% at mid-21st century. The spread of this ethnic transition in the British population will be driven by the commonalities in the migration patterns across all ethnic groups: a preference for lower density living. The major exception will be that London will remain an extraordinarily attractive place to live for ethnic minority group members (Rees and Duke-Williams 1995a).

Figure 4.3 The principal net migration flows between district types by ethnic group, 1990-91



Source: Recomputed from the 1991 Census Special Migration Statistics, Crown Copyright, by Rees and Duke-Williams 1995a

4.3.2 Variation by economic activity

Table 4.5 shows the way in which inter-regional migration is associated with changes in economic position with respect to the the labour market. Inter-regional migration is dominated by those employed at the start and end of the year of migration. The second biggest flow is for those remaining inactive (dependants of the employed migrant probably). Of the inter-regional migrants changing economic status, the largest number move from education into employment, followed by inter-regional migrants moving into unemployment or out of it. Those moving into unemployment exceed those moving out of it. Owen and Green (1992) suggest this excess may be associated with return migration of those who have not 'made it' in the labour market at a previous move. Those remaining retired make a small number of migrations and a small number of migrants move from employment to retirement.

Table 4.5 Inter-regional migrants by economic position in 1986 and 1987

Economic status in 1986	Economic Status in 1987					
	Employment (000s)	Unemployment (000s)	Education	Inactivity	Retirement	Total
Employment	516.3	65.0	13.0	36.7	7.9	638.9
Unemployment/scheme	40.6	30.4	3.5	10.5	0.4	85.4
Education	77.6	11.4	59.0	5.4	0.4	153.8
Inactivity	38.3	19.4	4.4	118.1	0.6	180.8
Retirement	1.0	0.0	0.0	2.8	18.6	22.4
Total	*673.8*	*126.2*	*79.9*	*173.5*	*27.9*	*1081.3*

Source: 1987 Labour Force Survey used in Owen and Green (1992), Table 2.13

4.3.3 Are the unemployed more or less migratory?

One question that is frequently asked is whether the unemployed are particularly mobile. The question needs knowledge of the economic position of the migrant before migration and the decennial census provides that only when linked over ten years to the previous census in the Longitudinal Study. Table 4.6 reports that, for 1971-81, the inter-regional migration rates for the unemployed were near the average and therefore much lower than those in the highest non-manual occupations but much higher than manual occupations in general.

Different pictures, however, emerge from different studies. For instance, Antolin and Bover (1997) found that in Spain unemployment is no longer a push factor to mobility and that the registered unemployed have even lower migration rates than the remainder of the labour force. A clear rationale for this relative mobility has been discovered by Kitching (1990) in a study of low-skilled and unemployed people in Liverpool, where the chance of secure local housing and the support of family and friends seem to carry stronger weight than the uncertain prospects of better job opportunities elsewhere. However, a cross-national study by van Dijk *et al.* (1989) incorporating both individual level and regional level unemployment characteristics, found that unemployed individuals were more likely to migrate than employed. Efficient transmission of information in the Netherlands on job vacancies enabled the unemployed to find work easily.

Table 4.6 Occupational and social class differences in migration rates

Fielding's social classes	% 1981	In labour market in 1981	In labour market in 1971-81
Service class	21.1	194	188
Petite bourgeoisie	6.6	91	97
White collar	26.4	92	94
Blue collar	37.7	55	56
Unemployed	8.2	98	110
Total	*100.0*	*100*	*100*
SOC major groups	% 1987	Intra-regional moves	Inter-regional moves
Managers & administrators	12.4	106	141
Professionals	8.7	101	174
Associate professionals & technicians	9.3	122	152
Clerical and secretarial	18.0	102	93
Craft and skilled manual	16.3	96	48
Personal and protective service	7.2	116	159
Sales	7.8	94	85
Plant and machine operatives	10.0	92	48
Other occupations	10.3	74	67
All	*100.0*	*100*	*100*

Notes: 1. Migration rates have been converted to ratios of the national migration rates.
Top panel: England and Wales = 100. Bottom panel: Great Britain = 100.
2. SOC = Standard Occupational Classification.

Sources:1. Top panel: Longitudinal Study from Fielding (1992), Table 13.1. Inter-regional moves only.
2. Bottom panel: Labour Force Survey from Owen and Green (1992), Table 2.11.

4.3.4 Variation by social class

For those in employment we can examine variation in migration activity by social class. Social classes are groupings of people according to their economic position, their prestige and their power position over others. In the main these concepts, originating in the work of Marx in the nineteenth century and of Weber in the early twentieth century, have been operationalised by describing a person's occupation and then grouping those occupations in simple, partially hierarchical classifications which reflect the income accruing from an occupation, the social esteem in which people in that occupation are held and the power which people in an occupation hold over others. The occupational classifications are not a comprehensive description of the population because they usually cover only males in work and deal unsatisfactorily with the unemployed, the inactive (students, retired) and women. Any occupational classification will conceal a wide variation in incomes, in prestige and in power in the occupations placed in a class.

The differences between social classes are moderate when the conventional classification of SOC groups is used and all migrations are considered but the differences widen when inter-regional moves are considered and a slightly different classification is used (Table 4.6).

The evidence in the table from the 1971-81 decade and from 1986-87 show clearly that inter-regional migration selects for persons in the higher occupations. Fielding's 'Service class' and the 'Managerial and professional' SOC groups exhibit inter-regional migration rates 50 to 90% higher than the average. By contrast, the manual occupations (Fielding's 'Blue collar' and the SOC groups 'Craft, skilled manual' and 'Plant and machine operatives') have inter-region migration rates only 50% of the average. The other non-manual occupations (Fielding's 'Petite bourgeoisie' and 'White collar', the SOC groups 'Clerical and secretarial' and 'Sales') have rates just below the average. The 'Petite bourgeoisie' consist of small employers or the self-employed with considerable capital invested in the current location, so that their inter-regional migration rates are much lower than the average. The junior white collar and sales jobs are general in their skill requirements and ubiquitous across labour markets so that inter-regional migration is not as necessary as with higher skill or rarer occupations.

What lies behind these differences in migration activity of the different occupational groups? Essentially, Öberg (1997) argues persuasively that migration is a result of specialisation in occupations and the timing of the birth of new labour compared with the timing of the birth of job vacancies. The higher up the occupational hierarchy the more likely it is that a qualified person will have to move to find a suitable vacancy. Jobs as drivers, construction workers or secretaries become available in labour markets everywhere, whereas posts as Chief Constables in the Police Service become available only in a few locations and at random intervals in time.

Some occupations have migration built into the way they are organised. All grades in the Armed Forces are continually re-posted in order to maximise experience in different *milieu* and to limit time spent in dangerous locations. Multinational businesses have a strategy for moving managers between locations to gain experience and to bind them to the corporate organisation. Salt (1990, quoted in Flowerdew 1992) used the LFS of 1981 to show that 58% of inter-regional migrants employed both at the time of survey and one year earlier had the same employer.

4.3.5 Migration and education

Owen and Green (1992, Table 2.12) report the migration differences between LFS respondents according to highest qualifications achieved. Inter-regional migration rates are around twice the average for those with degree or higher degree qualifications, while they are much lower for those with only school qualifications. These differences are related to the occupations for which people are qualified. Graduates have a greater need to migrate to find suitable work than do non-graduates.

However, higher education (HE) also contributes to migration directly. England's system of higher education grants has in the past encouraged students to seek a place at a university away from their home areas, leading to an internationally high proportion moving between regions. The expansion of HE places over the past 10 years has led to an increase in inter-regional migration among 18-19 year olds, though by not as much as the number of places because the increasing costs of courses and the expansion of part-time courses have reduced the relative importance of long-distance movements. At the same time, however, there have always been difficulties in measuring both the flow of students to HE institutions and the migration on graduation (see Stillwell *et al.* 1996 and Rees 1997).

This type of migration is important because students constitute an important source of demand for cheap housing in areas close to universities. This is supplied by the institutions themselves with new build being financed through commercial mortgages and through expansion of the private furnished rented sector of the housing market, mainly through house conversion. In these neighbourhoods, student demand does force up prices of rented accommodation which impacts on poorer family households and may raise their demands for social housing. Some HE institutions appreciate these problems and see investment in student housing as a social duty to keep prices in local housing markets reasonable. Such entrepreneurial/social investment in housing is probably more risky in greenfield site universities than in big urban locations.

4.4 Labour market factors

In the previous section we discussed the degree to which migration levels, particularly for movement between regions, vary with labour market position and occupation. The focus was on individual characteristics. However, the jobs which people in different occupations actually do manifest themselves in particular spatial locations. People move from origins where the right job is not available to destinations where it is. This section looks at the ways in which work opportunities in regions or localities affect migration. We examine, firstly, some general economic influences; secondly, the traditional attractive/repulsive factors of employment change, unemployment differentials and wage differences; and thirdly, the influence of consumption led migration.

4.4.1 Occupational vacancies and skilled labour mismatches

Öberg (1997) argues that even if aggregate labour supply and labour demand in regions is in balance, migration of workers will still be necessary because of mismatches in timing of recruitment of labour with specialist skills to small labour markets and the timing of vacancies for persons with those skills.

He provides the following hypothetical example to illustrate the mechanism:

> "If 100 people apply for jobs as teachers of mathematics in a small local labour market during a period of ten years, and 100 vacancies of this kind occur in the same period, one's first inclination might be to suppose that none of the applicants would fail to obtain employment as a teacher. But the odds are that the vacancies will occur at irregular intervals throughout the period, and people concerned may apply for jobs more or less randomly during the period. As a result of these random variations, there will sometimes be a queue of teachers looking for employment, while at other times there will be a shortage." (Öberg 1997, p.30).

To avoid such queues, labour migrates between labour markets and employers seek to recruit from other labour markets as well as their own. Inter-regional migration occurs even in the absence of regional imbalances in jobs and labour, and will affect the composition of sending and receiving labour markets.

Related to the timing of labour graduations and job vacancies is the observation, frequently made by commentators describing gross migration flows between regions,

that there is a close correlation between inflows and outflows. Champion (1996, Figure 6) plots the inflows and outflows to counties and Scottish regions in 1990-91, demonstrating a high correlation. There is a tendency for high inflow/outflow areas (e.g. counties to the north and west of London) to experience net in-migration and for low inflow/outflow areas to experience net out-migration (e.g. metropolitan counties).

4.4.2 The changing structure of the economy and its effect on migration

Profound changes have been taking place in the structure of the international economic system in the past two decades and these have had profound effects on national and regional economies in developed countries and in the UK in particular. Dunford and Fielding (1997) identify seven elements of post-Fordist (labour intensive mass production) economic restructuring which have affected the patterns of migration:

- deindustrialization
- privatization
- flexible specialization
- feminization
- multi-culturalism
- social polarization
- globalization.

Deindustrialization is the process of shifts of jobs into the service sector from manufacturing and of shifts from materials oriented industries into information oriented industries. Metropolitan cores were the centres of industrial employment in the decade after 1945 but this saw the migration of industries, with government encouragement, out of big cities to better, cheaper locations. Since the 1950s metropolitan centres, including London, having seen absolute decline in their manufacturing employment, which has reduced the attractiveness of such centres for both inter-regional and international migration by blue collar workers.

Privatization is the process of the sale of public assets to private owners. Central and local government bureaucracies have been reduced and converted into smaller private sector service employment. Dunford and Fielding (1997) suggest this has had the greatest effect in London, encouraging its transition to a more middle class employment mix and has widened the differences between the capital and the rest of the country, reducing migration flows between London and other big cities in the UK.

Flexible specialization describes the set of changes in the organization of production in smaller units, producing smaller product runs tailored to sub-markets using more efficient technologies (just-in-time delivery) and connected in networks of innovative firms. This process has gone furthest in high technology industries and in new manufacturing plants built outside the traditional metropolitan cores. If you make redundant the mass production worker, then you also remove the need for mass migration of such workers (Dunford and Fielding 1997, p.270).

Feminization of the formal labour market is a long term trend in all regions. More women are working than in earlier decades and fewer men, relatively speaking. This influences migration at the upper end of the labour market when both partners in a

marriage or consensual union have professional or managerial jobs. The aspirations of both partners are best satisfied in large metropolitan labour markets such as London, where the rate of movement of women into managerial jobs is high compared with other regions. In the earlier discussion of dual career households (drawing on the work of Green 1997) we saw the importance of accessibility to a wide labour market as an influence on choice of residential location.

Multiculturalism is the process that creates viable ethnic communities and subeconomies. London's diversity, in particular, attracts international migrants and may reduce its attractiveness to internal migrants of the White majority (see the earlier discussion of the internal migration of ethnic groups).

Social polarization is widening of the gaps in income and in standard of living between the succesful in the labour market and the unsuccessful as a result of changes in the transfer mechanisms built into the taxation and welfare systems. This polarization is expressed in the growing differences between areas of middle class, working class and lower class residence in all cities and towns. Dunford and Fielding (1997) suggest that polarization has emphasized the advantages of living in London's favoured neighbourhoods and has pushed out the poorer households as areas have gentrified. However, there is little evidence for the UK that the unemployed and those relying on benefits have migrated in large numbers to lower housing cost locations. This contrasts to the situation in Australia (Newton and Bell 1996) where such disadvantaged households can migrate to lower cost locations within each Australian state because social housing is provided on a state-wide basis rather than local authority by local authority.

Globalization (the trend towards freer international trade and division of labour) influences all regional and urban economies in the country, which must compete with rivals not just in the UK but throughout the world. Emphasis is usually placed on the competition between regions for inward, foreign investment which brings with it the immigration of skilled managerial and technical personnel. This occurs in both manufacturing industry (e.g. Japanese, German, French and American owned vehicle production) but also in the financial services sector (the takeover of UK financial firms by larger American and European rivals). These transitions in ownership affect particular regions and localities profoundly. Less attention has been paid to the ability of regional and urban economies to replace imports with home grown products and services, which can be equally important in driving economic growth in successful regions (Jacobs 1969).

4.4.3 Employment change, unemployment differentials and wage differences

So far, we have discussed 'broad brush' economic influences on migration. There is a substantial body of work that seeks to measure those influences more exactly for particular regional systems and for particular time periods. Various forms of migration models have been tested. In Chapter 5 we review inter-regional migration models using a general framework, so only a brief résumé is given here. Attention is concentrated on what economic characteristics of origins and destinations have proved important.

Migration models that examine economic influences use one of two migration indicators as dependent variables: net migration (the balance of in- and out-migration) and gross migration (usually the flows between origins and destinations), though one of the

pioneering pieces of work in this area reported on both a net migration and a gross migration model (Lowry 1966). Net migration models are more numerous in the literature for two reasons: (i) they are simpler to construct as only one set of area characteristics need be considered where for gross flow models the attributes of both origin and destination must be considered and (ii) net migration totals can be computed as residuals (using population change minus natural increase) and so are available for more places and periods than gross flows which derive from migration questions in censuses or surveys or from residence registration systems. Gross flow models use internal migration data only and so neglect to model external migration. Net migration totals normally incorporate net external as well as net internal migration totals. We argue, in Chapter 5, that models of gross migration are more appropriate in a forecasting context but this leaves a major gap in forecasting methodology – how to predict the distribution of external migration across the regions of the country.

Most migration modellers realise the importance of constructing models for labour force groups with common motivations and determinants. In the past, this has meant that the dependent variables were restricted to labour force ages in general but more recently researchers have sought to use age-disaggregated data (Congdon 1991, Clark and Hunter 1992). Most migration models also seek to include a range of factors, including housing and amenity/environmental variables as well as economic factors, so that the independent effect of the economic influences can be determined.

Ideally, the models should look at three sets of labour market influences: employment opportunities (vacancies), employment exits (redundancies), and the economic benefit of new jobs (earnings). Job 'births' and 'deaths' stimulate migration, which is influenced by the price of labour. In practice, indirect indicators of these influences are used: quantitative change in employment, levels of and changes in unemployment and income differentials. These variables are not quite what is needed but they are usually what is available.

It is useful to appreciate the way in which migration and population change in Great Britain varies with the most used of the indicators, namely the unemployment rate for an area. Tables 4.7, 4.8 and 4.9 (from Rees, Durham and Kupiszewski 1996) show the relationship aggregated from statistics for wards (England and Wales) and postcode sectors (Scotland) provided in the 1991 Census. Wards are grouped into ten bands depending on the percentage of the economically active workforce seeking work.

Table 4.7 shows that the relationship between both population shifts over a decade (largely shaped by net internal migration) and net internal migration in the year before the Census. Both are strongly negative and linear. For each increase in unemployment level by 1%, the decade population change rate falls by 1% and the net migration rate drops by one tenth of a percent, on average.

When the flows between wards in different unemployment bands are examined (Table 4.8), the transfers all accord with the economic gradient. Each unemployment band loses migrants to lower bands and gains migrants from higher unemployment bands. The efficiency of the transfer increases with the "unemployment distance" between ward unemployment bands. Efficiencies are particularly high for migration out of the highest unemployment band. In the report from which Table 4.8 is extracted, net internal

migration efficiencies are computed for five age groups as well as for the population as a whole. The highest efficiencies are achieved by pensioner group (aged 65+). Here the relationship is not a labour market one: the unemployment indicator is probably acting an amenity indicator for the retired who migrate out of the least desirable neighbourhoods (those in the highest unemployment bands).

Table 4.7 The variation of population change 1981-91 and net migration 1990-91 for wards/postcode sectors grouped into unemployment bands, Great Britain

Unemployment rate 1991 Census (per cent)	Population change rate 1981-91 (per cent)	Net migration rate 1990-91 (per cent)
<4	+7.2	+0.64
4-<6	+4.5	+0.40
6-<8	+2.3	+0.20
8-<10	-0.2	-0.05
10-<12	-2.1	-0.14
12-<14	-4.3	-0.28
14-<16	-4.6	-0.43
16-<18	-7.0	-0.47
18-<20	-7.0	-0.74
20+	-12.7	-1.26

Source: Rees, Durham and Kupiszewski (1996).
Computed from the 1981 Census SAS and 1991 Census SAS and SMS.
Crown copyright. ESRC/JISC Purchase.

Table 4.8 Net migration between wards/postcode sectors grouped into unemployment bands, males, all ages, Great Britain, 1990-91

Origin unemp	Destination % unemployed 1991									
	<4	4-<6	6-<8	8-<10	10-<12	12-<14	14-<16	16-<18	18-<20	20+
<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*

Notes: 1. The numbers below the main diagonal are net migrants in 100s.
2. The numbers above the main diagonal are the effectiveness of migration (net flow/gross flow as a %).
Source:as Table 4.7

Might the relationship between unemployment and migration be confounded by the association of both with population density? Table 4.9 shows that this is not the case.

When net migration is computed for wards falling in a crossclassification of unemployment bands and density bands, we can see that net migration varies independently with each dimension. The table has 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 table from top right to bottom left but displaced a little upwards. High unemployment, irrespective of density, is associated with net migration loss, while low unemployment is associated with net migration gain in all but two density bands. Also high density guarantees net migration loss.

Table 4.9 Net migration for wards/postcode sectors classified by unemployment and population density, Great Britain, 1990-91

% 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: as Table 4.7

Congdon (1991) has investigated the determinants of migration flows between London boroughs and between South Eastern counties, exploring the efficacy of alternative model specifications and the variation in model predictors and prediction power across occupation groups and age groups. The determinants include the standard "gravity model" set of distance between origin and destination, population at the origin and population at the destination, all of which have a highly significant role in predicting migration flow volumes (Table 4.10). Chapter 5 takes the discussion of these variables much further. Congdon also introduces predictor variables reflecting housing and labour market conditions. Conditions at the origin do not seem to be consistently significant, with no origin variable coefficient reaching the 99% significance level and with only 3 out of 12 being significant at the 95% level. Two destination variables do have significance: house prices at the destination and growth in jobs at the destination. The negative sign of the house price regression coefficient indicates that high prices have a deterrent effect, while growth in jobs have strongly positive coefficients and large standardized values.

These results suggest that in developing an inter-area migration model, it is important to include both employment change variables and information on house prices. These are variables directly related to the migration decision, while regional income is much more loosely linked. It is also important to develop separate predictions for the different ages. Clark and Hunter (1992) show, for US counties, that the determinants vary considerably across ages: for example, employment growth is not significant for retirement migrants (aged 60-74) while it is a deterrent for migrants aged 75 and older.

Table 4.10 Standardised regression coefficents between migration flows and predictor variables, age groups, South East counties, 1980-81

Predictor variable	Age groups		
	15-29	30-44	45-retirement
Constant	37.66**	26.20**	33.80**
	Standardized regression coefficients		
Distance	-1.79**	-1.82**	-1.71**
Population, origin	0.86**	0.95**	0.94**
Population, destination	1.02**	0.83**	0.57**
House prices, origin	-1.41**	-0.89*	-0.11
House prices, destination	-2.27**	-1.55**	-3.00**
New housing, origin	-8.62	-0.47	-1.47
New housing, destination	2.81	3.23	-10.70*
Growth in jobs, origin	5.85**	2.62	2.17
Growth in jobs, destination	7.46**	7.25**	12.21**
Income growth, origin	1.43	0.82	2.28
Income growth, destination	4.05*	1.71	0.61

Notes: 1. The model used is a quasi-likelihood negative binomial model.
2. ** = significant at 99% confidence level
* = significant at 95% confidence level

Source: Congdon (1991)

A second stream of modelling work on the labour market determinants of migration attempts to capture the effect of migration on the determinants. For example, we would expect that if people migrate out of high unemployment regions, then this should serve to lower the unemployment rate there. There have been suggestions that this mechanism appears to work in the USA but not in Europe or Australia (Groenewald 1997). The shifts of migrants between high and low unemployment regions are probably not fast enough to produce equilibrium in regional labour markets in the short run.

4.4.5 National and regional business cycles and inter-regional migration

While most investigations of the economic determinants of migration focus on spatial variation in migration within one time interval, attention is now being paid to the influence of economic fluctuations over time on migration. Milne (1993) has studied the links between national economic growth rates and the level of migration for Canada and finds that migration activity has followed the fluctuations in the growth and its recent downward reduction. For the UK several authors have pointed out the parallels between migration series fluctuations and the rise and fall of mortgage interest rates which have a major impact on the volume of transactions in the owner occupied sector of the housing market. However, a rigorous test of the links between migration fluctuations and economic activity in the UK remains to be carried out. Such a test will have to take into account the cohort hypothesis put forward by Plane and Rogerson (1991) and further tested by Pandit (1997) (see earlier).

The business cycle and cohort fluctuations affect migration profoundly at regional scales but not in a simple way. The collection of papers focusing on regional trends in migration

in the UK (Stillwell, Rees and Boden 1992, Part II) provides a number of clues as to the relationship between migration fluctuations and regional economic fluctuations for a set of broad regions: Northern Ireland, Scotland, Wales, the North, West Midlands, East Midlands and the South.

Compton (1992) stresses the close association of inflows to and outflows from *Northern Ireland* to the UK cycle of economic activity, but in a counter-intuitive way. When economic activity picks up in Great Britain outflows from Northern Ireland increase and the province experiences increasing net migration losses. When recession sets in on the mainland, the outflow turns down, inflows rise as a result of return migration of released workers, and the net out-migration balance reduces.

Jones (1992) characterises the experience of *Scotland* in the 1980s as one of continuing migration loss overseas and to England, but tempered by the attractions of oil industry jobs in North East Scotland in particular. Within Scotland selective net out-migration and population loss have occurred in some rural areas, large cities and older industrial areas, balanced by population gains in commuting hinterlands. The impact of oil has been particularly pronounced as it stimulated labour recruitment and migration from depressed West Central Scotland and elsewhere to the Grampian region and parts of the Highlands and Islands for work offshore on the rigs, or work onshore in the service installations or rig fabrication yards. Stillwell, Rees and Duke-Williams (1996) identified the Grampian region as the UK's most favoured destination in the year before the 1991 Census.

Rees, Stillwell and Boden (1992) review migration trends for the *North* of England. This region has a long history since World War One of migration losses to southern England, but during the later 1980s it seemed that this trend might be changing with net inflows recorded in the second half of 1988. However, this turned out to be shortlived and the 1990s have seen a return to consistent net outflow. The swallow of 1988 simply marked the high water of out-migration from the South East as commuters sought to escape the housing price boom of the period. Within the North the principal cities lost migrants over the whole period from 1975 to the mid-1990s; other metropolitan districts were also net migration losers overall but gained from migration from the principal cities; the shire counties were heavy gainers of migrants from the principal cities and metro districts but lost on balance in exchanges with other regions except in the housing boom period (1987-89).

In her discussion of migration trends in *Wales* Green (1992) stresses the role of migration from England, directed at the rural areas and south-east Wales. Wales was essentially part of the out-migration hinterland of the Liverpool, Manchester, Birmingham and Bristol metro areas and perhaps even of South East England.

The *West Midlands* region has experienced sustained net out-migration since 1971 (Flowerdew and Boyle 1992), principally as a result of de-industrialization and restructuring of its economy. Migration volumes fell in the 1975-76 to a trough in the 1981-82 recession and then rose in the recovery period, narrowing almost to balance, benefiting like the North from southern overspill in the late 1980s boom. In the early 1990s recession net outflows rose once again. Analysing the population deconcentration from the West Midlands conurbation, Flowerdew and Boyle (1992) stress that most of

it must be regarded as extended suburbanisation rather than the movement of both work and home to new smaller settlements (counterurbanisation).

The counties of the *East Midlands* have been in rough balance (Derbyshire, Leicestershire and Nottinghamshire) or gain (Lincolnshire and Northamptonshire) (Jenkins 1992). The latter two counties in particular have gained strongly from the south of England, particularly in the second half of the 1980s with lower levels of overspill migration in the 1990s.

It is clear from the accounts of regional migration trends above that the engine driving regional migration balances in England has been the *South*, centred on the South East. The early 1980s saw reduction in the massive outflows from London that had been dominant in the 1970s and a reduction in the exodus to the other parts of the South as a result of the recession of the first half of the decade (Champion and Congdon 1992). Recovery from recession brought greater inflows from the rest of the UK and abroad. The boom period saw outward shift of people and firms in search of cheaper locations and less congested environments. Before the 1980s were out, this process was slowing drastically as the property-market led recession took hold in the South East first in contrast to the de-industrialisation recession of the early 1980s which had affected northern regions first. The 1990s have seen lower net migration losses from the South East and continuing gains to the South East outside London, East Anglia and the South West.

This review of the fluctuating migration histories of Britain's regions from the mid-1970s to the mid-1990s suggests that some caution is needed in extrapolating the latest trends, particularly as the regional expression of migration flows in the last two cycles followed very different patterns.

4.4.6 The multiplier effects of consumption led migration

The discussion of the economic drivers of migration in Britain has largely concentrated on the influence of job shifts or on the role of lengthened commuting. However, some types of people are totally or largely free of workplace constraints and choose amenity rich and cheaper locations outside the main cities. These migrations, however, then have a multiplier effect in creating service jobs to cater for the population growth generated. Newton and Bell (1996) and Bell (1995) refer to this phenomenon, prominent in Australian migration, as 'consumption led migration'. Most frequently cited among these types is the elderly, but similar patterns of migration have been identified for people of older working age making a pre-retirement move, for the self-employed who do not need to travel regularly to a separate workplace and for unemployed people who reckon that their fixed welfare benefits will go further in non-metropolitan areas and out-of-season resorts.

4.5 Housing factors

While considerable attention has focused on the role of employment factors in generating inter-regional migration, the vast majority of shorter distance movement is residentially motivated; much of the shorter distance movement between contiguous regions will be of this type. When moves over all distances are considered, housing reasons are the explanations most frequently cited by movers (Buck 1994). However, longer distance

moves are also constrained or enabled by inter-regional differences in: the structure of the housing market and regional differences in the number of houses in each of the different housing tenures; vacancies in the different types of housing in an region; and variations in house prices and rents. These all contribute to the complex relationship between migration and housing.

4.5.1 Public sector housing as a barrier to labour migration

Much of the literature on migration and housing in recent years has considered the role of local authority housing as a barrier to labour mobility. Persistent inequalities in unemployment exist between the regional labour markets in Britain and, unlike in the United States, manual workers are actually less likely to move inter-regionally than non-manual workers; migration does not appear to be equalising unemployment rates as neoclassical theory would expect (Hughes and McCormick 1989). A related point is the fact that wage inflation is curiously unresponsive to high rates of unemployment (Bover *et al*. 1989).

This suggests that there may be structural differences between Britain and the US which explain these discrepancies. The work of Hughes and McCormick (1981, 1985, 1987) is central to this debate as they argue strongly that the management of public housing discourages the migration of tenants over long distances. This tenure is dominated by manual workers and, while the allocation system allows for relocation within local authority districts as the tenants circumstances change, it is difficult for tenants to move between local authority districts as preference is given to people from the local area already on the waiting lists. Indeed, Minford et al. (1987) argued that unemployment is half a million more than it would otherwise be because of the inability of council tenants to undertake employment related migration.

Perhaps ironically, therefore, Hughes and McCormick (1981) showed that those living in council housing were actually more likely to be recent migrants, but they were less likely than those in owner occupied housing to move over long distances. These results were replicated by Boyle (1993) and Gleave and Palmer (1978) and have recently been shown to be true by Buck (1994) using British Household Panel Study (BHPS) data. These high overall rates of mobility among council tenants are clearly related to the relative ease with which households with changing circumstances can move between council properties within the same district.

Using individual household data from the General Household Survey, Hughes and McCormick (1981) considered inter-regional migration using logit models that controlled for certain socio-economic variables (education, age, origin region, labour force participation, occupation and industry). While several factors were shown to influence inter-regional migration, council tenants were shown to be significantly less likely to migrate inter-regionally than owner occupiers; thus, council tenants are more likely to move overall but less likely to move over long distances.

However, the models that Hughes and McCormick derived may be criticised on a number of counts, including the very small size of their inter-regional migrant sample and their failure to control for potentially significant individual level variables (see Forrest and Murie 1992). More recently, however, similar results have been obtained using individual-

level data from the Sample of Anonymised Records (SAR) which is a much larger data set (Boyle 1995). This study used a logit regression model to compare long and short distance movers and showed that those in council housing were less likely to have migrated over 50kms, controlling for a wide variety of other individual characteristics, such as age, gender, social class and education.

Accepting that council tenants are less likely to migrate long distances than people in other tenures, it is interesting to compare the distance moved by those in different tenures who have moved between, rather than within, Districts. Using a doubly constrained Poisson regression model of inter-county migration flows, Boyle (1993) showed that those that do manage to migrate long distances (between counties) into council housing are no more deterred by distance than those moving into owner occupied housing. This finding was confirmed by Boyle and Shen (forthcoming) who used a multi-level OLS model on SAR data to examine the distance moved by migrants resident in different tenures. Once those moving less than 20kms were extracted from the sample and other socio-economic variables were controlled for, there were no significant differences in the distances moved by owner occupiers and council tenants.

Boyle (forthcoming) took this work a stage further by focusing geographically on the South East of England where the problems of attracting manual labour from elsewhere in the UK have long been acknowledged. Again, this work used a logit model which controlled for socio-demographic characteristics along with tenure. It is demonstrated that manual workers from the north of England, compared to manual workers from elsewhere, actually found it harder to move into owner occupied than council housing in this region. One reason for this will be the high house prices in this region compared to elsewhere (see below), although various other factors are also likely to be relevant.

The 1980 Housing Act transformed the British public housing market by giving tenants the 'right to buy' their council property and a stated factor influencing this legislation was the aim to 'free up' labour. A range of discounts, which varied between the type of property and the length of residence, were used to encourage these purchases. The Act gave tenants an unexpected windfall at a time when owner occupation was at its most popular and by 1989 20% of the tenants in England had taken up the offer. It was anticipated that reducing council housing in favour of owner occupied property would encourage previous tenants to migrate. Also, the houses from which they were moving would then become part of the 'free market' of owner occupied housing for others to move into.

In fact, there is little evidence so far that this has resulted in greater inter-regional migration. Forrest and Murie (1988) show that those choosing to buy are those most likely to have moved into owner occupancy anyway and in surveys few of the purchasers indicated an intention to move on in the future; on the contrary, the option to buy was seen by many as a means of guaranteeing residency in a particular area rather than as a means of moving on (James *et al*. 1991). Moreover, many purchasers have found that the houses or flats they bought are difficult to sell.

Using data from the SAR, Boyle and Shen (forthcoming) implemented a multi-level OLS model of the distances moved by migrants in different tenures controlling for individual level characteristics, such as social class, employment and family status, qualifications, age and gender. Additionally, area-level destination characteristics were included for the

278 SAR-areas in Britain. Of particular interest among these were the variables relating to the percentage of public housing in the area and the percentage change in public housing between 1981 and 1991; the majority of the reductions will have resulted from right-to-buy purchases. The results indicated that neither the proportion of public housing in a SAR-area or the absolute reduction in public housing in a SAR-area between 1981 and 1991 had a significant effect on the distance moved by in-migrants.

4.5.2 Owner occupied housing

Those in owner occupied housing are known to be more likely to migrate long distances than those in council housing, but less likely to move long distances than those in privately rented accommodation. The continuing growth of the owner occupied housing sector therefore has implications for inter-regional migration but the relationship between the two is highly complex. Indeed, in the past 40 years there have been two major booms in the UK owner occupied market, during the early 1970s and late 1980s, and these unexpected events make predicting the relationship between inter-regional migration and housing very difficult. We review here findings from the literature about factors that are important without attempting to specify their interrelationships beyond those captured in the particular studies.

New housebuilding. The majority of households in the UK reside in owner occupied housing but the availability of vacant housing varies between places. Evans (1990) argues that tight planning controls on the development of land for residential (and industrial) purposes will cause rises in house prices which will deter in-migration. In England, planning controls are stricter in the south, where the demand for housing is greatest, than in the midlands and north. House prices may be artificially increased because of these policies which restrict supply but their role in influencing inter-regional household may not be explained fully by assuming that the effect is entirely accounted for by using data on house price differences (see below). House prices may, or may not, respond rapidly to variations in housing vacancies.

Boyle *et al*. (1998) modelled aggregate migrant flows between the 200 wards in a single county (Hereford and Worcester) using a Poisson regression model. This study was original because of the scale of the analysis and because, along with standard census variables, data were collected on owner occupied, local authority and housing association housing completions within the county (unfortunately house price estimates are not readily available at the ward level). They found that migration within the county was significantly and positively associated with the completion of new private housing, as we might expect at this scale. Similarly, modelling of net migration at District level in England has demonstrated a strong positive relationship with scale of new private housing completions (Bramley 1955, Bramley and Watkins 1996), suggesting that net in-migration rates are highly responsive to the release of housing land by the planning system (see also section 4.8, below).

However, Forrest and Murie (1994) considered the role of new private sector housebuilding in southern England in the late 1980s using a social survey of 2,300 households. This is an area of rapidly rising prices, where employers have complained of recruiting problems (CBI 1988). They concluded that the home ownership market was becoming introverted, due to substantial price rises, making it difficult for a

substantial minority to enter owner occupation. The development of new housing does not, therefore, result in the conventional model of a 'moving column' with the progressive recruitment of lower income households into home ownership. Instead, low income households are 'crowded out' by more affluent new households and home owners, such as retirees, moving within the sector and competing for smaller housing units. Long distance mobility into these houses was therefore evident among firms' core employees but not among their secondary staff.

House prices. The role of house prices as a constraint on inter-regional migration has been considered widely. Some American studies have suggested that the relationship between migration and rents (in practice, housing costs) will be positive. Graves (1983) demonstrated this using a single variable regression equation where rents in 137 cities were regarded as a surrogate for amenities that affect migration; higher rents will occur in places with better amenities. The relationship between in-migration and rents was significant and positive. We should also expect this relationship to be circular. As net migration increases in an area the increased competition will further increase rents. This was clearly evident in the Aberdeen area during the 1970s, associated with the expansion of the oil industry (Jones and Maclennan 1986). Similar findings (a positive relationship between origin-specific regional house prices and migration) have also been identified in Spain (Antolin and Bover 1997).

On the other hand, it has generally been shown that there is a negative relationship between regional house prices and migration in Britain. Hamnett (1992) documents the twelve fold increase in average prices between 1970 and 1990 but, importantly, there were considerable regional variations with prices doubling in London and the South East between 1983 and 1987, while northern regions witnessed increases of only 30%. Economic models have demonstrated that inter-regional migration in Britain is negatively related to relative house prices (Gordon 1982, Harrigan *et al*. 1986) and it has been suggested that this is one of the main causes of the labour shortages in the south of Britain and rising unemployment in the north (Champion *et al*. 1988, Healey 1987). Bover *et al*. (1988) focused on the South East of England and argued that some simple mechanisms, related to the house price boom during the 1980s, explained this 'mobility trap'. First, home owners living outside the region found it difficult to afford to move there. Second, owners in the South East were reluctant to migrate elsewhere because they did not want to lose out on the possibility of further price appreciation and because they felt that it might be difficult to return. Third, once the relative prices in the South East began to fall, people were reluctant to move into the area because investment in property appeared unwise. Fourth, the down turn in property prices made it difficult to sell (see also Buck 1994). This is partly why Forrest (1987) argues that it is owner occupied, rather than council, housing that is emerging as the major barrier to labour mobility, particularly for those in the secondary labour market. Also bear in mind Buck's (1994) finding that low income households have the highest levels of housing costs as a proportion of their overall incomes.

However, more recently, Thomas (1993) used a logit model analysis of destination choice using Labour Force Survey data and showed that while job movers were attracted to areas with high wages, conforming to neoclassical expectations, they were not affected by high house prices in such areas. In contrast, it was non-job movers including retirees that were deterred from areas with high house prices. It appears that, controlling for

other factors, house prices differentials may be less important for those in work compared to those out of work. An analysis of house price changes confirmed Thomas' (1993) finding indicating that, in the South East especially, those moving for non-job reasons were strongly influenced by relative house prices (Alexander and Barrow 1994).

At the micro-scale the relationship between housing costs and mobility is complex. Many move to improve their financial situation, either voluntarily or involuntarily. Buck (1994) shows that housing-related moves are associated both with getting out of financial difficulties and with getting into difficulties, but much less with remaining in difficulties. This suggests that moving can be both a cause of and a response to financial difficulties.

National recession. There is also some evidence that national booms and recessions will have different effects on the housing market and subsequent inter-regional migration patterns. It has been shown that during national recessions both the employed and unemployed become less mobile (Pissarides and Wadsworth 1989). However, Fielding (1993) also points out that the South East 'escalator' region experiences net migration losses during economic booms, and net migration gains, or only small losses, during deep recessions. Out-migration rates for the South East fall considerably during recession periods, with one important factor being the difficulties that arise in disposing of housing. This was especially problematic in places like the South East where house prices rose rapidly, or were relatively high compared to other regions, prior to the recession period. By contrast, in-migration rates do not appear to vary significantly between boom and recession periods in this region. Some measure of the overall economy is likely to influence inter-regional migration rates, therefore, as the relationship between migration and housing markets will vary between the regions; its impacts in the South East may be more severe than elsewhere.

Evictions. Recent studies have also shown that large numbers of people are involved in forced moves out of owner occupation and this is a field that requires more research. For example, eviction, or repossessions, was given as the reason for movement for as much as 8% of movers captured in the first two waves of the BHPS (Buck 1994).

4.5.3 Privately rented housing

Far less attention has been paid specifically to the role of privately rented housing on migration, despite the fact that for certain relatively mobile sub-groups this is the dominant, and more flexible, tenure choice. Britain is also relatively unique because such a small proportion of property is privately rented compared to some nations like the US. Certainly, it is feasible that the lack of privately rented housing in the UK is one factor which helps explain the different migration rates of manual workers between the US and Britain, although this has yet to be tested. Minford *et al*. (1987) suggest that the policies related to private renting, including measures to protect tenants, are responsible for the relative lack of privately rented property in the UK. They also argue that, once tenants gain 'sitting' protection, they may be reluctant to move on as they will be forced to enter the free market again.

Bover *et al*. (1989) support these broad arguments identifying the 1965 and 1974 Rent Acts as key factors in reducing inter-regional mobility:

'We agree with the case strongly argued by Hughes and McCormick, Minford and others that the absence of a rented sector ruled by freely undertaken contracts is a major explanation of the low rates of labour mobility in the UK, especially among manual workers, in comparison with the US.' (p.129)

However, the time series models upon which they based their assumptions failed to incorporate migration flows explicitly and the small sample and large group of independent variables meant that the degrees of freedom were unusually small. It also failed to distinguish between manual and non-manual workers which McCormick (1989) argues is essential.

Boyle (1993) and others (Hughes and McCormick 1981) have shown consistently that those migrating into privately rented property are less constrained by distance than those moving into other tenures and this is true at small scales (Boyle *et al.* 1998) as well as larger scales of analysis (Boyle and Shen forthcoming). Boyle's (1993) study showed that among inter-county movers, those moving into privately rented accommodation were less constrained by distance than those moving into other tenures. Among the residuals from the modelling exercise, flows between large metropolitan areas and areas with naval and army bases were unusually high for private renters.

This type of aggregate-level analysis, however, fails to control for other individual level characteristics. We might anticipate that those who utilise privately rented accommodation most (e.g. young adults) are also most likely to migrate over longer distances. Nevertheless, Boyle and Shen (forthcoming) do control for a range of both individual-level and area-level characteristics and confirm that those moving into privately rented accommodation are less restricted by distance than those moving into other tenures.

4.5.4 Migration between tenures

The discussion so far has concentrated on the independent effects of different tenures. In fact, migration often involves tenure changes, with substantial numbers of movers leaving one tenure at the origin and moving into a different tenure at the destination. Buck (1994) uses data from the BHPS to show that there are suprising proportions of moves from owner occupied categories to renting, which runs counter to the prevailing assumptions about the ineluctable rise of owner occupation.

Prevalent among this group are elderly people moving into some form of sheltered accommodation, but a considerable number are related to evictions and repossessions. Young adults leaving the parental home also contribute to the numbers moving from owner occupation into renting. Because of the importance of owner occupation for households with children, this sector dominates the tenure at the origin, but renting accounted for 55% of first destination tenures, with private renting being especially important.

4.6 Environmental factors

This section of the chapter discusses the role of environmental factors, which the literature identifies as being particularly influential in migration from urban to rural regions and moves from larger to smaller places in the urban hierarchy, sometimes termed 'counterurbanisation'. These factors refer to the milieux in which potential migrants

live and the milieux of potential residential locations. Migrants make decisions to move based on assessment of the utility of origins and destinations. Labour market characteristics are important for migrants in the 25-59 age group (the principal labour force ages) but other area attributes are also important for this group and loom even larger for those in younger adult and older ages. These include:

- the physical environment, e.g. the quality of the landscape, the climate and the sea/land interface
- the built environment, e.g. type of housing and other buildings
- the social environment, e.g. accessibility to friends and family, type of neighbours, level of social 'buzz', degree of anti-social activity, congestion, noise
- the services environment, e.g. proximity to retail facilities, entertainment and leisure facilities, medical facilities, nursing homes.

These factors are called into play to explain movement out of the larger cities and down the urban hierarchy, which Chapter 3 has demonstrated is the dominant pattern of net migration in England and impacts on population distribution not only within but between regions. There is a substantial body of survey research which examines the reasons why people migrate. This section reviews this research, drawing heavily on Champion (1997, Chapter 6).

4.6.1 Migration out of cities is a complex process

In trying to understand why people move out of the largest cities into the rest of the country, we are dealing with a varied and complex process. In the first place, there is a range of different types of destination from smaller cities through towns and villages to deep countryside. Secondly, a variety of people are involved in this movement, including the retired, the self-employed, those taking jobs locally after their move and commuters who retain their city-based jobs.

Following on from this, the reasons that people quote for choosing to move to a non-metropolitan residence are equally varied. Nevertheless, amongst these, there are two reasons that appear to predominate: the advantages of living in a physically attractive environment and the search for a different type of community and lifestyle compared to the city. Moreover, underlying the whole process, there is arguably an element of 'oneupmanship', in that a move to the countryside may be viewed as the pinnacle of social achievement, all the more so as demand grows and entry becomes more difficult. In the next few paragraphs, we develop these points in a bit more detail.

4.6.2 Migration is to a variety of places

The first point concerns the variety of destinations that people moving out of the largest cities can opt for. The non-metropolitan counties of England can be distinguished in terms of their proximity to metropolitan areas, contain a wide range of settlement types and possess inherently different characteristics and personalities. They include large commercial and industrial centres such as Bristol, Nottingham and Plymouth, a variety

of long-established cathedral cities, resorts and spas, and market towns like York, Cheltenham and Bishops Stortford and a host of relatively new and/or rapidly-growing towns like Milton Keynes, Bracknell and Basingstoke. Even in relation to the deep countryside, it is important to recognize that this itself features a great diversity that is only partially captured by drawing a distinction between rural areas that are relatively accessible from metropolitan centres and inter-city motorways and those are more remote (see, for instance, Cloke, 1985).

4.6.3 There are several different types of movers

Given the wide range of destinations for metropolitan out-migration, it is not at all surprising that such movements can be interpreted in a number of alternative ways. Halliday and Coombes (1995), for instance, in what they term the 'counterurbanization conundrum', feel able to identify three potentially separate types of urban exodus:

- 'anti-metropolitan', involving the desire to get away from a heavily-populated region with its high house prices and 'rat-race' connotations

- 'anti-urban', denoting the 'push' factors of crime, social malaise, ethnic unease, congestion and pollution that are problems more commonly associated with larger cities and towns as opposed to smaller settlements

- 'pro-rural', emphasizing the search for a better environment or a more tranquil lifestyle and seen as an extension of suburbanization in the sense that this quest could just as readily be satisfied by a relatively short hop from built-up area to neighbouring green-belt village as by a longer-distance move from, say, London to the Devon countryside.

The conundrum is seen to arise because, whereas any move from south-east England to Devon would be seen as 'anti-metropolitan', someone moving from a smaller town in the South East like Crawley or Horsham to the City of Plymouth would actually be shifting up the urban hierarchy and therefore not be participating in an 'anti-urban' move.

4.6.4 There is a wide variety of reasons for moving

Nevertheless, even if attention is focused entirely on long-distance movement out of metropolitan areas into rural areas composed of smaller towns, villages and countryside, as is the case for most studies of people involved in the counterurbanization process, it is difficult to think of it as one single phenomenon. Even when highly distilled, the literature identifies at least three main groups of people involved in this process: retired people, long-distance commuters and those taking up local jobs (Cross, 1990).

The literature is also very clear about why these people are moving in larger numbers and are having bigger impacts on rural areas nowadays than previously. For one thing, the elderly population is growing in overall size, people are retiring at an earlier age or are prepared to move earlier in anticipation of eventual retirement, more people are now owner-occupiers and are able to contemplate buying a smaller house in a cheaper area and thereby increasing their savings, and over the past quarter of a century the choice of retirement area has switched firmly away from seaside resort and spa town to the countryside.

In relation to commuters, improved transport links like high-speed rail services into London and motorway connections much more widely across the country, allied to changing employment practices such as flexitime and more days spent 'on the road' rather than at the primary workplace, have vastly extended the length of the journey to work that people are prepared to make.

The single most important change of recent years, however, has been the massive transformation in the geography of employment. Not only has the increase in retirees and long-distance commuters generated job growth in consumer services, but a major rebalancing has been occurring between conurbations and shire counties as a result of the 'double whammy' of de-industrialization and decentralization. As a result, the vast majority of households moving into rural England contain people who are in work as opposed to being retired or unemployed and, if not immediately, certainly within a couple of years, are working locally or in a nearby town rather than commuting back to their metropolitan job.

Not surprisingly, therefore, a wide variety of reasons is cited by people for moving into non-metropolitan and more rural areas. In their 1987-88 survey of newcomers to Devon, Halliday and Coombes (1995) found that, while employment considerations formed the most commonly cited reason for moving into the county (being given as the main reason by 26 per cent of movers), several other reasons were also well represented: family reasons (17%), retirement (12%), business (10%), way-of-life (9%) and scenery (8%). Bolton and Chalkley (1990), in their study of newcomers to North Devon, found that 30 per cent gave voluntary job or career-related factors as their main reason for choosing this area to live, with a further 10 per cent arriving because the move had been required by their existing employers, while the other mostly frequently cited reasons related to social and physical environment (24%), family and health (18%) and housing/property (15%).

4.6.5 Reasons vary by type of area

The balance of reasons, however, has been found to vary in certain ways, particularly with respect to the importance of job-related moves. It seems to depend partly on the location and type of rural area, with Cloke *et al.*'s (1994) study of rural lifestyles finding that, while employment reasons accounted for over 20 per cent of moves into rural areas of Northamptonshire and Cheshire, they made up less than 13 per cent of moves into Wiltshire, Shropshire, North Yorkshire and Northumberland. Distance of move is also a highly significant discriminator. According to Halfacree's (1994) study of people moving from urban areas into Mid Devon and Lancaster districts, employment formed the main reason behind as many as 56 per cent of long-distance moves but behind only 6 per cent for those moving from towns within 25km. On the other hand, newcomers with jobs – particularly when these are based in larger towns – tend to opt for more accessible rural areas rather than moving deeper into the countryside, according to Hardill and Munn (1996).

4.6.6 People like the environment of the countryside

Beyond these main reasons triggering moves into non-metropolitan areas, however, there is a great deal of evidence that suggests a strong predilection for the countryside. Where studies have asked about *all* the reasons behind people's decision to move into these areas, a considerable proportion cite environmental reasons of one sort or another as being influential.

Of all the reasons given by in-migrants to Devon, for instance, the most frequently mentioned – by fully 50 per cent of respondents – was 'scenery', while 'way-of-life' was cited by almost one-third (32%). Similarly, in Halfacree's (1994) study, 59 per cent of urban-to-rural migrants cited 'physical quality of the environment' and 41 per cent mentioned 'social quality of the environment' as considerations in their move. Typical features quoted to Halfacree include 'more natural surroundings', 'quietness', 'less traffic', 'space, fewer people', 'to get away from it all', 'slower pace of life', 'more of a community atmosphere', 'escape from the "rat race"', 'fewer "non-white" people', 'safer at night' and 'better for children's upbringing' (Halfacree 1994, pp.177-80).

4.6.7 People like greenery, traditional homes and close knit communities

Drawing on the *urbs in rure* research tradition pioneered by Pahl (1966) and developed further by Newby (1985), Bell (1994) and others, Murdoch (1997) emphasizes the twin principal attractions of the village and the countryside more generally: the physical surroundings – the greenery of the countryside and the traditional nature of the buildings – and the pattern of social relationships – the idea of being part of village life and a rural community – and the way in which these two things are closely intertwined in people's minds, such that 'A locality which looks right must also, it is assumed, support a desirable way of life' (Newby 1985, p.23, quoted by Murdoch 1997).

Referring specifically to commuters moving into more accessible countryside, Murdoch (1997) concludes: 'Country life has two main attractions: firstly, it allows counterurbanizers to live in something resembling a natural environment; secondly, it holds the potential for living in real communities in which diverse class groupings engage in a multitude of shared activities'. The picture for in-migrants to more remote rural areas is not far different, Murdoch (1997) goes on to conclude, except that the emphasis on the rural aspects of life will be even stronger for this group.

From the various pieces of information collected by surveys on the changing nature of village life, it is possible to build up a picture of the perceived ideal rural village – one that is small, relatively compact, set in attractive countryside, with a few basic shops and a pub, with little evidence of new development, with an age and social mix amongst its inhabitants, a 'traditional' set of social activities and an 'organic' rather than 'self-consciously introduced' sense of community (see Halfacree 1995, p.14). According to Murdoch (1997), 'The power of this idealised conception of rural life may well be motivating people to move to rural areas in the hope that they can find a place in an organic community which has, for time immemorial, lived in a close relationship with nature'. Mythical or otherwise, the 'rural idyll' (Mingay 1994) would seem to be providing the cognitive framework within which many people are, consciously or subconsciously, making their decisions to join the urban exodus.

4.6.8 Opinion polls reveal a strong rural bias

All the evidence seems to suggest that there is a force deep in the English psyche which is driving people to aspire to a rural lifestyle. Very few appear to be forced to make this move, either by their employers or by the conditions prevailing in the places that they have moved from. By and large, people moving out of metropolitan areas are leaving the well-to-do suburbs rather than the less attractive neighbourhoods.

According to the Countryside Commission (1997), within the cities, 43 per cent of suburban residents and 51 per cent of inner city residents would like to live in a village or the countryside, and across England as a whole 54 per cent would like to do this, well over the twice the proportion (24%) that do so currently. If those preferring to live in towns as opposed to cities are added in, the overall proportion who want to live outside cities rises to 69 per cent. This latter figure is not far short of the 72 per cent who replied to a Gallup poll that they would prefer living in the countryside rather than in the city (King 1989, quoted by Halfacree 1994). The outside observer could easily be forgiven for misreading the title of the Government's Rural White Paper, *Rural England: A Nation Committed to a Living Countryside* (DoE/MAFF 1995): England appears to be a nation that is rural at heart and committed to living in the countryside.

Moreover, this appears to have been the case for a long time: the equivalent proportion in 1939 was 61 per cent wanting to live in the countryside (King 1989). Unlike Americans who prevailingly strive for a suburban lifestyle and European nations which, to varying extents, still prize urban living, for the English the lure of the countryside seems more irresistible than ever.

4.6.9 People make money in the town and spend it in the country

This is hardly surprising. This aspiration was led by wealthy industrialists who, in craving social respectability, used their profits to try and ape the landed aristocracy, a step which was followed on a much more modest scale by the better-off entrepreneurs and white-collar workers who managed to escape the squalor of the nineteenth-century industrial city. The perceived importance of this exodus has been enhanced by the success with which Britain has protected its countryside over the past half-century or more, both by ensuring a reasonably strong economy in rural areas and through imposing constraints on the scale, location and character of new urban development.

The controls over new housebuilding, while perhaps not as firm as some would have liked, have served to protect the appearance of the countryside and the lack of affordable housing provision has restricted residential access to it. As a result, the social *cachet* conferred on people by being able to live in the countryside has been escalating. Moreover, through its effects on both the desire and the ability of people to make this move, the countryside has become increasingly 'middle-class' and remains almost exclusively 'white'.

4.6.10 Migration directions and motives follow a life-course rhythm

Although migration out of metropolitan regions is the dominant theme in English migration, participation in that theme varies with stage in life course. Fielding (1993) has seen these centrifugal movements as part of a life cycle process whereby people are attracted to cities, and notably London, in the early stages of their adult lives, with many then rising rapidly in their job status and in due course stepping off this 'escalator' for a quieter life in less congested and expensive surroundings. This observation, however, is merely inferred from evidence of young adults moving to cities and somewhat older, wealthier and higher-status people moving away, rather than from evidence following the same individuals through their lives.

Research on the extent to which rural in-migrants may be returning to their former county or locality, or are newcomers to non-metropolitan life, is much sparser, but in the West Cornwall study it was found that just under a quarter of responding in-migrants had been born in the county (Perry *et al*. 1986). Incidentally, amongst the 'new settlers' in West Cornwall, almost half (49%) had chosen it because they had enjoyed previous holidays there as temporary residents and clearly saw this as a preferred environment.

4.7 Public policy factors

Some determinants of migration connected with public policy have not been covered in the discussions in the earlier sections, notably policies that are associated most directly with migration. These do not tend to be as significant in England as in many other countries, notably in North America (Charney 1993) because welfare, education and government services are more uniform across local authorities here. While taxation levels do vary across England, the scope for local differences is much reduced when over 80% of local government expenditure is funded out of central government revenues.

4.7.1 Direct migration incentives

Central government has, on occasion, organised migration or provided incentives for people to migrate. These *dirigiste* policies have largely fallen out of favour because of the controversy they generate. For example, the stream of immigrants from the Caribbean was initiated in the early 1950s by London Transport labour recruitment in the British West Indies. Another example was the scheme for transfer of miners from the declining Scottish and Northeast coalfields to the East Midlands, which provided housing as well as jobs in the Nottighamshire coalfield. The deliberate policy of sending children from local authority homes to the British dominions in the first two postwar decades, irrespective of their wishes and those of their mothers, has been exposed to scrutiny through the efforts of one Nottingham social worker and the Child Migrant Trust she helped found (Humphreys 1995).

4.7.2 Defence spending

Defence spending has a considerable influence on migration in several ways, though its impact is diminishing as it declines as a share of public expenditure. Military bases provide employment and stimulate migration of young adults. Military activity demands fairly frequent migration to new training areas, to new mission locations and as a result of promotion procedures. Generally speaking, the Armed Forces provide housing for military personnel, though very recently a large part of the stock has been bought as an investment by the Japanese financial firm Nomura. This may mean that vacancies in the former military housing stock can be reduced and new forms of social housing supplied.

4.7.3 The role of higher education expansion

One of the major migration streams which moves several hundred thousand migrants each autumn is that of students into higher education (HE). That such a large proportion of students migrate to enter HE is a peculiarly English phenomenon (Stillwell and Rees 1985, Rees 1985). Where those HE places are being generated will affect local housing demand. One minor counter to the long standing North to South regional migration drift

is the small net flow in the opposite direction produced by the higher propensity of southern regions to generate HE students who move to the Midlands and North to find HE.

4.7.4 Local taxes

There is some evidence that tax-service levels have an influence on migration. John, Dowding and Biggs (1995) carried out a questionnaire survey of households' moving decisions in four London boroughs during the years of the poll tax. Taxes and services are found to be important factors in the moving decision. Those who moved from higher to lower tax boroughs did cite low taxes and good services as part of their motivation.

4.7.5 The role of planning

It almost goes without saying that planning policies about land use and release of land for development are crucial in directing in-migration to new housing at micro-geographical scales. The whole history of post Second World War land use planning has been concerned with limiting the continuous built up area of the larger conurbations by encircling them with *cordon sanitaires* in the form of green belts. Growth outside of the green belts has been directed to particular settlements, the most important of which were the New Towns which provide homes for several million people in the late 1990s.

Whereas in early postwar decades there was considerable investment in social housing in new towns, expanded towns and on the suburban fringes of cities, the last two decades have seen such activity decline to very low levels and be replaced by private development. Planners have responded to the demand for release of land for private housing in new ways. The crucial role of land release policies is emphasized by the current arguments between countryside dwellers who resist greenfield developments and the developers who seek such locations as being both cheaper and more desired than the alternative brownfield sites within existing urban areas. The concern over the 'circularity' of household projections is a key issue (see section 4.5.2 above, and Chapter 2)

4.7.6 Immigration policy

Immigration policy is clearly important in determining the volume of international inflows. Of particular importance is the policy with respect to asylum seekers. There has been considerable debate in the recent past about the terms under which asylum seekers can settle, the grounds for sending them back to their origin countries, the conditions of their detention in the UK, their human rights and their access to housing and social benefits (*The Economist* 1998). Policies are currently under review by both government and the courts, and may well change in the future. These changes will affect the numbers of asylum seekers accepted for settlement.

4.8 Impedance factors

When the migration flows between two places are considered, a critical variable is the impedance between origin and destination, as is argued in Chapter 5. The greater this impedance the lower the migration flow, other things being equal. Although the patterning of flows between origins and destinations by themselves may not be of as much policy interest as their impact on places' populations, it is essential to model the gross flows between

places in order to maintain system consistency. A brief discussion is provided here.

Usually what is done in migration models is to use some simple measure of distance between two places (often straight line distance between the centre co-ordinates). Sometimes more elaborate measures are used, such as travel distance or travel time on the road network. The latter measure recognises that different speeds are possible on the variety of links on routes between places. A number of technical issues arise when creating an interplace distance matrix. When places are separated by a body of water, then the straight-line distance may not be appropriate.

An example of this occurred in the study of student migration by Stillwell and Rees (1985) when migration flows of HE students out of Northern Ireland were shown to increase with distance from Belfast. This was because the lowest cost destinations from Northern Ireland were in London and surrounding counties, as a result of the cheap air shuttle service between Heathrow and Aldergrove airports. In many modelling studies, the results have been shown to be very sensitive to intra-region distance. The solution is to estimate an average migration distance using flows at a finer spatial scale, and within those units use population weighted distances.

However, the direct cost of travel between two places is probably only a minor component of the impedance. Migrants may well also be making a calculation about the longer term travel costs back to the region that they left to visit relatives and friends. Furthermore, there is a component of impedance which relates to the amount of information about a destination available at an origin.

Once the decision to move has been made, personal knowledge of a place is important in choosing a destination and the probability of knowledge falls off with distance. The flow of information between places has also been subject to distance decay, though in recent times this decay may have become less significant because of the developments in telecommunications and computer networks.

4.9 Conclusions

The determinants discussed in this chapter play a variety of roles: they control the volume of migration, they show selection effects in the profile of out-migrants from regions, they influence the choice of destination and the mix of in-migrants, and they affect the flows between origin and destinations. In Chapter 5 frameworks for modelling migration are presented that elaborate and operationalise the origin-destination-impedance framework of Lee (1966). In Table 4.11 we summarise how each set of determinants influences the various migration streams identified in Chapter 3 and try to highlight the variables that might be used in the explanatory models outlined in Chapter 5.

4.9.1 Demographic factors

Demographic factors are extremely influential in determining the volume and composition of interregional migration and cannot be left out of any prediction of the future demand for housing. Demographic factors (the size of different age groups) enter into the prediction of total outflows from regions.

There is the need to convert the individual age and sex group figures in the demographic forecast into housing demand via households. At present this is done using a sophisticated headship rate method, which again is basically demographic in nature (Corner 1989, 1992). To link the events which happen to individuals to the households and housing they live in is an attractive goal, but at the moment there is no comprehensive source of the transition data that would be needed.

However, the life course concept should be used to disaggregate any migration model into sub-models that apply to people in the same life course stage. The explanatory factors included in migration models for young adults, families, retired couples and elderly people will differ considerably. The migration of young adults will be driven by the distribution of HE places and first jobs in the labour market. The migration of families will be driven by labour market factors and environmental factors influencing the type of area of destination choice. The migration of the retirement age group will be driven by the state of the housing market and by environmental factors (pushing them out of large cities and pulling them into smaller places). The migration of the elderly will be driven by the provision of support and care either based on the family, community or the state. Demographic factors are thus a vital part of the explanation of migration patterns.

4.9.2 Cultural and social factors

Four cultural/social groupings were identified in our discussion: migration activity varied by ethnic group, by employment status, by social class and by educational status. These decompositions of the population would be important to include in a migration model if there was a desire to carry out projections or simulations of housing demand for such groups or where there are strong correlates between groups in these different classifications and the demand for social housing (e.g. Bangladeshis, the unemployed, social class V). Interesting though these disaggregations of the population are, however, the only one for which a firm case could be made for inclusion in a migration model is employment status, supplemented, if information were available, by knowledge of the income status of migrants.

4.9.3 Labour market factors

Labour market factors are of vital importance in understanding longer-distance migration. The most important direct variables that should be included in a migration model are the flow of job creations and job losses by region. These, however, are difficult to observe and proxy variable such as (net) employment change can be used. The difficulty with using such drivers in a migration model is that you need a projection model for regional employment change as well.

There is increasing evidence from other countries (e.g. Australia reviewed in Newton and Bell 1996) that the relationship between employment change and migration can also operate the other way round: consumption-led migration by families or retirees leads to the creation of service employment which attracts labour migration. Labour market factors should be incorporated in a migration model, connected to one of the national econometric models of regional economic development.

Table 4.11 Summary of the role of migration determinants

Spatial pattern	Temporal trend	Demographic factors	Cultural/Social factors	Labour market factors	Housing factors	Environmental factors	Policies	Impedance factors
International migration								
Volume	Increasing in level because of asylum seekers	Concentrated in adult ages	Ethnic mix, social mix, geographical distribution affected	Intra-EU migration and business elite migration affected	High demand for social housing by asylum seekers	Not important	Immigration controls and settlement policy vital	Various international links important not distance
Modelling implications	Scenario model needed to project volume	Model needed to estimate emigrants	Model needed to distribute immigrants				Alternative policy scenarios needed	
Migration between England and Rest of UK								
Volume	Out-migration from England increasing	Changing age/sex composition affects volume	Destinations of inflows very different for each country	Flows affected by labour market conditions	Flows affected by housing market conditions	Important for Scots and Welsh in-migrants	No direct policy affects these flows	Cultural barrier effect probably present
Modelling implications	Scenario model needed							
Migration within England								
Volume	Varies with business and house price/ wages cycles	Changing age/sex composition affects volume	Changing employment status affects volume		Flows affected by housing market conditions			Impedance important
North/South	Varies with business and house price/ wages cycles	Selective of working ages	Nonmanuals migrate; manuals left behind	Unemployment levels important	South East house price changes are vital drivers	Environmental factors may play a role		Impedance important
Urban/Rural	Varies with business and house price/ wages cycles	Selective of family and retired ages; reverse flow of young adults	Better off migrate to rural areas; ethnic minorities concentrate in London	Self employed flow is important	South East house price changes are vital drivers	Environmental factors vital	Land use policies important	Impedance important
Inner City/ Suburb	Varies with business and house price/ wages cycles	Selective of family ages; reverse flow of young adults	Better off migrate; selective gentrification	Shift of jobs to suburbs important		Environmental factors vital	Land use policies important	Impedance important
Modelling implications	Need a model of the regional business and house price/ wages cycles	Size of future age groups already determined; maybe a cohort effect on migration	Include employment status	Use projected employment change	Use housing tenure at destination	Environmental indicators needed in model	Destination scenarios needed	Measure impedance using drive time and good intra-region technique

4.9.4 Housing factors

Housing is a critical element underlying migration patterns in the UK although it clearly cannot be divorced from other factors such as inter-area variations in wages, (un)employment and amenities. It is also noteworthy that while much attention has been given to the role of housing in migration models, the reverse is less true (e.g. Muelbauer and Murphy 1997), despite the fact that each is likely to impact upon the other.

Public sector housing is a barrier to mobility, as those moving into council houses do tend to move shorter distances than those moving into other tenures, but this varies by region. There is no concrete evidence that the right to buy has generated greater mobility, although in the absence of large data sets which identify council tenants who have bought their properties from other owner occupiers, this is difficult to prove. Relaxing the administrative constraints on moves between local authority districts may have promoted mobility just as much as the more draconian measure of implementing the right to buy.

It appears, from a variety of studies considering owner occupied housing, that the relationship between house prices, housebuilding and long distance migration is not simple and at the very least we should expect different relationships for those on high and low incomes, and especially between those in and out of jobs. National level recessions have also been hypothesised to have significant effects on the movement into and out of owner occupied housing and these effects probably vary regionally. Cross-sectional models of migration may be improved if some measure of national economic activity can be incorporated.

Privately rented property remains the tenure which provides most flexibility for inter-regional migrants and the relatively small share of the housing market dedicated to this tenure in the UK may be an important issue for further study, particularly in those areas where house prices are high. Consistently it has been shown that those moving into privately rented housing are least restricted by distance. Places with high proportions of this type of housing may attract people from longer distances than average.

Overall, from the perspective of modelling aggregate inter-regional migration flows, this suggests that the relative proportion of different types of housing should be a significant explanatory variable. A further improvement in such models could be achieved by modelling flows that are disaggregated by tenure at the destination and if possible, at the origin. Other factors must also be distinguished in these models, notably with the flows of job and non-job migrants being a key distinction which is related closely to the housing market.

4.9.5 Environmental factors

These are relatively most important in accounting for intermediate-distance moves, especially between more urban and more rural areas. Our discussion has examined the attitudes which people hold about what makes for a good ‘quality of life’ and the types of places which best satisfy their aspirations in this regard. It has found evidence suggesting that the English are, by and large, a nation committed to living in the countryside or as near as they can get to it. The corollary to this is that the main reason for leaving cities is that the latter fall short in social and environmental terms, but given that most newcomers

to the shire counties and their rural areas are moving from the more attractive and less deprived parts of metropolitan England, the 'push' factors associated with city life would seem to be of less importance than the quest for the 'rural idyll'.

On the other hand, it is doubtful whether out-migration to non-metropolitan areas could take place on anything like its present scale if it were not for a 'replacement population' taking up the spaces that they vacated, including people who are primarily moving out of the older and more deprived parts of the conurbations as well as people moving in from non-metropolitan areas and from outside England. This raises questions concerning the extent and nature of the linkages between each of the different types of migration including immigration from overseas, the way in which these relate to other aspects of population change including natural increase and household formation, and the possibility that there is some form of 'environmental capacity' which influences how migration redistributes residents between different types of places.

4.9.6 Public policy factors

It is clearly vital to specify any migration model in such a way that public policy variables can be explicitly represented. The most influential of these will be the outcomes of discussions between the DETR and local planning authorities on the amount of land to be allocated for new housing units. This allocation has been influenced by the projected number of individuals and households in the subnational projections. These projections have, to date, been trend driven and thus may become self-fulfilling (see Bramley 1995, 1998 for a discussion of the circularity issue). By representing both demand (potential migrants) and supply (availability of housing) in the migration model (and associated social housing model), alternative policies can be explored as a contribution to policy formulation.

4.9.7 Impedance factors

If a modelling strategy that integrates the explanatory factors outlined above into spatial interaction models is adopted, which is the recommendation that emerges from the review in Chapter 5, then it is essential to introduce a robust and accurate measure of impedance. Drive times are available commercially for incorporation into such a model. Careful attention will need to be paid to the estimation of intra-regional distances, particularly if the model is specified for spatially extensive units such as the standard or Government Office regions.

The next chapter reviews the methodologies that have been developed to make operational the testing of models of migration incorporating the determinants discussed in this chapter.

CHAPTER 5: MIGRATION MODELLING

5.1 Definitions

In this chapter we review the approaches available for the formal modelling of migration flows. By formal modelling we mean the quantitative prediction of the size of the flows using a mathematical procedure which is thought to represent how migration is determined. Successful formal models have two sets of characteristics: proper, consistent specification of the predictive equations and use of independent variables as determinants which have good predictive power. Chapter 5 concentrates mainly on the first set of characteristics. Chapter 4 was concerned with the selection of the best determinant variables and the variables that pick out population groups with different migration behaviours. The remainder of this first section defines terms used throughout this chapter.

1. Migration is the permanent or semi-permanent relocation of an individual or household. It always involves a change of residence and normally involves a relatively long distance move and a change in employment, or a change in the chance of employment if the person is unemployed.

2. Migration 'units' are those who move as a result of a single decision process. A migration unit can therefore be one adult individual, a couple of adults, or a family.

3. Migration 'flows' are the numbers of migrants (not usually migration units) migrating from origin i to destination j. Here, migration flow is denoted by M_{ij} . Migration flows can also be the number of events of migration from i to j.

4. Migration has to be measured over some time interval and the interval chosen affects the migration measured. Short time intervals lead to small sample sizes and the risk of under-representative measurements of flows; long time intervals lead to undercounts where migration units move from i to j and then to k so that the move to j might go unrecorded. Similarly, within longer time intervals, individuals might move from i to j and back to i so no migration is recorded.

5. A migration matrix (see Figure 5.1) describes the migration flows between a set of origins (usually denoted by i) and a set of destinations (usually denoted by j). The number of origins does not have to equal the number of destinations but it usually does in migration matrices and here, for mathematical convenience, we will only consider cases where every place is both an origin and a destination for migrants. Let the number of origins (and hence the number of destinations) in the system be denoted by n. The cell values are denoted by M_{ij}; the row totals (denoted by M_{i*} or O_i) denote the total out-migration from origin i; the column totals (denoted by M_{*j} or D_j) denote the total in-migration into destination j; and the overall number of migrants is denoted by M_{**} or M. The following equations hold:

$\Sigma_j M_{ij} = M_{i*} = O_i$ Total outflows from each origin

$\Sigma_j M_{ij} = M_{*j} = D_j$ Total inflows to each destination

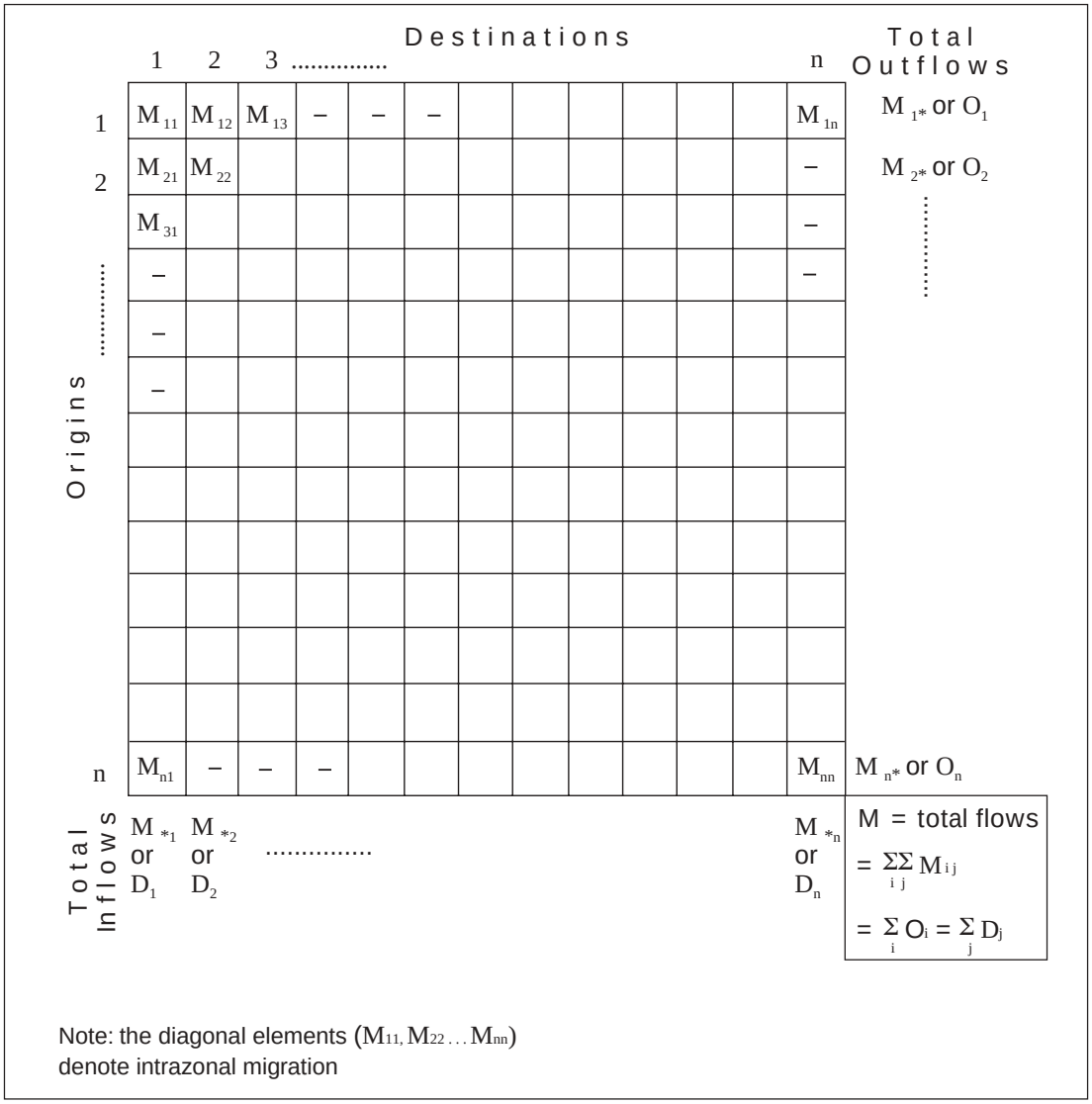
$\Sigma_i\Sigma_j M_{ij} = M_{**} = M$ Total flows

or equivalently,

$$\Sigma_i M_{i*} = \Sigma_j M_{*j} = M_{**} = M$$

6. Migration flows between zones are known as *interzonal flows*. Migration flows within the same zone are known as *intrazonal flows*. Typically in migration modelling the focus is on the interzonal flows only and the intrazonal flows are ignored or estimated separately. Intrazonal flows are often not regarded as 'true' migration flows but as simply denoting people moving house within the same urban area.

Figure 5.1 A migration matrix



7. Origin and destination zones can be at any spatial scale from enumeration districts to major census regions.

8. A common objective of migration modelling is to predict some aspect of the flow matrix. Usually the objective is to predict the flows themselves although some models only predict row and/or column totals. A predicted value is denoted by '~' so that $M_{ij}^{\sim}$ is the predicted value of M_{ij}; $O_i^{\sim}$ is the predicted value of O_i; $D_j^{\sim}$ is the predicted value of D_j; and $M^{\sim}$ is the predicted value of M.

9. The migration flow from i and j is sometimes termed the *gross migration flow from i to j*. The migration flow from i to j plus the migration flow from j to i is the *total migration flow between i and j*. The migration flow from i to j minus the migration flow from j to i is the *net migration flow between i and j*. That is:

M_{ij}	gross migration flow from i to j
$M_{ij} + M_{ji}$	total migration flow between i and j
$M_{ij} - M_{ji}$	net migration flow between i and j

5.2 Reasons for modelling migration

This section covers the issue of why it is important to understand and to forecast migration and what information can be obtained from migration models.

Along with birth rates and death rates, migration is an important determinant of regional and sub-regional population projections. As sub-national variations in birth and death rates decrease over time, sub-national variations in population dynamics increasingly become a function of migration differentials. Within the advanced economies of countries such as the UK, population decline experienced in some regions is driven by net out-migration and population growth experienced in others is driven by net in-migration. If pure numbers are all that is important, it might be sufficient to simply predict a matrix of net-migration flows between regions. Note, however, that housing demand is not only a function of population numbers but how those numbers combine into households. Consequently, regional variations in housing demand are a function not only of net migration rates but also of variations in the factors affecting household formation such as marriage rates, divorce rates and average family size.

It is also often necessary to consider more than a simple addition or subtraction of net migrants to an existing population total to assess variations in housing demand. It might be important to know what type of migrants are leaving and what type of migrants are entering a region. For instance, if the majority of migrants leaving a region are home-owners and the majority of migrants entering the same region are renters, the net-migration is of relatively little importance – it is the mismatch between the departing and arriving migrants in terms of their housing needs which is of much greater importance.

To summarise the above, focusing on net-migrants as opposed to gross migrants can be simpler and might be appropriate if all that is required is an estimate of population numbers. However, any analysis of net-migrants leads to information on the in-migrants and out-migrants being lost, information which might be crucial to certain decisions.

Given that it is often important to understand migration flows for the reasons described above, there are two major reasons for obtaining this understanding through the mathematical modelling of migration flows:

(i) to predict migration flows for a future time period or between zones where migration data have not been collected; and

(ii) to obtain information on the determinants of migration flows. This is usually done through calibrating a model in which the dependent variable is migration flow and the independent variables are the attributes of the origin and/or destination zones which are thought to affect the migration flows. Information on the causes of migration is obtained from the parameter estimates obtained in the model calibration.

The two reasons are not mutually exclusive: we often need to understand the factors which influence migration flows in order to predict such flows. For instance, if the unemployment level is high in a potential destination, will that have the effect of decreasing in-migration to that destination? Similarly if the unemployment level increases in a zone (it may still be low), to what extent will migration to and from that zone be affected? However, there are modelling approaches which allow predictions of migration to be made without understanding the determinants of migration. Such models extrapolate known trends in migration flows to either future time periods or different sets of zones (the former is by far the more common). However, the majority of migration models are designed to produce knowledge of the ways in which various attributes drive migration flows and the majority of the discussion below focuses on such modelling attempts.

5.3 Operational questions in migration modelling

This section aims to describe briefly some of the conflicts which arise in migration modelling and some of the decisions which have to be made in operationalising migration models.

Do you want to use the migration model to 'explain' migration flows or not? Certain types of migration models (for example, trend models) simply extrapolate trends without providing an understanding of the determinants of the migration flows. Whilst these are generally easier to operationalise, they suffer the obvious problems of not being able to predict rapid changes in migration patterns caused by changes in macro-economic and macro-social conditions and not being able to handle situations well where boundary changes happen. Migration models which attempt to provide information on the determinants of migration are generally more difficult to operationalise as they involve model calibration but they provide a clearer picture of the determinants of migration flows between regions and they are more useful in predicting the effects on migration flows of changes in macro-economic and macro-social conditions.

Do you want to predict the migration behaviour of groups of migrants (an *aggregate modelling* approach) or of individual migrants (a *disaggregate modelling* approach)? In theory, the latter should provide more accurate information because individual attributes can be used in the model although because of data availability there are very few examples of disaggregate migration modelling and those few examples do not paint a greatly convincing picture of their superiority. Partly this is because the individual attributes are sometimes difficult to measure and partly it is to do with sample size: idiosyncratic reasons for migration behaviour can play a larger role in disaggregate modelling than they would in the typically much larger data sets used in aggregate migration modelling.

If you want to analyse the behaviour of groups of migrants, which groups do you want to examine. For what groups of migrants is migration behaviour relatively homogeneous and significantly different from other groups? For instance, are there significant differences in migration behaviour by age, sex, income or education? Are there problems

with very small sample sizes and sparse matrices once migration matrices are disaggregated by migrant type? Adding data from attitude surveys could be useful but this also has limitations in that potential migrants are asked to respond to hypothetical situations and their actions in real situations remain uncertain.

Do you want to calibrate models separately for each origin or not? The majority of migration models have been calibrated using the whole migration flow matrix which means that an 'average' set of migration relationships with the independent variables is produced through the parameter estimates of such models. These averages can mask interesting and important variations in the determinants of migration across origins. For instance, take the relationship between migration rates from an origin i to several destinations and the median house prices at those destinations. If the price of housing is low in origin i, then variations in house prices across the destinations are likely to be important to migrants from i: high house prices at a destination may act as a strong deterrent to migration from i. However, if the price of housing at i is high, price variations across the destinations are likely to be less important: indeed high house prices might even be an attraction for investment purposes or to avoid capital gains taxes. An example of such a finding is given by Fotheringham and O'Kelly (1989) and is reported in the list of examples included at the end of this report.

At what geographical scale should the analysis of migration flows take place? Different conclusions may well be reached from modelling the same basic migration data at different spatial scales. That is, an analysis of migration flows between enumeration districts might well lead to one conclusion about the relationship between migration and destination unemployment while an analysis of the same data aggregated to regions might produce a completely different conclusion. This problem is well-known in general forms of spatial analysis (Openshaw 1984, Fotheringham and Wong 1991) as well as in flow modelling (Amrhein and Flowerdew 1989). The reasons for such discrepancies centre on the fact that as data become aggregated, interesting relationships appearing at the small scale can be averaged away at more coarse spatial scales. One obvious problem in modelling migration flows between very large spatial units is that the measurement of separation between the zones (almost invariably one of the most important determinants of migration flows) becomes increasingly less accurate as the measurement is usually taken between single points within regions and each point becomes less representative of the region as a whole as the region becomes larger.

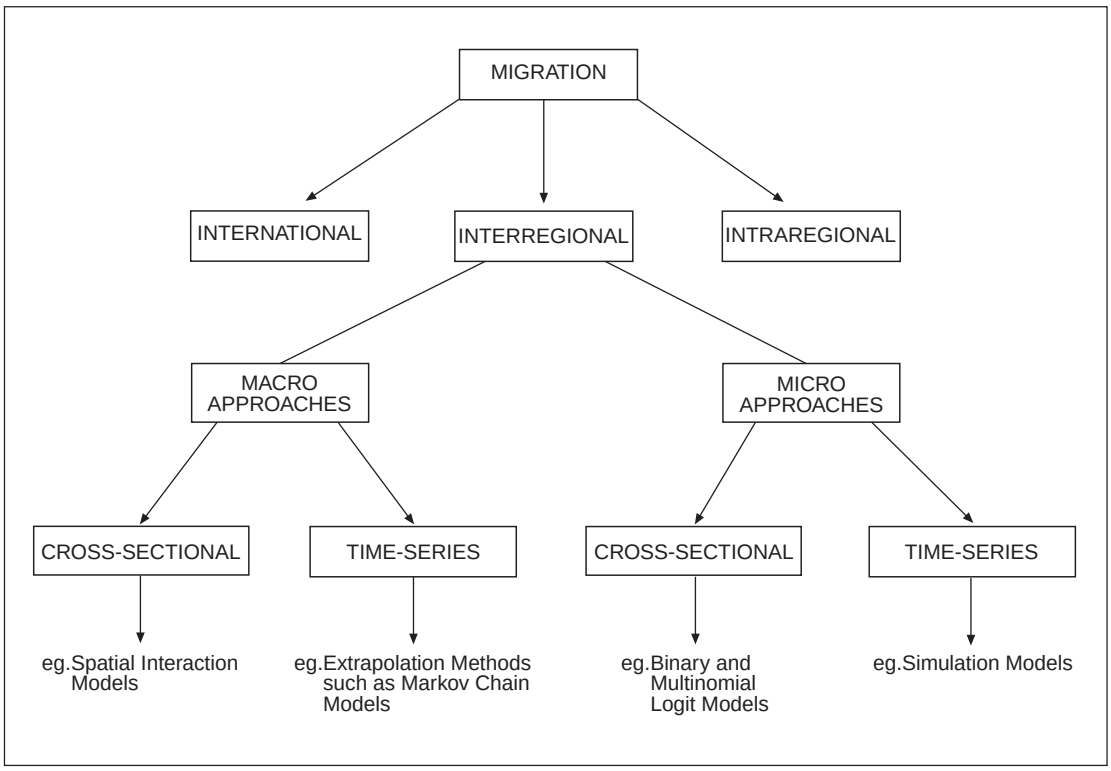
5.4 An overview of four types of migration models

> 'There is no necessarily correct or incorrect method of modelling migration and this is undoubtedly one of the reasons for the bewildering plethora of model structures and applications which is to be found in the literature'
>
> Stillwell and Congdon (1991, pp. 2-3)

It is difficult to categorise migration models for two reasons: (i) there are so many different migration models employed in the literature (indeed it is hard to find examples of the same two models used in different studies!); and (ii) as Stillwell and Congdon (1991, p13) note: 'mutually exclusive migration model categories are almost impossible to establish'. However, it is possible to provide an overview of the more common types of migration models within a four-fold framework described in Figure 5.2 and below.

Broadly speaking, migration can be viewed from a *macro* or a *micro* perspective (Cadwallader, 1992). In the former, migration is viewed as a societal process and an adjustment process in a system of regions; in the latter, it is viewed as the outcome of an individual decision-making process. However, the distinction is often quite blurred because some of the migration models calibrated with aggregate data are derived from theoretical principles that apply to individual decision-making. Also the two types of models do not necessarily represent contradictory views of the migration process: often the distinction is a pragmatic one concerning the type of data available with which to calibrate the models.

Figure 5.2 A typology of migration models



Migration models can also be classified by their use of cross-sectional (referring to migration in only one time period) data or time-series data (using migration data for more than one time period). With the above dichotomy of macro versus micro models, this produces the following four-fold classification of migration models:

Aggregate (macro) cross-sectional models: By far the most common type of migration model. Aggregate migration data are employed for one time period. The data can be aggregated to all migrants or to groups (cohorts) of similar migrants. Thus the migration flow matrix will consist of flows between origins and destinations for all migrants or, alternatively, different migration matrices might exist for different cohorts. Migration flows are modelled in terms of a set of explanatory variables so that information is obtained on the determinants of migration.

Disaggregate (micro) cross-sectional models: The models are essentially the same as applied to aggregate data but are applied to, and calibrated with, data on individual migrants as opposed to groups of migrants. The models are 'richer' than their aggregate equivalents in that data such as income, and age can be included as continuous explanatory variables

of the migration process whereas in the aggregate modelling approaches the effects of these variables can only be included by calibrating the models separately for each migration group defined in terms of discrete and arbitrary cut-off points. For instance, separate aggregate models might be calibrated for age groups 20-24, 25-29, 30-34 and so on whereas age can be added as a continuous variable in a disaggregate migration model. However, the advantage of disaggregate migration models is offset by severe data availability problems and there are relatively few applications of such models in the literature.

Aggregate (macro) time-series models: These models predict migration for future time periods through trend extrapolation under certain assumptions of stationarity without attempting to provide any explanation of current or past migration flows. They are useful for short-term forecasting where there is little chance of dramatic change occurring but their utility is suspect over long time periods and they are particularly suspect in times of changing economic and social conditions. Their use is also limited when boundary changes occur.

Disaggregate (micro) time-series models: Simulation exercises play a large role in this type of modelling framework. The simulation models introduce dynamics to the migration process at the level of individuals by forecasting the behaviour of individuals under a variety of economic and social conditions. The behaviour in time interval t results in a simulated change in zonal populations at the end of the time period and these new populations are used to simulate migration activity in time interval t+1 etc.

Each of these four modelling types is now discussed in more detail.

5.5 Aggregate (macro) cross-sectional models

These are by far the most common types of migration models and many examples of their use in migration studies exist in the literature where they are typically referred to as spatial interaction models (Haynes and Fotheringham, 1984; Fotheringham and O'Kelly, 1989). The models have the general form:

$$M_{ij} = f(X_i, X_j, X_{ij})$$

where M_{ij} is the migration flow between origin i and destination j; f( ) represents a functional form; X_i is a vector of attributes which describe the propulsiveness of i as an origin for migrants; X_j is a vector of attributes which describe the attractiveness of j as a destination for migrants; and X_{ij} is a vector of attributes describing the spatial separation of i and j (or any other attribute of j which varies with i). In practice the number of independent variables in the model can range from 1 (usually the distance separating i and j) to a very large number as in Flowerdew (1991). The previous Chapter on the determinants of migration gave examples of the attributes that can be included in each of these three vectors.

Four specific and related forms of spatial interaction migration (SIM) model can be derived from the general equation given above by constraining the predicted migration flows in different ways. These are known as the *total-flow-constrained model; the production-constrained model; the attraction-constrained model;* and the *doubly constrained model.*

Consider the migration flow matrix described in Figure 5.1. If the total predicted volume of flows, $\tilde{M}$, is constrained to equal the observed total, M, that is,

$$\Sigma_i\Sigma_j M_{ij}^{\sim} = \Sigma_i\Sigma_j M_{ij}$$

then the model obtained is a *total-flow-constrained model.* It has the general form:

$$M_{ij}^{\sim} = c\, x_{i1}^{\alpha} \ldots x_{ik}^{\phi}\, x_{j1}^{\delta} \ldots x_{jm}^{\gamma}\, x_{ij1}^{\beta} \ldots x_{ijp}^{\lambda}$$

where c is a constant which ensures the constraint given above on total flows and there are k origin attributes, m destination attributes and p separation attributes (often p=1 with the only separation term being a distance measurement between i and j). Estimates of the parameters in the model are obtained in the model calibration either by maximum-likelihood estimation or by ordinary least squares (see later for an empirical comparison of the use of the two calibration techniques with an interregional migration model). In the case of the latter, which is the more frequently used calibration technique for this type of model, the model is made linear-in-parameters by taking logarithms of both sides. In doing so, it should be noted that the constant term estimated in the regression will not ensure the constraint on total flows (it will ensure a constraint on total logged flows) and the intercept should therefore be adjusted manually after the least squares calibration (see Fotheringham and O'Kelly, 1989, Chapter 3 for a fuller discussion of this and other calibration issues). Also, problems arise in the logarithmic transformation when any of the flows are zero (highly likely in migration matrices between very small spatial units). Although the model has been used extensively in the past, today it is relatively little used as it typically provides much poorer fits to observed migration matrices than the models described below. It remains, however, a convenient way of determining the effects on migration flows of a series of origin and destination attributes.

By far the most frequently used migration model is the *production-constrained model* in which for each origin the total predicted outflow is constrained to equal the total observed outflow. That is, the constraint:

$$\Sigma_j M_{ij}^{\sim} = \Sigma_j M_{ij} = O_i$$

is imposed on each origin so that the migration model has the general form:

$$M_{ij}^{\sim} = O_i \quad \frac{x_{j1}^{\delta} \ldots x_{jm}^{\gamma}\, x_{ij1}^{\beta} \ldots x_{ijp}^{\lambda}}{\Sigma_j\, x_{j1}^{\delta} \ldots x_{jm}^{\gamma}\, x_{ij1}^{\beta} \ldots x_{ijp}^{\lambda}}$$

where O_i is the total observed outflow from origin i. The denominator ensures that the constraint on total outflows from each origin is met. The model is therefore a 'share' model which predicts the share of the total out-migrants from each origin, O_i, going to each destination. The model is useful for forecasting the total number of in-migrants at each destination by:

$$D_j^{\sim} = \Sigma_i M_{ij}^{\sim}$$

where the symbol '~' denotes a predicted value from the model.

The production-constrained model is also useful for examining the characteristics of destinations which affect migration although it does not yield any information on the origin characteristics which affect the volume of total out-migration from each origin.

The origin attributes are subsumed in O_i which is assumed to be known. This model is popular because it can be derived from the intuitively appealing theoretical principles of random utility maximisation and it models the choice of a destination from a set of alternatives. The model is usually calibrated by maximum-likelihood estimation or by least squares. The latter is possible through a rather convoluted transformation given by Nakanishi and Cooper (1975) and described in Fotheringham and O'Kelly (1989) or by calibrating an origin-specific constant term which takes the place of the denominator in the above equation (Cesario, 1975).

An alternative to the production-constrained model is the *attraction-constrained model* where for each destination the total predicted inflow is constrained to equal the total observed inflow. That is, the constraint:

$$\Sigma_i \, M_{ij}^{\sim} = \Sigma_i \, M_{ij} = D_j$$

is imposed on each destination so that the migration model has the general form:

$$M_{ij} = D_j \, \frac{x_{i1}^{\alpha} \ldots x_{ik}^{\phi} \, x_{ij1}^{\beta} \ldots x_{ijp}^{\lambda}}{\Sigma_i \, x_{i1}^{\alpha} \ldots x_{ik}^{\phi} \, x_{ij1}^{\beta} \ldots x_{ijp}^{\lambda}}$$

where D_j is the total observed inflow into destination j which is allocated to the origins according to the ratio in the right-hand-side of the equation. The model does not yield any information on the characteristics of destinations which affect migration flows but it can be used to estimate the total out-migrants from each origin by:

$$O_i^{\sim} = \Sigma_j \, M_{ij}^{\sim}$$

The attraction-constrained model provides information on the determinants of out-migration through the model's parameter estimates. The model is used less frequently than its production-constrained counterpart and although it is sometimes used to allocate individuals to housing areas given a sudden boost in employment at j, applications to migration modelling are quite rare. It can be calibrated in the same way as the production-constrained model. Rees *et al.* (1990) describe the use of both the attraction-constrained and the production-constrained models for forecasting migration between wards in Swansea.

A spatial interaction model in which constraints on both the total predicted outflows and total predicted inflows operate is known as a *doubly constrained model* and has the form:

$$M_{ij} = A_i \, O_i \, B_j \, D_j \, x_{ij1}^{\beta} \ldots x_{ijp}^{\lambda}$$

where,

$$A_i = [\, B_j \, D_j \, x_{ij1}^{\beta} \ldots x_{ijp}^{\lambda} \,]^{-1}$$

and

$$B_j = [\, A_i \, O_i \, x_{ij1}^{\beta} \ldots x_{ijp}^{\lambda} \,]^{-1}$$

so that the 'balancing factors' A_i and B_j are estimated iteratively and ensure both origin and destination constraints are met. The model is the most accurate of the four cross-sectional frameworks in being able to *replicate known flow matrices* because of the constraints on the model. However, its relative ability to *predict unknown flows* is less obvious and it yields only limited information on the determinants of migration. Only spatial separation variables appear in the model and no origin or destination attributes are included. The model is essentially an allocation model: flows are allocated to origin-destination pairs with constraints on the total inflow into each destination and on the total outflows from each origin. The model is generally calibrated by maximum-likelihood estimation although convoluted transformations to a linear-in-parameters model is available under certain conditions (Sen and Soot 1981, Gray and Sen 1983).

One advantage of aggregate cross-sectional models is that they can be calibrated separately for each origin (or for each destination) in the system. Normally, migration models are calibrated using the complete migration matrix but this yields 'average' parameter estimates which may hide important differences either across origins or across destinations. For instance, the well-known effect of distance as a deterrent to migrants may well be less for migrants arriving in London than that of migrants arriving in Middlesbrough. Similarly, as mentioned earlier, the effect of house prices on migration flows might not be uniform across all origins. High house prices in destinations are likely to have a negative impact on migration flows from an origin with low house prices but their effect may not be nearly so negative (and may be positive) on migration flows from an origin with high house prices. Variations such as these can be easily incorporated into any of the above frameworks by calibrating origin or destination specific versions of each model. For instance, the origin-specific version of the production-constrained model is calibrated separately for each origin and the model can be written as:

$$M_{ij} = O_i \frac{x_{j1}^{\delta(i)} \ldots x_{jm}^{\gamma(i)} x_{ij1}^{\beta(i)} \ldots x_{ijp}^{\lambda(i)}}{\Sigma_j x_{j1}^{\delta(i)} \ldots x_{jm}^{\gamma(i)} x_{ij1}^{\beta(i)} \ldots x_{ijp}^{\lambda(i)}}$$

where the parameters of the model are now specific to origin i. Origin-specific models would usefully capture any effects of migration between say Scotland and England and between Northern Ireland and England. Origin-specific models of migration from Scottish origins, for example, could include a dummy variable which had the value of 1 if the destination was in England and O if in Scotland (similar dummies could be constructed for the other countries) so that the parameter on the dummy would indicate the amount of migration deterrence caused by crossing such a boundary. Examples of the application of origin-specific models applied to migration systems include Fotheringham and O'Kelly (1989, chap. 5) and Stillwell (1991).

The four models described above can also be calibrated separately for different groups of migrants so that the parameter estimates are then specific to each group. For instance, the deterrence of distance in migration appears to be greater for less well-educated migrants than for well-educated migrants (Pellegrini and Fotheringham, 1998). Stillwell (1978; 1991) also describes variations in distance-deterrence across migrants of different ages (see below). When calibrated separately for each migrant group, the production constrained model is written as:

$$M_{ijm} = O_{im} \frac{x_{j1}^{\delta(m)} \ldots x_{jm}^{\gamma(m)} x_{ij1}^{\beta(m)} \ldots x_{ijp}^{\lambda(m)}}{\Sigma_j x_{j1}^{\delta(m)} \ldots x_{jm}^{\gamma(m)} x_{ij1}^{\beta(m)} \ldots x_{ijp}^{\lambda(m)}}$$

where the index m denotes a group of migrants.

Obviously, it is also possible to combine both the origin-specific (or destination-specific) and the cohort-specific models as in the following production-constrained model:

$$M_{ijm} = O_{im} \frac{x_{j1}^{\delta(im)} \ldots x_{jm}^{\gamma(im)} x_{ij1}^{\beta(im)} \ldots x_{ijp}^{\lambda(im)}}{\Sigma_j x_{j1}^{\delta(im)} \ldots x_{jm}^{\gamma(im)} x_{ij1}^{\beta(im)} \ldots x_{ijp}^{\lambda(im)}}$$

where the model is now calibrated separately for each origin and for every cohort in each origin.

The aggregate cross-sectional models described above are static in that they are calibrated with data from one time period. However, they can be calibrated separately with migration data from different time periods and then any variation in the parameter estimates over time depicts temporal variations in the determinants of migration. For instance, it appears from various studies that the effect of distance as a deterrent to migration is decreasing over time (*inter alia* Kau and Sirmans, 1979). Ultimately, one could have a migration model which is calibrated separately by time period, by cohort and by origin. A production-constrained version of such a model would be:

$$M_{ijmt} = O_{imt} \frac{x_{j1}^{\delta(imt)} \ldots x_{jm}^{\gamma(imt)} x_{ij1}^{\beta(imt)} \ldots x_{ijp}^{\lambda(imt)}}{\Sigma_j x_{j1}^{\delta(imt)} \ldots x_{jm}^{\gamma(imt)} x_{ij1}^{\beta(imt)} \ldots x_{ijp}^{\lambda(imt)}}$$

where the index t denotes a time period.

Aggregate cross-sectional models allow more complex interaction structures to be modelled. For instance, it might be postulated that although migration patterns are, in part, a function of house prices at the destinations, house prices might be influenced by migration: areas of high net in-migration might experience a housing shortage which pushes up prices. Mathematically then:

$$M_{ij} = f(H_j)$$

and

$$H_j = g(M_{*j})$$

where H denotes median house price and f( ) and g( ) are functions.

Aggregate cross-sectional models are generally used to provide information on the determinants of migration flows from origin and into destinations through the estimation of the models' parameters. However, they can also be used to forecast migration flows. In the case of the total-flow-constrained model, the overall volume of migration would need to be forecast exogenously and the model would be used to distribute these flows

between origins and destinations. In the case of the production-constrained model, the total out-migrants from each origin would need to be forecast exogenously and the model would distribute these migrants across destinations. In the case of the attraction-constrained model, the total in-migrants to each destination would need to be forecast exogenously and the model would allocate these migrants to origins. In the case of the doubly constrained model, the total out-migrants from each origin and the total in-migrants into each destination would need to be forecast (the row and column totals in the migration matrix) and the model would allocate flows to the cells of the matrix in accordance with these constraints and the spatial separation between origins and destinations.

5.6 Disaggregate (micro) cross-sectional models

Fuelled by the development of a logically consistent discrete choice theory based on the hypothesis of random utility maximisation (McFadden 1974, Manski 1977), enormous progress has been made in the area of disaggregate spatial choice over the past two decades. Much of this research has been focused on the attributes, both of the individual and the alternatives, which affect migration decisions and on the way individuals make decisions. This latter area of research replaces economic theories of migration with cognitive theories rooted in psychology. Increasing emphasis is placed on understanding how individuals make choices and what determines the choice set from which they make decisions.

Migration decisions can arguably be divided into two separate components: the decision to move and the decision about where to move to. These are referred to as the departure choice and the destination choice, respectively. Disaggregate cross-sectional migration models have been applied to both decisions with more applications found of the departure model because of data availability. The departure choice models usually take the form of a *binary logit model.* The disaggregate destination choice model is akin to the production-constrained aggregate model described in the previous section and attempts to explain the destination choice of migrants in terms of place attributes and personal attributes in a *multinomial logit model* framework. Examples of the application of the multinomial logit model to migration include Odland and Ellis (1987), Liaw and Ledent (1987, 1988) and Liaw (1990).

An important development in the field of disaggregate migration modelling has been the release of high-quality microdata where the unit of analysis is the individual or the household. By using microdata, it is possible to account for migration behaviour in terms of place attributes and personal attributes yielding potentially less biased results than with aggregated macrodata. Unfortunately the UK microdata set (Sample of Anonymised Records, SAR) only records migration information from very large spatial units (the 12 major census regions) to 278 ‘SAR-areas’ and any advantage in terms of destination choice modelling is therefore lost to aggregation bias (Kanaraglou and Ferguson 1996, Shaw 1985). However, the data can still be used to model the departure choice decision. For a discussion of migration microdata see Fotheringham and Pellegrini (1996).

The departure model relates the probability of migrating to a set of place characteristics and a set of personal characteristics in the following general form:

$$p_{hi} = f(X_i , Z_h)$$

where p_{hi} represents the probability person or household h in place i will migrate; X_i represents a vector of place characteristics describing the attributes of location i where person h lives; and Z_h represents a vector of person attributes describing individual or household h. The vector of place attributes can include social and economic conditions at the origin and can be measured in absolute terms or relative to the conditions in other places. If social and/or economic conditions at place i are worse than at competing places, this can produce migration stress in individuals which induces them to migrate. The vector of individual attributes describes aspects of the individual such as age, marital status, housing tenure, stage in life cycle, and various other factors felt to affect the decision to migrate. It can also include migration histories if time-series data are available: generally people who have migrated are more likely to migrate than those who have never migrated, *ceteris paribus*. The model, a binomial logit, can be written as:

$$p_{hi} / (1 - p_{hi}) = x_{i1}^{\alpha} \ldots x_{ik}^{\phi} z_{h1}^{\pi} \ldots z_{hn}^{\theta}$$

The destination choice model is very similar to the production-constrained aggregate model described above. It attempts to model the choice of destination given an individual has decided to migrate. Its general formula is:

$$p_{hij} = f(X_j , X_{ij} , Z_h)$$

where p_{hij} is the probability that person h living in origin i will select destination j given that he/she has decided to migrate. X_j is a vector of attributes describing destination j; X_{ij} is a vector of separation attributes which includes the spatial separation between i and j but can also include cultural/social/economic/political differences between i and j which might affect person h's decision to migrate there; and Z_h is a vector of attributes describing person h. In practice, this latter vector is often omitted and the model calibrated for groups of similar individuals producing a model which is a hybrid aggregate/disaggregate model. Alternatively, the Z variables can be included by forming interaction terms between them and the destination attributes or by introducing dummy variables for the destinations and forming interaction terms with those. Without the person attributes, the model can be written as:

$$p_{ij} = \frac{x_{j1}^{\delta} \ldots x_{jk}^{\gamma} x_{ij1}^{\beta} \ldots x_{ijp}^{\lambda}}{\Sigma_j x_{j1}^{\delta} \ldots x_{jk}^{\gamma} x_{ij1}^{\beta} \ldots x_{ijp}^{\lambda}}$$

Some commentators have argued that the separation of the departure and destination decisions shown above is not very realistic and that individuals make both in some inscrutable and integrated manner: that is the decision to move cannot be separated from the decision about which destination to move to. To offset such criticism, the *nested logit model* of determination choice (Ben-Akiva and Lerman, 1985; Liaw, 1990) can be applied which has the following form:

Destination choice:

$$p_{ij} = \frac{x_{j1}^{\delta} \ldots x_{jk}^{\gamma} x_{ij1}^{\beta} \ldots x_{ijp}^{\lambda}}{\Sigma_j x_{j1}^{\delta} \ldots x_{jk}^{\gamma} x_{ij1}^{\beta} \ldots x_{ijp}^{\lambda}}$$

Define I_i , known as the inclusive value, as $(\Sigma_j x_{j1}^{\delta} \ldots x_{jk}^{\gamma} x_{ij1}^{\beta} \ldots x_{ijp}^{\lambda})$ and then,

Departure choice:

$$p_{hi} / (1 - p_{hi}) = x_{i1}^{\alpha} \ldots x_{ik}^{\phi} z_{h1}^{\pi} \ldots z_{hn}^{\theta} I_i^{\sigma}$$

so that the inclusive value term links the two components of the model. The parameter on the inclusive value term should be between 0 and 1: as the alternative locations to place i become more attractive, the odds of moving from i increase. The nested logit structure therefore models departure as a function of origin attributes, personal attributes and competitor attributes (through the inclusive value).

5.7 Aggregate (macro) time-series models

It is possible to forecast interregional migration flows with reasonable accuracy without understanding anything about the determinants of the migration process. This is achieved by simply extrapolating migration information from a previous time period or periods to the forecast period. There are many possible ways of doing this but all have the following common features:

- the forecasts will be more accurate generally when the forecast period is relatively short
- the forecasts will be more accurate when the system is not undergoing any major social or economic changes
- the forecasts will be more accurate when large spatial units are used so that fluctuations can be 'averaged' out
- problems arise when boundary changes occur from the data collection periods to the forecast period.

Perhaps the most well-known type of extrapolation model is that of Markov Chain Analysis (Collins 1975, Rogers 1971). The basic premise is very simple. Consider the migration flow matrix, M, where the typical element of M is,

$$m_{ij} = M_{ij} / P_i$$

where P_i is the population of i, where m_{ij} is the probability that a person originating in region i survives in region j at the end of the time interval, so that the elements of M sum to 1 across each row. The M_{ij} terms refer to surviving migrants from origin i to destination j, as before, but the diagonal, M_{ij}, terms are the numbers of people present in region i at both the start and end of the time interval. Then, the population of each region in time t+1 can be related to the population in time t by:

$$P^{t+1} = M \, . \, P^t$$

where P^{t+1} represents the vector of regional populations in time t+1 and P^t represents the same vector in time t. M is known as the transition matrix and the diagonal elements represent the proportion of people in region i who do not migrate from that region (the stayers) while the off-diagonal elements describe the movement patterns between regions. Extrapolating to the next time period yields:

$$P^{t+2} = M \cdot P^{t+1} = M \cdot M \cdot P^t = M^2 \cdot P^t$$

and in general:

$$P^{t+n} = M^n \cdot P^t$$

This approach makes population projections relatively simple although they have to be adjusted to account for regional variations in birth and death rates. The following model allows for varying birth and death rates across regions although it still assumes uniformity of migrants:

$$P^{t+n} = G^n \cdot P^t$$

where

$$G = \begin{bmatrix} m_{11} + b_1 - d_1 & m_{12} & \dots & M_{iq} \\ m_{21} & m_{22} + b_2 - d_2 & \dots & M_{2q} \\ \vdots & \vdots & & \vdots \\ m_{q1} & m_{q2} & \dots & (m_{qq} + b_q - d_q) \end{bmatrix}$$

where q is the number of regions, b is the birth rate and d is the death rate.

The basic model described above can be made more complex by allowing for different migration rates across different groups of migrants and then also accounting not only for movements between regions but also for movements between migrant groups over the time intervals used. For instance, when age intervals are used that correspond with the time interval over which migration is measured, migrants change regions and age groups. Similarly, over the time interval migrants may switch housing tenures or marital status etc. For more detail on these complex regional population growth models, see Rogers (1971, 1995).

The utility of the Markov Chain approach to migration modelling depends heavily on the assumption that the transition matrix, M, remains constant over the forecast period. Also the above model represents a first-order Markov process (the one usually used) in which the transition from one region to another and from one age to another depends only on the previous time period and no life history is built into the system.

Markov Chain models are not the only type of extrapolation-based migration modelling. In terms of the migration matrix given in Figure 5.1, it is possible to extrapolate various elements of this matrix in order to forecast migration flows. For instance, suppose the overall volume of migration, M, is forecast for time t+1 based on trends observed in migration totals over times t, t-1, t-2 etc. Forecasts of the row totals and column totals of the migration matrix can then be obtained from:

$$O_i^{t+1} = \frac{M^{t+1}}{M^t} O_i^t$$

and

$$D_j^{t+1} = \frac{M^{t+1}}{M^t} D_j^t$$

and obviously net migration totals for each spatial unit can be obtained by

$$N_i^{t,\,t+1} = D_i^{\,t+1} - O_i^{\,t+1}$$

Clearly, this method assumes that the change in overall migration volume is distributed as a constant factor across all spatial units which may be a questionable assumption.

If the migration flows themselves need to be forecast, they can be obtained from a variety of methods (for example, see Stillwell 1991 for a discussion and comparison of various methods). One way is simply to multiply each flow at time t by the ratio M^{t+1} / M^t .

Another is to use the forecasts of the row and column totals in a doubly constrained model (see above) to estimate the cell values in the flow matrix:

$$M_{ij}^{\,t+1} = A_i\, O_i^{\,t+1}\, B_j\, D_j^{\,t+1}\, d_{ij}^{\,\beta}$$

where d_{ij} is the distance between zones i and j and β is a distance-decay parameter which has to be estimated from migration data in time t. Here the extrapolated row and column totals are used to constrain the model and the flows are allocated according to these constraints and the distance between zones.

Yet another technique for forecasting migration flows from the extrapolated data is that of Willekens and Baydar (1986) who simplify the above procedure by substituting $M_{ij}^{\,t}$, the migration between i and j in the previous time period, for $d_{ij}^{\,\beta}$ and so obviating the need to calibrate the model. The model is then:

$$M_{ij}^{\,t+1} = A_i\, O_i^{\,t+1}\, B_j\, D_j^{\,t+1}\, M_{ij}^{\,t}$$

For all of the above extrapolation techniques, it is possible (and desirable) to disaggregate the flow matrices by migrant type. That is, the extrapolations are best performed separately for groups of migrants and the results aggregated to obtain total flows. For instance, the above model can be rewritten for migrant types m as:

$$M_{ijm}^{\,t+1} = A_{im}\, O_{im}^{\,t+1}\, B_{jm}\, D_{jm}^{\,t+1}\, M_{ijm}^{\,t}$$

An example of an extrapolation forecasting technique for migration is that used by the Office for National Statistics (ONS) in deriving its subnational population projections for England (ONS 1997). As part of these projections, it is necessary to account for net migration between regions (as well as other factors such as birth and death rates). This is done in the following sequence of steps:

Step 1: Calculate migration rates

$$p_{ijm}^{\,t-1,t} = M_{ijm}^{\,t-1,t} \,/\, M_{i*m}^{\,t-1,t}$$

where p_{ijm} is the probability of choosing destination j given out-migration from origin i for migrants in age groupm; M_{ijm} is the migration flow between origin i and destination j for age m; and M_{i*m} is the total out-migration of age m from origin i.

Step 2: Calculate out-migration probabilities for each origin

$$p_{i*m} = GMR_i \,.\, OM_{im}$$

where GMR_i is the gross migra-production rate and OM_{im} is the proportion of the gross migra-production rate at i due to cohort m

Step 3: Project total outflow from each origin by multiplying out-migration probabilities by population in time t

$$M_{i*m}^{\,t,\,t+1} = p_{i*m} \,.\, Pop_{im}^{\,t}$$

Step 4: Forecast migration flows

$$M_{ijm}^{\,t,t+1} = p_{ijm} \,.\, M_{i*m}^{\,t,t+1}$$

Step 5: Forecast total in-migrants to each zone

$$M_{*jm}^{\,t,t+1} = \Sigma_i \, M_{ijm}^{\,t,t+1}$$

Step 6: Calculate net migration rates for each zone

$$N_{im}^{\,t,t+1} = M_{*im}^{\,t,t+1} - M_{i*m}^{\,t,\,t+1}$$

Step 7: Update populations

$$Pop_{im}^{\,t+1} = Pop_{im}^{\,t} + N_{im}^{\,t,t+1}$$

These updated populations can then be fed back in to step 3 as populations in time t and the procedure continued for the required number of projection intervals.

5.8 Disaggregate (micro) time-series models

Micro-models aim to predict the behaviour of individual actors in a socio-economic system. They are used when the influences on that behaviour are complex and when aggregate data does not give clear guidelines about the factors affecting individual behaviour. Individual behaviour is simulated in a micro-model using two elements: (1) a set of rules about behaviour (e.g. that the probability of migration declines with increasing distance from the current residence) and (2) a mechanism for selecting a particular behaviour from the distribution of behaviours predicted by the rule. This mechanism is usually ‘chance’ and involves selecting an outcome randomly. This class of models have been called microsimulation models.

The microsimulation approach was used by the Swedish geographer Torsten Hägerstrand (1957) to understand the movement of individuals over time in central Sweden. The model works as follows. The territory is divided into a grid of areas. Each cell contains individuals who are tested for relocation in each time interval. This is done by placing a floating grid of cells of probabilities centred on the area of residence. The probability of remaining in the same cell is set high; the probability of moving to neighbouring

cells is moderate and the probability of moving to distant cells is low. A random number is drawn from a cumulative range, each part of which is assigned to a grid cell. The number drawn determines which cell the individual moves to. Repetition of this lottery for all individuals living in a cell and repetition of the process for all cells produces migration between areas in the time interval. Similar techniques were later used to simulate the spread of innovations across space (Hägerstrand 1968). Note that the only factor used in the model is spatial one in a crude grid. No cognizance is taken of the characteristics of the population exposed to the risk of migration or of the nature of the areas to which migrants can move or of the competition of other people for vacancies in the labour or housing markets, all factors which have been built into macro-models.

Geographers have applied Hägerstrand's idea mainly in the context of the migration of ethnic groups within cities. Morrill (1965) took the spatial microsimulation approach a step further by applying it to one ethnic group, Black Americans, in the city of Seattle. The rules of the model were more sophisticated: the population experienced birth and death; probabilities of migration were varied to recognize barriers to Black relocation (strong resistance to renting or purchase by Blacks in working-class White neighbourhoods but weaker resistance in middle class White communities); variation of the probability of migration according to the racial composition of potential destination grid cells, a probability mechanism which meant that Black migrants selected for migration to a cell might be rejected. The simulation model results were tested against observed evolution of the racial composition of inner Seattle between the censuses of 1950 and 1960. The model successfully projected the extent of spread and the continuing high level of racial segregation but not necessarily the future of any individual cell with great accuracy. Morrill was prevented from publishing any projections (as opposed to historical simulations) by legal pressure from the real estate industry (Morrill, personal communication).

Woods (1981) adapted the Morrill model to several ethnic groups in the city of Birmingham, using 1971 Census data for the population stock information and surrogate marriage data to establish the distance decay function needed. The Asian and Caribbean origin populations of inner Birmingham were simulated over time and the ways in which they were to spread outward were successfully predicted. Woods' model did not contain barrier effects (the practices underlying them were illegal) but did take into account the different attitudes of the two main immigrant communities to public housing opportunities: Asian households preferred to purchase their homes or to rent from fellow ethnic group members. In fact, many Asians became important landlords in inner city neighbourhoods and today provide housing to the White population (e.g. to students in the Selly Oak area). West Indian families were more prepared to move to public housing which provided better accommodation than the privately rented neighbourhoods of first entry. The demographic model of population growth was, however, still quite crude and failed to reflect the very different age and household structure of the ethnic minority communities compared with the native White community. The model also failed to take into account the distribution of housing opportunities in destination cells and did not have direct evidence on migration upon which to base the migration probability fields in the model.

The need to move from a one dimensional view of population (distinguished only by location) was recognized by Orcutt (1957) in his work at the Urban Institute. Lutz (1997, p.2) recently reviewing Orcutt's work says:

"The basic concept is that social processes resulting from the interactions of larger numbers of individuals can best be studied by looking at the microunits and modelling their behaviour".

The original ambition was to construct dynamic models that simulated the evolution over time of the micro-units. However, this has proved to be difficult to achieve in the absence of suitable data from which critical transition probabilities can be estimated between the individual characteristics represented. The main applications have therefore been in reconstructing a population of individuals set in their household context that combine data from different sources in order to address policy questions rather than in simulating the change in individuals' characteristics over time. Lutz (1997) describes an ambitious microsimulation being constructed at the Austrian Institute for Family Studies (ÖIF) and the International Institute for Applied Systems Analysis (IIASA), which uses data from the Family and Fertility Survey covering 20 industrialized countries that is dynamic and which can be applied to many countries.

Duley (1989) and Duley and Rees (1991) attempt to construct a dynamic microsimulation model, called UPDATE, which incorporates migration as a key event (see the review in the Appendix). This model handles simultaneously demographic, socio-economic and locational attributes for small area populations (postcode sectors in the Leeds postal district). However, in order to achieve the demographic and socio-economic detail, some locational detail is sacrificed: each postcode sector is treated as a single, isolated system receiving in-migrants from and sending out-migrants to an outside world which has minimal impact on the area's population being modelled. The number of in-migrants is dependent on events within the postcode sector only, and not on events elsewhere as in the macro multiregional projection model or spatial interaction model.

Can the knowledge built in these different microsimulation models be used in an operational model of migration between regions as input to an econometric model for the estimation of the demand for social housing? The answer is probably 'yes, but it would be difficult'. A microsimulation model that married the interaction detail of the Morrill/Woods models with the demographic process and household composition detail of the Duley/Rees model would be needed. To date, no one has shown that such a model could be built using existing data sources and that it would yield useful results. The model of Nijkamp, Van Wissen and Rima (1993), which simulates the behaviour of migrants and households in the Amsterdam housing market, probably comes closest (see the review in the Appendix). However, the list processing (microsimulation) method has considerable attractions and is a very effective vehicle for integrating knowledge from other modelling work of a partial nature.

5.9 Conclusions

A summary of the four main types of migration models described above is given in Table 5.1 and more discussion is provided below. There are two, not always coincidental, reasons for modelling migration flows. One is to uncover knowledge about the determinants of (and perhaps processes which underlie) migration. This itself has two components: the migration departure choice and the migration destination choice. The second is to forecast migration patterns without necessarily understanding their causes. Understandably, the academic literature emphasises research on the former rather than the latter although there is a reasonable amount of work on forecasting.

Table 5.1 A summary of the four main types of migration models

Model	Features	Pros	Cons
Spatial Interaction Models – aggregate cross-sectional models	Aggregated migration flows modelled in terms of a set of explanatory variables. Explanatory variables can be used for origins and/or destinations.	Data availability. Well documented usage. Easily disaggregated by location, migrant type and time. Provide useful information on the determinants of migration – esp. policy-related variables. Useful for 'What if...?' scenarios. Can be integrated into more complex model frameworks. A family of models is available for different purposes.	Have to use groups of migrants which can be crude. Migration matrices can be sparse when disaggregations take place. Models have to be calibrated with flow data.
Multinomial Logit Models – disaggregate cross-sectional models	Models calibrated with individual level migration data. Migration modelled in terms of a series of explanatory variables. Explanatory variables can be used for origins and/or destinations.	Data on individual migrants is more accurate. Can include lifestyle variables. Decision to migrate and decision on destination can be modelled simultaneously.	Data difficult to obtain. SAR has very poor spatial resolution. Calibration more difficult.
Trend Extrapolation Models – aggregate time-series models	Predict migration without understanding determinants of destination choice. Extrapolate past trends under certain assumptions of stationarity. More useful for large spatial units where local fluctuations can be 'averaged out'.	Easy to use. Useful for short-term forecasting under stable conditions. No model calibration necessary.	Assumptions of stationarity can be questioned. Restricted 'What if...?' scenarios possible. Migration decisions not understood. Can be unreliable in periods of change. Difficult to handle boundary changes between time periods.
Simulation Models – disaggregate time-series models	Model dynamics at level of individuals or households. Predict behaviour of individuals within broad economic and social context.	Introduce information on household formation/dissolution to migration forecasts. Can analyse the effects of changes in policy on migration trends.	Models have to be very complex to work well. Very difficult to calibrate and run. Difficult to obtain data.

The relative merits of trend extrapolation methods and models which attempt to 'explain' migration decisions, such as spatial interaction models for destination choice and binary logit models for departure choice, can be summarised as follows:

(i) Both forecasting methods are at their most accurate over short forecast periods, although trend extrapolation methods are more susceptible to short-term processes and explanatory models might retain their relevance over longer periods.

(ii) Trend extrapolation methods are most accurate for large spatial units where the effects of unusual events are averaged out or dampened, whereas spatial interaction models are most powerful where spatial differentation is at its greatest, as found with small spatial units.

(iii) There are problems with trend extrapolation methods when boundary changes occur between time periods. That is, if data are to be forecasted for a set of units other than those for which data have been collected, adjustments would have to be made which would inevitably add error to the forecasts. Again, this mitigates against using this approach with small spatial units which are more susceptible to change, whereas explanatory models are more robust in this respect.

(iv) Trend extrapolation methods cannot capture unusual changes in migration behaviour caused by changing economic or social conditions. They are therefore at their most useful in times of economic and social stability.

(v) Explanatory models are better at investigating 'what if?' types of scenarios as an aid to policy formulation but are probably poorer at short-term forecasting than simple trend models.

(vi) Trend extrapolation methods are probably better at forecasting net migration than at forecasting changes in population composition because the latter depends on being able to forecast flows of different migration groups separately. It is often changes in composition in which we are most interested.

Although the examples reviewed (see the Appendix) seemingly support the contention that trend extrapolation methods are superior to spatial interaction models for short-term forecasting purposes, conclusive proof is hard to find. The examples of extrapolation methods in the literature tend to use known row and/or column totals or overall migration totals to forecast the migration flows when, in reality, such values would themselves have to be forecast. This would add imprecision to the extrapolation methods.

As the evidence points to different migration behaviour across different ages of migrants, it would seem useful to disaggregate the forecasting technique by age and to aggregate the results for a picture of total migration. Variations in migration behaviour are perhaps better documented for the case of spatial interaction models and departure choice models than for trend extrapolation methods.

Most applications of migration destination choice models are at a fairly detailed spatial scale with districts, wards and even enumeration districts being used as the origin and destination units. This is because larger spatial units tend to disguise some of the

interesting influences on destination choices – ultimately, migrants choose cities or neighbourhoods rather than large regions. Detailed migration destination choice modelling between large spatial units (e.g. the 8 standard regions of England) is generally thought to be of little use. Even where forecasts are only required at the regional scale, it is felt better to model at a spatially more disaggregate scale and then to aggregate the results to the regional scale.

In relation to modelling the impact of 10 years of internal migration on the populations of England's eight standard regions, therefore, it is useful to consider how the two alternative approaches would be used. In theory, the simplest method would be to extrapolate trends in total inflows and outflows for each region over a single 10-year period. One could attempt this for overall totals or separately for different migrant groups. In either case, it would be necessary to have a sufficient amount of existing data on which to base a forecast by trend extrapolation. Unfortunately, however, there is insufficient data even on overall migration, given that the Census provides migration data for only one year in every 10 and that the continuous monitoring of the NHSCR data as yet spans less than three full decades.

A more sophisticated version of the trend extrapolation approach would be to examine annual trends to make projections for the 10 separate years of the forecast period. This method, however, would be subject to various cycles in the data and to the difficulties outlined above in any projection method. A particular problem here would be the difficulty in projecting migration under different economic scenarios.

Alternatively, if the SIM approach were to be used, many of the problems described above would be removed as only one time period's worth of data would be required and the model would allow forecasting under different scenarios. However, the cost of this is borne in the amount of effort needed to calibrate the model and having to make assumptions about the levels of the exogenous variables in the model during the forecast period. It would probably also be necessary to assume that the parameter values remain constant between the calibration period and the forecast period.

In essence, the decision between which of these two strategies to employ comes down to the degree of understanding of the migration system required. If it is felt useful to understand how migration (and, ultimately, housing demand) is affected by economic and social conditions in the regions, including housing availability and house prices, then a SIM approach is preferable. If such information is not needed, a trend extrapolation approach might be preferable, if data and other considerations make it a feasible option.

In relation to international migration, by contrast, there is very little, if any, modelling work to draw upon. This is for the obvious reasons that such 'choices' are extremely difficult to model and depend very heavily upon highly unpredictable events such as political and economic turmoil and government immigration policies. It is therefore better to apply some sort of Delphi method to forecast volumes of international migrants to the UK on an annual basis. It might be possible to model the destination choices of international migrants once they are in this country although we are not aware of any work that has taken place of this type and data availability might be an issue here.

Finally, most migration models use individuals as the units of migration flows rather than, say, households. This is because of a) the way data are often reported and b) because households often change during the migration process (or migration takes place because of household change). Examples are when married couples separate or when individuals marry.

In the final chapter, we build upon the above conclusions and on those given for the sections on data, trends, and determinants, bringing together our findings in relation to the nature and importance of each of the three types of migration identified at the outset and setting out our recommendations both for forecasting future levels of migration and for additional research designed to improve our knowledge of current migration patterns and processes.

CHAPTER 6: CONCLUSIONS & RECOMMENDATIONS

6.1 Introduction

The overall aim of this report has been to describe and discuss the migration flows which affect the spatial distribution of population in England, thereby enhancing the Department's ability to model future household numbers and social housing needs at the subnational level. At the outset of the work, four key questions were identified for examination:

i) How comprehensive and reliable are the existing sources of data for monitoring migration?

ii) What are the main types of migration producing subnational redistribution of population and households now and in the future?

iii) Which factors are most important in determining the volume and characteristics of the various migration flows and, in particular, which are most amenable to government intervention?

iv) Which methods of migration modelling are most likely to provide reliable estimates of the impacts of migration on subnational population profiles, including gauging the effects of adopting alternative assumptions about the future?

In relation to the Department's needs, these four questions can be distilled to two principal issues: whether it seems important to give special attention to migration in anticipating subnational trends in population and household numbers and, if so, whether it is possible to do this with a reasonable degree of confidence, given constraints of data availability and our current understanding of migration trends and processes.

The purpose of this final chapter is to address these two principal issues more directly and to offer advice on the most appropriate method of obtaining forecasts of population movements affecting England. This advice is based on our findings on the four major questions described above and contained in the previous chapters. For instance, having identified the most important types of migration that affect subnational populations (and, ultimately, housing demand), judgements will need to be made about how sophisticated an approach should be adopted towards the forecasting of these different types of migration.

The findings of previous chapters dictate that there are good theoretical and practical reasons for handling international migration separately from internal migration, while the particular purposes of the present study require that a distinction is also drawn between within-England moves and migration between England and other parts of the UK. Previous chapters have demonstrated the almost complete absence of overlaps in approaches to international and internal migration, with these two types of migration having largely different data sources, considerably different sets of determinants, and obviously different patterns of movement. It would therefore make sense, and it is our recommendation, that international and internal migration forecasts be treated separately which may mean that very different types of forecasting methodologies are used on the two types of migration.

In terms of the internal migration, the picture provided by our review is not so clearcut. Within-England migration could be treated separately from migration between the subnational areas of England and the other three countries of the UK. That is, independent forecasting frameworks could be used to predict flows in these two systems. However, a case could be made here for treating all flows within the UK as one, inter-related system and for modelling them with a single methodology. These two alternatives are discussed below.

Our overall conclusion is that the current 'state of the art' in the analysis and modelling of migration in England does not make it possible to develop a forecasting model that can directly predict the impact of migration on the number and tenure composition of households. This applies particularly to the treatment of international migration, which has been subject to very little quantitative analysis so far, but it is even the case for internal migration, because the often highly sophisticated modelling of within-England migration flows has concentrated almost entirely on the movement of people rather than households. Partly because of data problems, little progress has been made in England towards developing models which integrate migration with household change and match it with housing supply in a dynamic temporal context, unlike in the Netherlands for instance (Nijkamp *et al.* 1993). We therefore orientate our recommendations chiefly towards improving the migration component of a subnational population projection model, ending up with a plea for greater attention to the possibilities of modelling the household aspects.

The rest of this chapter is structured principally around the three broad types of migration described above (international, with the rest of the UK and within England), outlining for each the most appropriate approaches for forecasting its impact on subnational populations, assessing the likely accuracy of such forecasts and the identifying the main difficulties involved. The chapter concludes with a listing of our principal findings, including suggestions of areas needing further investigation before more comprehensive and accurate forecasts of the migration component of subnational change in population and households can be contemplated. First, however, the next section sets out some basic issues relating to the handling of migration in the subnational modelling of housing requirements, building mainly on the findings of Chapter 5.

6.2 Alternative approaches to handling migration in subnational forecasts

There are essentially three approaches to forecasting migration. Their utility depends partly on the way in which national territory is subdivided for forecasting purposes and on the approach used for the subnational forecasting of other factors affecting housing requirements. It also depends on the aspect of migration under consideration, as will be seen in the subsequent three sections.

The three alternative approaches are:

- through a trend extrapolation model, in which past observations of migration for a particular set of subnational areas are projected forward in time, perhaps involving subjectively-derived adjustments for any expected change in the conditions affecting migration

- via a freestanding explanatory model of migration, where the sole emphasis is on the accurate forecasting of migration by fitting a model to observed patterns,

where the model may involve 'black-box' relationships or proven causal linkages and where the model can be operationalised at a different spatial scale from that of the housing forecasting model and produce results that can be aggregated or apportioned to the required set of subnational units

- within a fully integrated model of housing requirements, in which the migration component of change over time is handled on the same time intervals and subnational areas as all the other aspects of change in the model and, furthermore, where migration is both affected by all the relevant conditions pertaining at the start of each time interval and in its turn helps to cause those conditions to change before the onset of the next interval.

The potential value of these three alternatives depends on the nature of the subnational division used, both in terms of the number of areas and their method of delineation. The larger the subnational areas (SNAs) for which migration is to be forecast, the relatively more satisfactory is trend extrapolation, all other things being equal. Given that, as shown in Chapter 3, most migration is over short distances, the migration component of population and household change becomes less significant as the size of areas increases. Moreover, as explained in Chapter 5, as the size of areas increases, so does their internal heterogeneity, leading to a reduction in their differentiation from each other and thus to a reduction in the relevance of models which explain migration in terms of local living environments.

Perhaps at least as important in relation to the size of areas, though, is the measurement of distance between the SNAs. It is clear from the empirical evidence that distance is *the* most important variable influencing migration patterns. In terms of modelling the migration process with a series of explanatory variables, it is therefore necessary to measure distance between every pair of spatial units. This distance measurement between two spatially aggregated units reflects the distance between all possible micro origin-destination pairs between the two units and as such it becomes increasingly inaccurate as the size of the spatial units increases. At the level of the eight standard regions within England, for example, a single distance measurement between any pair of regions becomes *extremely* inaccurate. Despite this, it is not clear at what level of spatial resolution explanatory models would necessarily produce less reliable results than trend extrapolation. This would need investigation and testing with the actual regionalisation required, leading to a decision as to whether the extra research input required for explanatory models was worthwhile.

In terms of the delineation of SNAs, the key consideration is the extent to which short-distance migration can be removed from the equation. From the point of view of the modelling of inter-SNA flows, the most successful results are likely to be achieved when the heterogeneity of migration flows is kept to a minimum. This condition is met most satisfactorily when regional boundaries pass through uninhabited territory, such that no short-distance moves (which have very different determinants compared with longer-distance migrations, as shown in Chapter 4) cross a regional boundary. If a large conurbation straddles or lies close to a SNA boundary, migration modelling would have to take account of not only the labour-market factors responsible for most migration between macro regions but also the environment- and housing-related reasons most often cited by short-distance movers.

This would certainly be the case if Greater London was treated as a separate SNA, as it is in terms of Government Office regions. Another example of possible confounding effects is provided by Sheffield, located in Yorkshire and the Humber but abutting on to the East Midlands, the intervening boundary being one commonly adopted for a two-way north/south division of England. Given the large number of medium-sized and smaller towns occurring across England, it would be useful to know what proportion of migrations crossing standard region or Government Office region boundaries comprised shorter-distance moves between neighbouring districts, but we are not aware of any study of this. Of course, the importance of short-distance moves becomes much greater if a finer spatial framework like the county level is used for the SNAs, so at such a level it is desirable to adopt the more sophisticated forms of modelling that can handle the greater heterogeneity of migration flows.

In theory, therefore, it would seem from what has been shown previously in this report that the most satisfactory approach for forecasting migration is one which covers the whole migration system affecting the SNAs and at the same time is constructed of geographical areas which are most meaningful in terms of the places which people migrate between. In application to the case of SNA-level forecasts for England, the appropriate extent of coverage should be determined on the basis of identifying the bounds of the 'national' migration system, notably whether the latter embraces the other countries of the UK and indeed the Irish Republic or whether the England/Wales and England/Scotland boundaries, in particular, are qualitatively different from those between areas within England. The answer, of course, depends partly on the scale of geographical area chosen for forecasting within-England migration. For this reason, as we now move on to look in more detail at the more practical aspects of handling the different types of migration, we begin with the migration that is internal to England.

6.3 Within-England migration

Internal migration is, as shown in Chapter 3, the major contributor to changes in population distribution in England today, making it a vital consideration in any attempt at forecasting housing requirements. In terms of gross numbers, it is estimated that the number of England's population changing address each year in the mid 1990s was around 4.6 million – very much larger than the number of births, deaths and external migrations which each totalled some 0.5-0.6 million. In terms of net redistribution of population caused by internal migration, key features include the 30,000 annual average shift from north to south, the 25,000 average gain of the South West region and the 90,000 average loss from Greater London and the six metropolitan counties combined.

Other features noted in Chapter 3 further underline the importance of migration and also indicate some of the problems involved in dealing with it. The statistics on overall net migration may disguise much larger changes in the composition of the populations of the areas affected, because the people moving into an area can have significantly different characteristics from those leaving. In addition, our review has noted that the volume of internal migration differs greatly between areas, it fluctuates considerably over time in both overall volume and spatial patterning and – in contrast to the other three components of population change – it varies massively according to the number and nature of the SNAs adopted.

Our review of migration modelling in Chapter 5, while revealing the great variety of alternative approaches and applications, concludes that many of these are not likely to be viable in the present context. In particular, the disaggregate models, whether cross-sectional or time-series, tend to be too demanding of data and/or too difficult to calibrate at the degree of complexity required to produce reliable results. This leaves a choice between two broad types of aggregate model: trend extrapolation models (TEMs) that project forward past trends under certain assumptions of stationarity and do not need an understanding of the determinants of destination choice, and spatial interaction models (SIMs) which are derived from cross-sectional analysis and model aggregated migration flows in terms of a set of 'explanatory' variables.

Choice of modelling approach

The choice between these two types of model depends on the nature of the application. As concluded in Chapter 5, TEMs can be expected to be more accurate over shorter forecast periods than longer ones and for larger spatial units where the effects of unusual localised events tend to be averaged out or dampened. Also, by definition, they will perform better in times of economic and social stability, where past patterns and trends can be considered likely to provide a good pointer to the future. As a corollary, models which attempt to explain migration are particularly appropriate for situations involving considerable alteration in the forecasting environment, as would be expected over longer time horizons, at finer spatial scales and in more rapidly changing systems. 'Explanatory' methods like SIMs are also better at investigating 'what if?' types of scenarios as an aid to policy formulation.

In terms of the particular application of providing input to subnational forecasts of housing requirements, three key considerations are therefore:

i) the time horizon involved;

ii) the geographical framework for which the forecasts are needed; and

iii) the degree of understanding required.

In relation to the first of these, drawing on the general experience of forecasting for land-use planning purposes, a five-year forecast would be considered short-term while ten years or more would be likely to produce enough change in the system to warrant the use of explanatory models, by which time any deficiencies in the model's fit to past patterns would be more than compensated by its ability to handle the altering environment.

In terms of geographical framework, SIMs become progressively more accurate compared to alternative methods as spatial disaggregation increases and the internal homogeneity of the separate SNAs rises. In relation to the urban and regional context of England, a breakpoint is likely to occur between a division into up to ten macro regions, within each of which are found almost the full national range of settlement types and local economic levels, and 25 or more SNAs which separate the major metropolitan concentrations and other large urban areas and preferably also distinguish the more remote rural regions, thus providing greater inter-SNA differences for SIMs to work on.

In terms of the degree of understanding required, SIMs provide such understanding whereas trend extrapolation methods do not. It might be that an understanding of the determinants of migration is unimportant in which case this particular criterion is unimportant. However, understanding the determinants of migration is important in producing accurate estimates of flows under changing economic and social conditions and for developing 'what if?' scenarios.

It must, however, be stressed that despite considerable empirical evidence gathered on migration modelling over the past quarter of a century, the results about the reliability of various modelling efforts are not conclusive and appear to be quite application-specific. It is a recommendation of this report that experimentation would be needed before a final decision is made on the most appropriate approach for any specific application in England.

One rather distinctive feature of England, compared to many other countries, is the relative lack of contrast between macro regions in terms of basic economic indicators such as per capita incomes, unemployment levels and overall rates of GDP growth. Another is the widespread access to 'urban' facilities allowed by the rather comprehensive coverage of urban centres across England and by the relatively well developed transport system. This results in little by way of the traditional contrast between well-served metropolitan regions and deprived low-density peripheries – perhaps, if anything, something of the reverse over most of the country, judging by the attention given in recent years to the twin problems of inner city decline and non-metropolitan growth.

The role that SIMs could play in providing detailed and accurate forecasts of migration within the UK needs to be examined in detail. The main issues are the following.

- What are the attributes that should go into such a model?
- What form of model should be used?
- How stable are the determinants of migration patterns over time?
- How much do these determinants vary over space?
- How much do these determinants vary across different groups of migrants?

If a detailed model of migration was to be constructed, it would be interesting to see if it could predict the remarkable volatility of internal migration in England in the short term, as seen very clearly towards the end of the 1980s in the switch from net north-to-south to south-to-north population shift and back within the space of five years and in the halving of metropolitan England's net migratory losses in just two years. Thus far, there has been very little testing of projecting/forecasting migration models in England to see how stable the parameters are over time. It would be useful to attempt this using observed data for past time periods; for instance, calibrating the model on observed data for 1991 and then testing forward projections against data for each subsequent recorded year.

Over the longer term the main question is whether the changes in migration that are likely to occur principally involve differences that are essentially quantitative in nature

or arise from more fundamental qualitative developments in migration behaviour. This is a challenging issue because, over the period of around two decades for which we have continuous records of longer-distance migration, it is difficult to distinguish cyclic elements from what may be longer-term secular trends. The 'counterurbanisation' phenomenon provides a particularly good example of this, in that in the UK, as in the USA and some other countries, this has waxed and waned over a 20-year period since the late 1960s and seems to have begun another cycle. Given that these trends have been explained partly in terms of changes in labour and housing markets, the overall conclusion must be that their forecasting will be best handled by the SIM family of models applied to a geographical framework that represents these markets.

Experimenting with SIMs

If a decision is made to adopt a SIM approach, the following issues will need to be addressed:

- Which form of SIM will be used? Total-flow constrained models forecast migration propensities and destination choice; production-constrained models forecast destination choice but not migration propensities; attraction-constrained models forecast migration propensities but not destination choice, and doubly-constrained models forecast cell values given constraints on total out-migrants from each origin and total in-migrants into each destination.

- Whichever SIM is selected, some external information will be needed on migration levels. The total-flow constrained model needs exogenous forecasts of the total migration volume in the system; the production-constrained model needs exogenous forecasts of out-migrant totals from each origin; the attraction-constrained model needs exogenous forecasts of in-migrants into each destination; and the doubly-constrained model needs exogenous forecasts of both total in-migrants for every destination and total out-migrants for every origin.

- When a model has been selected, it will need some experimentation to determine the variables to be included in the model. While the inclusion of some variables, such as distance and population, is almost certain, it is more difficult to predict the relevance of others and their relevance to migration appears to be application-specific. Therefore only an empirical examination will determine the appropriate specific form of whatever model is chosen.

- If the models are used to forecast migration for a future time period, it will be necessary to predict the future values of the variables in the model.

- The parameters in the model will need to be calibrated given some observed migration data. While this is not a problem, it will need to be assumed that these values are relatively stable over time and this asumption can be examined from calibration of the same model with migration data from different time periods.

- Appreciably greater accuracy in model forecasts and a greater degree of understanding of the determinants of migration will be obtained from calibrating the model separately for each origin in the system.

- It seems likely, given our reviews of migration determinants and modelling in Chapters 4 and 5, that the SIM model will need to be formulated separately for different groups of migrants. It will therefore need experimentation to determine the appropriate migration groups and to calibrate the model separately for each of these groups. An obvious division is by age cohort but other possibilities are social class, housing tenure and ethnicity. Special tabulations of migration statistics might be needed if crosstabulations are required.

If migration is forecast separately for a number of population subgroups, the question arises as to how to allow for interactions between them. While it is assumed that interactions relating to propensity to leave an address and choice of destination are adequately handled by assuming the continuation of past relationships (as well as grouping children with the main parental age group), there is the issue of whether the sum total of departures and arrivals for each place and time period in the forecasting model is realistic or whether some measure of 'capacity' needs to be fed back into the forecast.

As outlined in Chapter 5, the SIM family of models includes both production-constrained and attraction-constrained versions, which respectively set the total number of outflows for each origin and the total number of inflows to each destination, as well as the doubly constrained model, which does both. In the context of the present application, however, anything but the total-flow-constrained model would seem to defeat the purpose of the exercise, because the principal aim is to forecast the overall effect of migration on each area; i.e. in terms of the full SIM matrix, to forecast the row totals and column totals and subtract one from the other, with the full matrix of flows being only a means to an end and of practical interest only for exploring the basis of the forecast outcomes and gauging how sensitive they might be to changing circumstances including policy interventions. Moreover, any 'capacity' constraints on within-England migration would need to take account of the effects of the other influences on the demand side, including changes within the existing population as well as the other types of migration, and the effects of changes on the supply side, including housing, jobs and services.

The way forward

In sum, our message from the above discussion on forecasting within-England migration is as follows. We can foresee no major changes that are likely to dramatically alter what constitute the main types of migration and the determinants behind them. We need, however, to point out, firstly, that within-England migration can be extremely volatile in the short term and, secondly, that over time the underlying geography of England will be changing, thus altering the distribution of the different types of people at risk of migration and modifying the character of the potential destinations to choose from.

In terms of forecasting approach, the extensive literature on internal migration provides a variety of options, but it is not possible to say categorically which would perform most satisfactorily without testing them in the relevant context. Our tentative verdict is that, for a short forecasting time horizon and for a spatial breakdown into a small number of macro-level regions, trend extrapolation methods along the lines of those currently used by the ONS for subnational population projections will perform best. By contrast, if looking further ahead and dealing with a larger number of smaller and internally more homogeneous SNAs, explanatory methods of the SIM type are likely to produce

the most reliable results, given the amount of urban and regional change normally occurring in England. Experimentation would be necessary to assess the relative merits of the two for providing 10-year forecasts at the level of the standard regions.

If the framework which is eventually decided for the DETR's subnational forecasts of housing requirements suggests that the SIM type of model is the most appropriate, we would strongly recommend that it is operationalised at a relatively high level of spatial disaggregation, such that it captures a significant proportion of longer-distance labour-market-related movement; namely, labour market areas or, bearing in mind considerations of data availability, local authority districts or counties or some combination of the two. In theory, this should not only provide a more accurate forecast of longer-distance migration between regions but would also be better equipped to handle the substantial number of short-distance moves across some boundaries between adjacent regions. If the main subnational housing forecasting model was based on a more aggregate spatial framework, the results of the within-England migration model could be summed to this level, as well as providing additional intelligence on the expected level of migratory shifts between areas within these broader SNAs.

It has to be acknowledged, however, that the SIM approach will be most accurate if it employs the most reliable estimates of changes in the attributes of the origin and destination areas, which presumably would be the levels generated by the housing forecasting model. If the latter was for broad macro regions, a trade-off would need to be made between using a more disaggregated spatial framework which provides a better fit to past observations and a less disaggregated framework for which there are more reliable estimates of the future attributes of SNAs.

6.4 Migration between England and the rest of the UK

Migration exchanges between England and the other three countries of the UK have much less effect on the size and composition of England's subnational populations than the within-England flows just described. Secondly, unlike with the latter, the volume of gross flows across subnational boundaries is not affected by the number of SNAs in which England is divided. Admittedly, the net migration impact will vary somewhat, because with greater spatial disaggregation the net gains and losses recorded by local areas are less likely to cancel each other out. Moreover, since the volume of within-England migration varies greatly according to the SNA geography, the *relative* importance of migration exchanges with other countries of the UK will vary. Nevertheless, the overall message of our review is that, whatever the SNA geography selected, this element has been relatively insignificant in recent years and therefore should be comparatively easy to deal with in subnational forecasting.

The limited numerical significance of migration is clearly demonstrated by the evidence of Chapter 3. In brief, it was shown there that the number of people moving into England from the rest of the UK has been averaging just over 100,000 over the past 15 years, with a very similar number moving in the opposite direction – much smaller figures than the 730,000 people moving between England's eight standard regions in the fairly typical year of 1994 and the total 4.65 million people estimated to have changed address within England that year. The net impact on England's total population is, of course, larger than within-England migration since the latter, by definition, is zero, but over the

last 15 years it has averaged a net loss from England of 1,250 – a miniscule amount by any standards and certainly very small compared with the net impact of migration between England and non-UK countries (see section 6.5). The long-term national population projections reinforce this point by forecasting an annual net loss of 500 people, and there is no clear evidence to support an alternative figure, either in terms of economic and social trends or arising from current proposals for political change. On the other hand, the annual level of net flows has fluctuated somewhat in the past, principally in relation to the strength of the English economy and especially to that of the South East, providing some challenge for forecasting future migrations for specific short periods.

The impact on SNAs is somewhat larger than these overall net figures indicate, because in any year some SNAs are net gainers in their migration exchange with the rest of the UK and others are net losers. In 1994 the total effect on England's eight standard regions (the sum of the regional changes ignoring the direction of net change) amounted to merely 5,800 – barely one-fifteenth of the effect on standard region populations of within-England migration of 84,300 that year. Its relative significance is slightly larger if England is divided into just the two regions of North and South, for which the total change amounts to 5,200 – around one-tenth of the 54,000-odd effects of within-England migration on the two regional populations. At the other extreme, it can be confidently asserted that, with progressively greater disaggregation of England, its importance relative to the effect of within-England flows in an average year will quickly drop well below the one-fifteenth found for standard region level.

The impact of these exchanges is also increased somewhat by the fact that the composition of migrants into England from the rest of the UK is somewhat different from that of people moving in the opposite direction. In particular, as seen in Chapter 3, in 1990/91 England made net gains of young adults, notably those aged 16-29, non-whites and people in employment after their move. By contrast, there were more out-migrants than in-migrants amongst children, those of older working age, the retired and the unemployed.

Even so, given the relative insignificance of this element of migration, it hardly seems worth devoting great efforts to developing methods which will produce a high degree of accuracy in subnational housing projections for England. On this basis, two alternative approaches suggest themselves to us. One is to use very simple extrapolation methods, whereby the average volume of past migration for each SNA is projected forward, essentially as currently carried out in the ONS projections. The other is to extend the SIM approach recommended for forecasting within-England migration (section 6.3) to cover the whole of the UK.

From a migration modelling perspective, the latter is the more appealing approach for at least two reasons. In the first place, to all intents and purposes, the UK constitutes a single migration system which is to a considerable extent pivoted on London and the South East and where movement between England's SNAs and the other three countries of the UK seems to respond to essentially the same determinants as long-distance flows within England. Similarly, shorter-distance moves across the England borders do not appear qualitatively different from those across the boundaries of adjacent regions in England, with notably strong links between north-west England and north Wales and between the west of England (including the West Midlands) and central and south Wales. Secondly, the variations over time in the scale and net direction of flows between England

and the other three countries tend to parallel closely those between the northern and southern regions of England. Therefore, if the SIM approach to within-England migration was linked to a wider regional economic model, the incorporation of the rest of the UK would provide a more reliable forecast of the year-to-year fluctuations in migration exchanges with the other three countries.

There are some choices to be made in carrying out this suggestion. One important area of choice is how the rest of the UK should be treated in spatial terms alongside whatever SNAs that England is divided into: as single 'region', or the three countries separately, or a larger number of units defined on the same basis as those for England. Conceptually, the last is the most satisfactory, though it poses a greater data availability challenge. There is also the possibility of using a dummy variable to represent the effect of the national boundaries if and where this was found to be significant. Otherwise, the choices are the same as for the within-England application (see section 6.4).

Beyond these choices, the main operational difficulty concerns the availability of outside-England data both to calibrate the SIM and to input to the model for the forecasting period. Calibration should not be difficult if the model is based on Census data sources, because the differences between the four countries are relatively minor, even though Northern Ireland is covered by its own separate Population Census. There are, however, some substantial differences in the nature and availability of administrative types of data between England and the other countries, least for Wales but more so for Scotland and especially for Northern Ireland. Data for inputting to the forecasting process would be a particular problem if, for forecasting within-England migration, reliance is placed on levels of SNA attributes being generated from a regional economic model developed only for England. While there would seem to be much theoretical sense in having a subnational economic model for the whole of the UK and thus not having to handle some integral parts of the UK space-economy exogenously, it is recognised that in practical terms this may not be possible.

6.5 International migration

One of the most impressive features of our review of migration patterns and trends in Chapter 3 concerns the increased scale of net immigration from outside the UK in the recent years. Since the early 1980s, the UK – in common with many other Old World countries in Europe – has switched dramatically from being a country of emigration to a country of immigration, and England has borne the brunt of this changeover. As a result, alongside the longer-term trend towards lower levels of natural increase, international migration has relatively suddenly emerged as a major force in national and regional population growth. Partly because of this, of the three elements of migration affecting subnational populations in England, it is the one that has been least well recorded and analysed and, leading on from this, is also the one about which there is least to say with any reasonable degree of confidence in forecasting terms. This finding inevitably prompts questions about how far and how quickly this situation can be rectified and, in advance of any such progress, araises the issue of how much effort should realistically be put into fine-tuning forecasts of the other two elements of migration.

The importance of international migration in the mid 1990s is easy to demonstrate, as shown in Chapter 3. It is estimated that in both 1994 and 1995 around 270,000 people entered England from outside the UK with the intention of staying at least 12 months (including

asylum seekers and visitor switchers), while some 170,000 left England for at least a year. This net increase of 100,000 was almost identical to England's surplus of births over deaths for those two years. For those two years, too, it was the most important of the three types of migration distinguished in this study in terms of its impact on population change at the level of England's eight standard regions: with all these regions sharing to some extent in accommodating the net influx, its impact of around 100,000 in 1994 compares with the 84,300 effect of inter-regional migration and 5,800 effect of migration with the rest of the UK. Its importance relative to within-England migration, however, becomes proportionately less as the number of subnational areas (SNAs) increases, with disaggregation of England to the county or district levels involving a wider range of net internal migration gains and losses than observed for standard regions but probably not significantly affecting the overall scale of impact of international migration on SNA populations.

What makes international migration so difficult to handle in terms of population forecasting at national level, let alone for SNAs, is its volatility over time. Net immigration in 1992 and 1993 is estimated to have been only one-third its 1994-95 levels, while those for the previous three years were roughly midway between the two. As mentioned in Chapters 2 and 3, it is not clear how much these fluctuations are real as opposed to arising either from the sampling errors affecting the gross estimates of arrivals and departures made from the International Passenger Survey or from the problems of recording asylum seekers, visitor switchers and migration with the Irish Republic. Even if it is assumed that these effects largely cancel themselves out over time, any smoothing of the data series makes it more difficult to relate trends to time-specific causes, notably the effect of economic cycles.

Also problematic is the lack of a robust model, or set of models, that can cope with international migration in conceptual, let alone quantitative, terms. Typologies of international migrants suggest that they form even more of a 'chaotic conception' than within-England migration, including as they do groups as varied as skilled professionals, unskilled manual labourers, students, expatriates, retirees, wives and families joining previous migrants, people involved in arranged marriages, refugees from war zones and people seeking political asylum. Whereas long-distance migration is normally associated with job-related movement and did indeed underpin much of the emigration of British citizens to the New World and much of the immigration from the Caribbean and South Asian regions in the 1950s and 1960s, nowadays only around one-third of the IPS-recorded emigrants (including those who are returning to work in their home countries after a period of study in England) and barely one-fifth of immigrants give work-related reasons for their moves (a figure that would be even smaller if asylum seekers were added into the equation). Small wonder that fluctuations in the aggregate volume of net immigration bear no clear relationship to the state of England's economy.

In relation to forecasts of future levels of movement, the problem of anticipating trends in the determinants of international migration is much greater than for the other two types of migration covered above. Whereas the factors influencing trends in within-England migration could perhaps be internalised in a single forecasting model (see section 6.3), many of those affecting moves to and from England are external to the UK and/or are of an essentially unpredictable nature. Examples from the past 25 years include the rather time-specific job growth in particular areas like Germany and the Persian Gulf states, the sudden arrival of the Ugandan Asians and the Vietnamese boat

people, and the effects of the collapse of Communism in central and eastern Europe. Perhaps the biggest question marks for the next few years concern the scale of pressures from asylum seekers and visitor switchers, the effects of the further elimination of national frontiers within an enlarged European Union and the nature and efficacy of any new measures designed to restrict the immigration from the Third World.

These are not the sort of migration phenomena that can be readily handled in an explanatory model, hence the recommendation in Chapter 5 that scenario development provides the most satisfactory method for examining possible alternative futures. This would involve convening a group of experts, drawn notably from the Home Office, ONS and academia, in order to obtain views on the likely evolution of international migration, particularly attempting to distinguish the various elements over which there was greater or lesser certainty and to give advice in relation to the latter. The results would be used in an essentially qualitative manner to explore the range of potential outcomes, with those considered most likely being studied in greater depth with the aim of gauging how far levels of migration based on trend extrapolation should be modified. This approach is basically the same as that already used by ONS for the international migration input to its national population projections. As outlined in Chapter 2, the latter is currently based on identification of eight migration streams (British and non-British citizens separately for four groups of countries) and, for each of these, on trend extrapolation tempered by judgement about the weight to be given to individual years in the past.

The difficulties which all these issues pose for forecasting are magnified when the focus of attention is shifted from the national scale to questions about the impact on subnational populations, principally because of the greater problems encountered in the measurement and analysis of past trends. As mentioned in Chapter 2, the breakdown of IPS-derived estimates to standard regions is subject to considerably higher percentage sampling errors than the national set. Partly because of this no doubt, the standard region estimates exhibit greater relative change from year to year than the national series. The data accuracy issues are compounded by the possibility that the immediate destination which immigrants give may not be the same as where they end up on a more permanent basis. In addition to the IPS-derived types of international migration, subnational forecasts must also consider the geographical distributions of asylum seekers and visitor switchers and of people migrating between England and the Irish Republic.

In practice, at standard region level, the scale of the forecasting challenge is mitigated to a considerable extent by the highly uneven distribution of the net impact of international migration. As shown in Chapter 3, this impact appears to have been highly concentrated on the South East in recent years, with a 10-year average of net IPS-recorded flows revealing net gains for the South East almost identical to that for the UK as a whole and with a sample survey of asylum seekers indicating that almost 9 out of 10 were living in the South East. This degree of concentration is a lot different from the situation in the 1950s and 1960s, when many immigrants were taking up jobs in the conurbations of the Midlands and northern England, and it can be expected to continue, given the long-term strength of the South East's economy and the greater numbers now entering through the country's main entry ports as asylum seekers rather than for locationally-specific job contracts.

Given the difficulties faced in forecasting the overall volume of net international migration at national and standard region levels, it must be concluded that any attempt at providing

greater spatial detail will be beset by even greater problems. Firstly, continuing the theme of spatial scale, the problems described above will be magnified for SNAs below the standard region because the extremely fragmentary basis for monitoring at this level makes even trend extrapolation a risky procedure. A further challenge is that the main sources give rather limited information about the characteristics of the migrants. The IPS gives only a very crude indication of labour-market position and occupation and nothing on household or housing characteristics. Once every ten years the Census provides as much information on immigrants over the pre-Census year as for internal migrants, but it contains no information on emigrants and thus none on the net impact of international migration.

Finally, there is the question of the relationship between international migration and the other two types of migration distinguished in this review. Any forecasts of international migration should bear in mind that its volume and geographical distribution is not likely to be entirely independent of migration taking place within the UK. As yet, this is not a well-documented topic in terms of past experience, but Chapter 3 provided some 1980s evidence to suggest causal linkages in both directions; for instance, with immigrants taking jobs in the South East in the mid 1980s that might in other circumstances have been filled by migrants from the northern conurbations, and with immigrants occupying housing in cities released by the process of counterurbanisation. This experience raises questions concerning how far trends in internal migration in the future might affect the volume and distribution of international migration and, vice versa, the degree to which patterns of internal migration might be rechannelled by any major change in the scale of migration between England and overseas.

Clearly, now that international migration has emerged as such a powerful force for net population change in England, the task of producing forecasts of subnational populations has become a great deal more difficult than in the past. Not only are the systems for monitoring movement between England and overseas much less developed than those for internal migration, but the phenomenon is inherently much less predictable. This is partly because one end of each flow is outside the relatively well-known territory of the UK but principally because several of the types of migration involved are much less amenable to statistical modelling than most of those which come under the internal migration label.

If it is concluded that the scale of international migration will continue at something like the historically high levels of recent years – and there would appear to be no strong reason to think otherwise in spite of much talk about a 'Fortress Europe' policy – then the problems of forecasting its impact on subnational populations confidently must lead to questions about the rationality of investing great efforts in perfecting methods of internal migration forecasting. This would seem to be particularly the case for forecasting at the standard region level, at which international migration is relatively more important compared with more local scales and where explanatory models of internal migration do not have such an advantage over trend extrapolation methods as compared with more disaggregated levels.

6.6 Summary of recommendations for forecasting migration

Treatment of migration

Recommendation 1: It is necessary to give separate treatment to internal migration and to migration exchanges between England's sub-national areas (SNAs) and non-UK

countries, but there is no similarly clear distinction to be drawn between within-England migration and migration between England's sub-national areas and the rest of the UK.

Recommendation 2: At present migration needs to be modelled for persons rather than households. Currently there is not enough data or understanding to handle households, not even to model the migration of households that do not change composition during the move let alone to model the impact of all migration on households. This is the case for all three types of migration affecting England's subnational populations.

Modelling within-England migration

Recommendation 3: On operational grounds, aggregate (macro) models are likely to provide a much more satisfactory basis than disaggregate (micro) models for forecasting migration flows between England's SNAs. This is mainly due to the limitations in data availability and complexities of data manipulation which have both hampered micro-level modelling of migration in England at this geographical scale.

Recommendation 4: Models which attempt to 'explain' migration decisions, such as spatial interaction models (SIMs) for destination choice and binary logit models for departure choice, are better than trend extrapolation methods at investigating 'what-if?' types of scenarios as an aid to policy formulation.

Recommendation 5: Tentatively, we suggest that, for a short forecasting time horizon and for a spatial breakdown into a small number of macro-level regions, trend extrapolation methods along the lines of those currently used by the ONS for subnational population projections will perform better than explanatory models, as long as sufficient data are available to establish trends with reasonable confidence and if obvious trends are present in the data. By contrast, if looking further ahead and dealing with a larger number of smaller and internally more homogeneous SNAs, explanatory methods of the SIM type are likely to produce the most reliable results, given the amount of urban and regional change normally occurring in England.

Recommendation 6: Even where forecasts are required for a small number of SNAs, there is a strong theoretical case for forecasting migration at a finer-grained spatial scale using SIMs and aggregating the results to the level required.

Recommendation 7: Assuming the adoption of an explanatory model, experimentation is required before a final decision is made on the most appropriate approach for any specific application in England. Particular attention should be given to the type and form of SIM and to the identity of the variables to be included in the models.

Recommendation 8: Whatever SIM is selected, model performance will be enhanced if the model is calibrated separately for each origin in the system.

Recommendation 9: Model performance will be enhanced if the determinants of migration included in the model, i.e. the levels of the SNA attributes, can be forecast accurately, either by inputting from a regional economic model run alongside the migration forecasting model or by having the latter fully incorporated in the former. 'What-if?' scenarios can be developed to gauge the sensitivity of migration projections to variations in the levels of determinants.

Recommendation 10: Whichever modelling approach is used, there is a need for the level of migration, i.e. the total number of relevant changes of address over a given time period, to be set exogenously.

Recommendation 11: Whichever modelling approach is adopted, it will perform more satisfactorily if it models separately population sub-groups that are distinctive in their migration behaviour and respond to different determinants, with special attention being given to distinctions by age, employment status and income. Two particularly distinctive groups are retired owner occupiers and full-time students.

Recommendation 12: Consideration needs to be given to whether it is both justifiable and feasible to include constraints into the migration forecasting model, such that limits be placed on the overall capacity of individual SNAs and account taken of all types of migration and of other aspects of housing demand simultaneously.

Modelling migration between England and the rest of the UK

Recommendation 13: There is a strong theoretical case for handling these exchanges within the model developed for forecasting within-England migration, using a similar spatial breakdown of the rest of the UK and – if shown to improve model fit – including dummy variables to represent the crossing of a national boundary.

Recommendation 14: In practical terms, it would seem unreasonable to devote substantial resources to the development of a completely separate, well-performing model for migration to and from the rest of the UK, given that the average annual impact of these exchanges on England's sub-national populations is much smaller than those of within-England migration and of migration exchanges with countries outside the UK.

Modelling international migration

Recommendation 15: International migration has emerged as such a significant contributor to England's population growth over the past decade that its impacts on the country's population distribution and composition merit much more detailed investigation that they have been accorded thus far, as do the interrelationships between the levels and patterns of international migration and those of internal migration.

Recommendation 16: In advance of such improvement in our knowledge and understanding, there is unlikely to be a significantly better way of allocating the total number of immigrants and emigrants to SNAs than the methods currently used by ONS and GAD, but it would beuseful to consult a group of experts from the Home Office, ONS and academia to consider ways of refining these techniques.

Recommendation 17: As regards forecasting the total number and composition of immigrants and emigrants to England, we recommend a combination of trend extrapolation and scenario writing. This can be used to gauge the likely range of effects on individual SNAs, with the impacts being by far the greatest for the South East, and especially London, but of much more limited significance for most of the rest of England.

Looking to the future

Recommendation 18: As a long-run goal the Department should be aiming for a model which integrates population migration and household change and matches it with housing supply in a dynamic temporal context.

6.7 The next steps

There are two basic ways in which progress can now be made towards the better forecasting of the migration flows that cause change to England's subnational populations:

- though experimentation with the recommended approaches in order to select the best-performing versions
- through further research designed to improve our knowledge of migration flows and their determinants.

In terms of ***experimentation***, it is particularly important to set up a feasibility study for refining the spatial interaction model needed for forecasting internal migration and comparing its performance with trend extrapolation methods. This will need to bear in mind data availability and the needs of the regional housing model, but the key aspects needing attention include:

- the choice of the form of spatial interaction model to be used
- the method of projecting the overall volumes of migration in the system
- the identification of the population subgroups to be modelled separately
- experimentation with calibrating models separately for each origin region
- the selection of the specific explanatory variables to be used in each model
- the exploration of the stability of model parameters over time
- the assessment of the feasibility of predicting the future values of the variables in the models
- examination of the possibilities of imposing constraints and handling interaction effects

The principal ***information and research needs*** identified by this study are the following:

- a comprehensive assessment of migration data reliability, especially with respect to the International Passenger Survey data on international migration and to the Population Census as the single most important source of detailed information on internal movements

- an examination of the geographical impact and characteristics of international migrants, especially asylum seekers and visitor switchers

- an investigation of the interaction effects between internal and international migration, especially possible links between rates of net immigration to London and certain other cities and net out-migration from these cities to the rest of England

- a study of the household dimension of both international and internal migration, especially the relationships between macro and micro levels of analysis

- research to identify the steps needed for developing micro-level models of migration behaviour, starting with the possibility of adapting models developed in other countries, notably the Netherlands.

APPENDIX: 18 SELECTED REVIEWS

1) Boyle P.J. (1998) Migration and housing tenure in South East England. *Environment and Planning A,* **30**, 855-866.

2) Cadwallader M. (1989) A conceptual framework for analysing migration behaviour in the developed world. *Progress in Human Geography,* **13**, 494-511.

3) Duley C. (1989) A model for updating census-based household and population information for inter-censal years. Unpublished Ph.D. thesis, School of Geography, University of Leeds.

Duley C. and Rees P. (1991) Incorporating migration into simulation models. In J. Stillwell and P. Congdon (eds.) *Migration Models: Macro and Micro Approaches.* London: Belhaven Press.

4) Flowerdew R. (1991) Poisson regression modelling of migration. In J. Stillwell and P. Congdon (eds.) *Migration Models: Macro and Micro Approaches*. London: Belhaven.

5) Fotheringham A.S. and O'Kelly M.E. (1989) *Spatial Interaction Models: Formulations and Applications.* Dordrecht: Kluwer. Pp. 56-58.

6) Fotheringham A.S. and O'Kelly M.E. (1989) *Spatial Interaction Models: Formulations and Applications.* Dordrecht: Kluwer.

7) Hughes G. and McCormick B. (1981) Do council housing policies reduce migration between regions? *Economic Journal,* **91**, 919-937.

8) Kau J.B. and Sirmans C.F. (1979) A recursive model of the spatial allocation of migrants. *Journal of Regional Science,* **19**, 47-56.

9) Kawabe H. and Liaw K.L. (1992) *Marriage and Migration in Japan: An Explanation by Personal Factors and Ecological Variables*. Nihon University Population Research Institute Paper Series No. 60. Japan: Nihon University.

10) Nijkamp P., Van Wissen L. and Rima A. (1993) A household life-cycle model for residential relocation behaviour. *Socio-economic Planning Sciences,* **27**, 35-53.

11) Pandit K. (1997) Cohort and period effects in U.S. migration: how demographic and economic cycles influence the migration schedule. *Annals of the Association of American Geographers,* **87**, 439-450.

12) Pellegrini P.A. and Fotheringham A.S. (1998) Intermetropolitan migration and hierarchical destination choice: a disaggregate analysis from the US PUMS. *Environment and Planning A,* forthcoming.

13) Rees P. (1994) Estimating and projecting the populations of urban communities. *Environment and Planning A,* **26**, 1671-1697.

14) Stillwell J.C.H. (1978) Interzonal migration: some historical tests of spatial interaction models. *Environment and Planning A,* **10**, 1187-1200.

15) Stillwell J.C.H. (1991) Spatial interaction models and the propensity to migrate over distance. In J. Stillwell and P. Congdon (eds.) *Migration Models: Macro and Micro Approaches*. London: Belhaven.

16) Stillwell J.C.H. (1991) Spatial interaction models and the propensity to migrate over distance. In J. Stillwell and P. Congdon (eds.) *Migration Models: Macro and Micro Approaches*. London: Belhaven.

17) Thomas A. (1993) The influence of wages and house prices on British interregional migration decisions. *Applied Economics,* **25**, 1261-8.

18) Van der Gaag N., Van Imhoff . and Van Wissen L. (1997a) *Internal Migration in the Countries of the European Union*. EUROSTAT Working Paper E4/1997-5, The Statistical Office of the European Communities, Luxembourg.

Van Imhoff E., Van der Gaag N., Van Wissen L. and Rees P. (1997) The selection of internal migration models for European regions. *International Journal of Population Geography,* **3**, 137-159.

Boyle P.J. (1998) Migration and housing tenure in South East England.
***Environment and Planning A*, 30, 855-866.**

Aims

More recent studies have confirmed the findings of Hughes and McCormick - council tenants do appear to be less likely to migrate inter-regionally than those in owner occupied or privately rented housing. This study focussed on the South East of England where many have suggested the problems of recruiting manual workers are especially pronounced. It is also the area where the economy has been most buoyant and house prices have been highest during the 1980s.

Methods

The study used individual level household head data from the 1991 British Census Sample of Anonymised Records.

Results

Of the 11,358 migrant household heads living in the South East, 2,970 moved long distances (over 50kms). Comparing those that moved long and short distances, it does appear that those moving into council tenures are more restricted by distance than those moving into other tenures. This confirms the findings of Hughes and McCormick for the South East region in 1991.

However, when the 509 migrants from the North of Britain (inevitably long distance movers) were compared the remainder of the sample, it was apparent that they were actually more likely to move into council housing than owner occupied housing, controlling for other socio-economic characteristics. The differences in parameter estimates were small, but we would expect differences in the opposite direction if the Hughes and McCormick theory had held. For this sub-group, long distance migration into owner occupied housing in the South East region, where relative house prices are exceptionally high, appears to have been difficult.

This suggests that for different flows of migrants the effects of housing tenure vary. The South East is an extreme example where the owner occupied housing market is difficult to penetrate for migrants from regions where house prices are much lower.

Cadwallader M. (1989) A conceptual framework for analysing migration behaviour in the developed world. *Progress in Human Geography*, 13, 494-511.

Aims

This paper aims to review the migration behaviour literature and to provide bridges between different approaches. 'Macro' approaches to migration analysis tend to explain migration in terms of the measured characteristics of different places whilst 'micro' approaches attempt to explain the decision-making process that underpins migration.

Methods

The conceptual framework involves four sets of relationships:

(1) between objective variables (e.g. income, unemployment) measuring different places and observed migration flows;

(2) between the objective variables and their subjective counterparts, through the individual perceptions of potential migrants;

(3) between the individual sets of subjective variables and an overall measure of attractiveness of different places (utility functions); and

(4) between the individual place utility functions and observed migration flows.

This framework is similar to that used in psychology. The first relationship is the 'macro' one which involves modelling aggregate level migration flows as a function of a set of regional characteristics. There are, of course, a range of explanatory variables that can be identified as being important influences on specific aggregate migration streams. Single equation regression models are used typically for this analysis and in most cases, the variables are combined in a multiplicative fashion (see Rogers 1967 for a classic example). However, there is an argument that there exists a mutual interaction between migration and variables such as unemployment or income and consequently it is necessary to use canonical correlation analysis or structural equation models (see Cadwallader, 1985 for an example) which incorporate both indirect and feedback effects.

The other three relationships expose, at a 'micro' level, what the 'macro' approach conceals. The second relationship between the objective and subjective variables has been explored by researchers within the context of cognitive distance in particular and various methods have been used to test the correspondence between objective and subjective measures of the same phenomenon.

The third relationship is where the most relevant subjective variables are combined to give an overall utility value associated with a particular place. There are various methods of uncovering the most important cognitive dimensions including multidimensional scaling and semantic differential techniques. Approaches to combining evaluations on these dimensions include conjoint measurement methods and models of human information processing.

The final relationship links overall attractiveness of places with actual migration behaviour. One of the key issues here is the constraints or controls that are influential in the form of the labour market, the housing market or national and local government policy. Estate agents, for example, significantly influence migration patterns because they hold large amounts of information concerning housing vacancies. It is the institutional factors in any given migration context that are most amenable to governmental control.

Evaluation

This paper is valuable because it provides a synthesis of the macro and micro theoretical approaches to the analysis of inter-regional migration behaviour.

Duley C. (1989) A model for updating census-based household and population information for inter-censal years. Unpublished Ph.D. thesis, School of Geography, University of Leeds; Duley C. and Rees P. (1991) Incorporating migration into simulation models. In J. Stillwell and P. Congdon (eds.) *Migration Models: Macro and Micro Approaches*. London: Belhaven Press. Pp. 228-261.

Aims

To demonstrate the complexities that have to be overcome in order to produce a realistic simulation model of migration and the housing market. An example of a disaggregate (micro) time-series model.

Methods

Duley (1989) and Duley and Rees (1991) construct a microsimulation model called UPDATE and which consists of the following modules:

- SIMPOP: this reconstructs the population of individuals in both private households and non-private (communal establishments);
- DEATH: this applies mortality probabilities for an annual interval;
- BIRTH: this applies fertility probabilities and probabilities of single or multiple births to the relevant female population;
- UNION/BREAKUP: this simulates the marriage/cohabitation process that forms unions of two people and the divorce/dehabitation process that breaks up couples;
- MIGRATION: this simulates the migration of whole households and of individuals within households;
- SOCIOECO: this simulates changes in social class;
- AGE: this increments the age of all individuals by one year before a new set of processes are started for the next year.

Migration is incorporated into the UPDATE model as three sets of transitions:

- migration associated with pair formation and dissolution;
- migration of whole households and of independent individuals within and out of an area;
- inmigration to an area of new households and of independent individuals.

Results

The bulk of the work reported in Duley (1989) and Duley and Rees (1991) involves attempting to estimate from inadequate data sources the necessary transition probabilities

and stock/flow numbers needed at small area scale. The complexity of the process can be appreciated from an examination of the Figure which shows the stages in the simulation of inmigration of households and individuals into an area. The boxes in the diagram show the counts of three different kinds of inmigrants which must be projected: the first count is that for vacant spaces created for inmigrant households to fill; the second count is that for newly built housing units which inmigrant households can take up; the third count is that of individual inmigrants within existing households. In between the count determinations are steps which simulate the characteristics of the inmigrant households.

Evaluation

Simulation of any type of human decision-making is enormously complex and the housing market and migration system is no exception. It is clear that one can spend years deriving a simulation model without capturing all the possible effects. Data avaliability and time constraints imply that only relatively simple simulation models are likely to be operationalised and it is not clear how well such models would work given they are clearly attempting to capture a highly complex process in a simple way.

Flowerdew R. (1991) Poisson regression modelling of migration. In J. Stillwell and P. Congdon (eds.) *Migration Models: Macro and Micro Approaches*. London: Belhaven. Pp. 92-112.

Aims

To demonstrate the relevance or irrelevance of a large number of potential destination attributes which might affect migration flows. An example of an aggregate (macro) cross-sectional model.

Methods

Flowerdew (1991) examines 1980-81 migration between the 30 largest functional regions in the UK with a total flow constrained model. The variables used in this study are given in the table below. Instead of just using one model, however, Flowerdew investigates a set of alternative models composed of various combinations of variables.

Table A Variables used in the analysis

Variable	Definition
P_i	Population of i, 1981
P_j	Population of j, 1981
O_i	Number of outmigrants from i to other places in the data set, 1981
D_j	Number of inmigrants to j from other places in the data set, 1981
d_{ij}	Straight-line distance between centroids of i and j
A_j	Accessibility measure ($A_j = \sum_k P_k / d_{jk}$)
I	Origin factor with one category for each i
J	Destination factor with one category for each j
C_{ij}	Contiguity (1 if Functional Regions i and j are contiguous; 0 if not)
OLD_i	Percentage at i of pensionable age, 1981
OLD_J	Percentage of j of pensionable age, 1981
$ECINACT_i$	Economically inactive per 100 economically active at i, 1981
$ECINACT_j$	Economically inactive per 100 economically active at j, 1981
$EMPCH_i$	Employment change (%) at i, 1978-81
$EMPCH_j$	Employment change (%) at j, 1978-81
U_j	Unemployment rate change (% point) at i, 1971-81
U_j	Unemployment rate change (% point) at j, 1971-81
U_{ij}	U_i-U_j
$MGRPRF_i$	% economically active in managerial and professional SEGs (1-4, 13) at i, 1981
$MGRPRF_J$	% economically active in managerial and professional SEGs (1-4, 13) at j, 1981
$CARS2_i$	% households with 2 or more cars at i, 1981
$CARS2_j$	% households with 2 or more cars at $_j$, 1981
$HOUSE_i$	Average house price at i, 1980
$HOUSE_j$	Average house price at j, 1980

Note: Several of the variables are used in logged form in some models, as indicated in the next table. Origin-specific terms are written $1 \cdot X_j$ and destination-specific terms are written $J \cdot X_i$ where X_i and X_j can refer to any of the available variables.

Results

The results of fitting these models are given in the next table where model performance is measured in terms of a deviance statistic where a value of 0 corresponds to a perfect fit and increasing values indicate increasingly poor prediction.

Table B Summary list of models fitted to the data

Model	Variables included	Degrees of freedom	Deviance
1	In P_i , In P_j , In d_{ij} (Ordinary Least Squares: $R^2 = 0.66$)		
2	null model	869	313 445
3	In P_i , In P_j , In d_{ij}	866	58 405
4	In P_i , In P_j , In d_{ij} C_{ij}	865	52 903
5	In P_i , In P_j , In d_{ij} In A_j	865	41 752
6	In P_i , In P_j , In d_{ij} U_i	865	52 443
7	In P_i , In P_j , In d_{ij} U_j	865	37 374
8	In P_i , In P_j , In d_{ij} U_{ij}	865	55 704
9	In P_i , In P_j , In d_{ij} U_i U_j	864	34 925
10	In P_i , In P_j , In d_{ij} C_{ij} , U_i , U_j	863	27 755
11	In P_i , In P_j , In d_{ij} In A_j , U_i , U_j	863	29 504
12	In P_i , In P_j , In d_{ij} C_{ij} , In A_j , U_i , U_j	862	23 881
13	In P_i , In P_j , In d_{ij} C_{ij} , In A_j , U_i , U_j , OLD_i , OLD_j, $ECINACT_j$, $ECINACT_j$, $EMPCH_i$,$EMPCH_j$, $MGRPRF_i$, $MGRPRF_j$, $CARS2_i$, $CARS2_j$	852	20 552
14	I, In P_j , In d_{ij}	838	43 812
15	J, In P_i , In d_{ij}	838	26 633
16	I, J, In d_{ij}	809	18 060
17	I, In P_j , In d_{ij} , In A_j	837	30 324
18	I, In P_j , In d_{ij} , C_{ij} , OLD_j , $ECINACT_j$, $EMPCH_j$, In U_j , $MGRPRF_j$,$CARS2_j$, In $HOUSE_j$	830	17 706
19	I, In P_j , In d_{ij} , C_{ij} In A_j , OLDj , ECINACTj , $EMPCH_j$, In U_j , $MGRPRF_j$, $CARS2_j$, In $HOUSE_j$	829	15 682
20	J, In P_i , In d_{ij} , In A_j	837	26 424
21	J, In P_i , In d_{ij} , Cij , In A_j OLD_i , $ECINACT_i$, $EMPCH_i$, In U_i , $MGRPRF_i$, $CARS2_i$, In $HOUSE_i$	830	17 190
22	I, J, In D_{ij} , C_{ij}	808	11 787
23	I, I In P_j , I In d_{ij}	780	29 989
24	I, I In P_j , I In d_{ij}, I In A_j	750	17 898
25	I, I In P_j , I In d_{ij} , C_{ij} , OLD_j , $ECINACT_j$, , $EMPCH_j$, In U_j , $MGRPRF_j$, $CARS2_j$, In $HOUSE_j$	772	12 917
26	I, I In P_j , I In dij , Cij , I In A_j , OLD_j , $ECINACT_j$, $EMPCH_j$, In U_j , $MGRPRF_j$, $CARS2_j$, In $HOUSE_j$	743	9 109
27	I, I, In P_j , I In d_{ij} , I In C_{ij} , I OLD_j , I $ECINACT_j$, I $EMPCH_j$, I In U_j , I $MGRPRF_j$, I $CARS2_j$, I In $HOUSE_j$	554	7 705
28	I, I In P_j , I In d_{ij} , I C_{ij} , I In A_j , I OLD_J , I $ECINACT_j$, I $EMPCH_,$, I In U_j , I $MGRPRF_j$, I $CARS2_j$, I In $HOUSE_j$	524	5 326
29	J, J In P_i , J In d_{ij} , J C_{ij} , J OLD_i , J $ECINACT_i$, J $EMPCH_i$, J In U_i , J $MGRPRF_i$, J $CARS2_i$, J In $HOUSE_i$	554	6 277
30	I, J, I In d_{ij} , J In d_{ij} , C_{ij}	749	7 052
31	In d_{ij} (offset In O_i+In D_j)	868	38 783
32	d_{ij} (offset in O_i+In D_j)	868	56 844
33	In O_i , In D_j , In d_{ij}	866	35 983
34	In O_i , In D_j , d_{ij}	866	54 834
35	- (offset In O_i+In D_j - 0.6862 In d_{ij} ; satisfies mean distance constraint)	869	39 528

The results suggest that some combinations of variables produce better fits to the data than others but that adding variables *ad infinitum* quickly reduces the degrees of freedom with sometimes little gain in replicative ability. Statistical tests should be carried out to determine the most parsimonious model.

Evaluation

The results suggests that some experimentation with the set of variables used in a spatial interaction model of migration is likely to be necessary. There appear to be some variables such as distance and population size which are always important and other variables which appear to be important in some contexts but not in others. The basic result is that it is very difficult to define the exact form of a spatial interaction model without calibrating it.

Fotheringham A.S. and O'Kelly M.E. (1989) *Spatial Interaction Models: Formulations and Applications*. Dordrecht: Kluwer. Pp. 56-58.

Aims

Fotheringham and O'Kelly (1989) compare the results of calibrating examples of four types of spatial interaction model (total-flow-constrained; production-constrained; attraction-constrained; and doubly constrained) with a common migration data set.

Methods

The data are 1970-80 migration flows between the 9 major census regions of the US and are given in Fotheringham and O'Kelly (1989, p.57). Their results are reproduced below in the table below. The models are also calibrated with both maximum likelihood estimation (MLE) and ordinary least squares (OLS) to investigate the similarity of the results. The population of each region is used as both a measure of attractiveness and a measure of propulsiveness in the models. Clearly other attributes can be added to the models to improve goodness-of-fit although the emphasis on this study was on a comparison of the model types rather than on obtaining as accurate a model of migration flows as possible.

Results

It is clear that from a comparison of the MLE and OLS estimates of the parameters of the four models that the calibration does affect the estimated parameters which is only to be expected given that they have different objective functions. However, the differences are only very small and are of little concern. Both calibration methods show very similar results across the four models.

The parameters in the table depict the origin propulsiveness effect (m), the destination attractiveness effect (a) and the distance-decay effect (b). The estimates do vary across the four models and the distance-decay parameter generally becomes considerably more negative as constraints are added to the model. It is worrying that the parameter estimates do vary so much because it means that the 'true' effect of distance on migration patterns is unclear. The results suggest that migration flows are greater to regions with large populations and from regions with large populations and that they are larger over shorter distances, everything else being equal.

The Goodness-of Fit statistic reported is the Standardised Root Mean Square Error (SRMSE) which is zero when the flows are predicted perfectly and one when each flow is estimated by the mean of all the flows. The doubly constrained model clearly produces the most accurate set of migration flows although this is to be expected given the extra constraints on the model; it is not clear whether it produces a more accurate representation of distance-decay. For this data set, the attraction-constrained model produces more accurate predictions of the observed flows than does the production-constrained model indicating that in this instance it is more difficult to predict migrants' destinations than their origins by population alone which would seem reasonable. Migrants are attracted to regions for reasons other than population (and the opportunities such population provides) but are likely to leave regions in fairly even proportions.

Table C OLS and ML Parameter Estimates for Four Interaction Models

	OLS Results				MLE Results			
Model	μ	α	β	SRMSE	μ	α	β	SRMSE
Unconstrained	.83	.74	.45	.60	.69	.64	.37	.58
Production-constrained	*	.64	.57	.56	*	.66	.49	.56
Attraction- constrained	.70	*	.71	.34	.74	*	.72	.34
Doubly-constrained	*	*	.99	.25	*	*	.91	.23

Evaluation

A useful comparison of the four main members of the family of spatial interaction models applied to migration flows. The example demonstrates the trade-off between the amount of information gained on the determinants of migration from a model and the abilty of the model to replicate a known flow matrix.

Fotheringham A.S. and O'Kelly M.E. (1989) *Spatial Interaction Models: Formulations and Applications*. Dordrecht: Kluwer, Chapter 5.

Aims

To examine the stationarity of the results of calibrating spatial interaction models for each origin separately.

Methods

Fotheringham and O'Kelly (1989, Chapter 5) describe the calibration of a production-constrained migration model with 1980-81 migration data between 30 large functional regions within the UK. The variables used to describe the attractiveness of a region for migration are described below:

Table D Attributes of Functional Regions used to explain destination choice

1.	p_j^*	-	1981 Population
2.	d_{ij}^*	-	Straight Line distance between FR centroids
3.	c_{ij}^*	-	Centrality Index $c_{ij} = S \underset{k=1,\ k\neq j,\ k\neq i}{} p_k/d_{jk}$
4.	b_{ij}	-	Contiguity Measure (1 if i and j are contiguous; 0 otherwise)
5.	o_j	-	Proportion of population classed as elderly (>65)
6.	e_j	-	Proportion of population classed as economically active
7.	m_i	-	Proportional change in employment 1978-81 (performance indicator)
8.	u_j^*	-	Change in unemployment rate 1971-81 (performance indicator)
9.	t_j	-	Proportion of population in managerial and professional socio-economic groups
10.	a_i	-	Proportion of households with 2 or more cars
11.	h_j^*	-	Mean house price

* Indicates a variable whose functional form in the Poisson Regression Model is a natural logarithm

Results

The global parameter estimates associated with each of these attributes are reported in the table. The interpretation of these 'global' parameter estimates is that, everything else being equal, migrants are attracted to regions with large populations, that are in close proximity, that are relatively isolated from other destinations, that are growing rapidly in employment, and that are relatively prosperous with high house prices.

Table E Parameter estimates obtained from the full migration dataset

Variable	PARAMETER	SE	SIG.
p_j^*	0.89	.01	+
d_{ij}^*	-0.79	.01	+
c_{ij}^*	-0.89	.03	+
b_{ij}^*	0.82	.02	+
o_j	-0.21	.36	
e_j	0.44	.17	+
m_j	1.45	.18	+
u_j^*	-0.36	.03	+
t_j	0.60	.52	
a_j	1.13	.30	+
h_j^*	0.22	.07	+

Notes:

* Indicates a variable whose functional form in the Poisson regression is a natural logarithm.

\+ Indicates a variable whose parameter estimates is significantly different from zero at the 95% confidence level.

However, the global estimates reported in this table above can hide interesting and significant regional variations in the determinants of migration. Fotheringham and O'Kelly (1989) therefore report the results of calibrating the same migration model separately for each of the 30 functional regions. Their results are reported in the table below which indicates the sign significance of each parameter for all 30 regions. What is interesting here is that only three variables – population, distance and centrality – have any consistent influence on migrants' destination choices. The other attributes have a significant effect on the destination choices of migrants from some origins but not for others and some attributes (including house prices) are insignificant for some origins, significantly positive for others and significantly negative for yet others!

Evaluation

The results strongly suggest the value of spatially disaggregating migration models. The typical application of a spatial interaction model to migration is to calibrate a single model for the whole matrix and assume that this applies equally to all origins and to all destinations. These results suggest that this assumption might not be a good one and that much more useful and informative results can be gained by spatially disaggregating the model.

Table F The significance and origin-specific parameter estimates

FR	p_j^*	d_{ij}^*	c_{ij}^*	b_{ij}	o_i	e_j	m_j	u_j^*	t_j	a_j	h_j^*
PLYM	+	-	-	n.a.	-	+	+	-			
NORW	+	-	-	n.a.							
NEWC	+	-	-	n.a.	-			-			
BOUR	+	-	-	+	-	+		-	+		
HULL	+	-	-	n.a.	-	+				-	
CARD	+	-	-	n.a.	-				+		+
LOND	+	-	-	+	+		-	-	+		+
MIDD	+	-	-	n.a.	-	+					
BRIS	+	-	-	n.a.	-	+					+
SOUT	+	-	-	+	-	+		-			
BRIG	+	-	-	n.a.							
PORT	+	-	-	+	-		+				+
SEND	+	-	-				-	-			
LEED	+	-	-	+				-	-	+	-
LEIC	+	-	-	n.a.					+		
OXFO	+	-	-	n.a.					+	-	
COVE	+	-	-	+					+		
STOK	+	-	-	n.a.					+		+
NOTT	+	-	-	+			+		+		
LIVE	+	-	-						+		
WOLV	+		-				-				+
DERB	+	-	-	+							
SHEF	+	-	-	n.a.			+		+		
BIRM	+	-	-			+				+	
READ	+	-	-				+			+	
BRAD	+	-	-	+				+	+		
MANC	+	-	-	n.a.			+				+
ALDE	+	-	-	+			+				
LUTO	+	-	-	n.a.						+	-
BIRK	+	-	-								+

Notes

* Indicates a variable whose functional form in the Poisson regression model is a natural logarithm. The other variables are proportions.

n.a. Variable not applicable (no contiguous region).

The criterion for significance is that the probability of making a Type 1 Error is less than 0.05.

Hughes G. and McCormick B. (1981) Do council housing policies reduce migration between regions? *Economic Journal,* 91, 919-937.

Aims

This is an early, but influential, paper which is commonly quoted when discussing the relationship between council housing and migration. It was one of the first to identify the barrier that council housing presents to tenants moving inter-regionally.

Methods

The study drew upon individual level data from the General Household Survey to examine whether ' council house tenancy reduces the probability that a household will migrate from one region to another during a given time period'. The data allowed a series of socio-economic characteristics expected to influence migration to be controlled for; namely, education, age, geographical region, the relative regional unemployment rate, and those not in the labour force.

The definition of migration was those households in 1973 that were living in a different region to one year previously and those households without a continuing head of household during the period, and those without complete information, were excluded from the analysis.

The study used a logit model to examine the likelihood of inter-regional migration for council tenants compared to owner occupiers controlling for these other variables.

Results

They found that council tenants were significantly less likely to migrate inter-regionally than owner occupiers. They concluded that the management of council housing makes it difficult for these households to move over long distances 'rather than as a central issue in the debate concerning the desirability of reducing council house stock', but their results have since been used to help justify the right-to-buy process.

Evaluation

The study can be criticised for the small number of explanatory variables used, the small sample size (101 households, of which only 7 were households in council housing that had moved inter-regionally), and the use of standard regions as the geographical scale (although this was constrained by the data source).

Kau J.B. and Sirmans C.F. (1979) A recursive model of the spatial allocation of migrants. *Journal of Regional Science*, 19, 47-56.

Aims

To investigate the stationarity or lack of temporal stationarity in the parameters of spatial interaction models applied to migration flows.

Methods

Kau and Sirmans (1979) calibrate a total-flow-constrained model with several origin and destination characteristics using US interstate migration in four time periods: 1930-40; 1940-50; 1950-60; and 1960-70. The model calibrated was:

$$\ln M_{ij}^{t} = \alpha_0 + \alpha_1 \ln y_i + \alpha_2 \ln y_j + \alpha_3 \ln a_i + \alpha_4 \ln e_i + \alpha_5 \ln c_i$$

$$+ \alpha_6 \ln c_j + \beta_1 \ln d_{ij} + \beta_2 \ln M_{ij}^{t-1}$$

where ln represent a natural logarithm, M_{ij}^{t} represents the migration flow between i and j in time t, y represents average income, a represents average age level, e represents average level of education attained, c represents a climate variable measured by average daily temperature, d_{ij} represents the straight-line distance between i and j, and M_{ij} represents the migration flow between i and j in the previous time period.

Results

The results of the model calibration in each of the four time periods is given in the table below. Across the four time periods migrants appear to be repulsed by low incomes and high temperatures at an origin and attracted by high incomes and low temperatures at a destination. Fewer individuals appear to migrate from areas having high concentrations elderly and less well-educated individuals which is evidence that migration tends to be selective and practised more by the younger and well-educated. Migrants appear to be deterred by distance and attracted to destinations chosen by migrants in previous time periods (although this is hardly an 'explanatory' variable and simply indicates the consistency in migration patterns between the time periods).

However, there are variations in the relationship between migration patterns and some attributes over the four time periods. The propulsiveness of low income at an origin appear to have diminished considerably in the last time period but the attraction of high incomes at a destination has strengthened. The relationship between migration and age only became significant in the last time period and the deterrence of distance appears to be decreasing over time.

Table G Kau and Sirman's nonrecursive migration results

Variable	Parameter Estimates			
	1970	1960	1950	1940
Y_i	-1.54	-3.54	-2.78	-2.24
	(6.69)	(9.33)	(8.13)	(13.87)
Y_j	1.96	1.63	0.86	1.18
	(11.64)	(12.87)	(7.01)	(15.38)
a_i	-3.09	0.11	-0.19	0.52
	(8.68)	(0.22)	(0.32)	(1.08)
e_i	7.10	5.14	8.11	10.96
	(13.45)	(17.92)	(24.67)	(30.48)
c_i	0.13	0.13	0.12	0.01
	(4.39)	(4.71)	(3.86)	(1.89)
c_j	-0.39	-0.50	-0.50	-0.51
	(15.48)	(18.54)	(16.61)	(17.06)
d_{ij}	-0.38	-0.48	-0.49	-0.72
	(12.49)	(16.18)	(14.97)	(20.72)
T_{ij}^{t-l}	0.45	0.43	0.42	0.47
	(32.74)	(34.01)	(31.74)	(30.61)

Note: Figures in brackets represent t statistics

Evaluation

The results indicate that migration determinants can vary over time significantly although the time periods used here are quite long. It is not clear from this paper how quickly relationships change over time and whether the speed of the change varies with context.

Kawabe H. and Liaw K.L. (1992) *Marriage and Migration in Japan: An Explanation by Personal Factors and Ecological Variables*. Nihon University Population Research Institute Paper Series No. 60. Japan: Nihon University.

Aims

Kawabe and Liaw (1992) investigate the role of life cycle changes in prompting migration decisions. Specifically, they examine the role of marriage in influencing departure rates and destination choice across prefectures in Japan.

Methods

Their data are taken from a national survey on the life-course migration history of household heads and spouses, conducted in 1986 as an attempt to get better insights into the migration decisions associated with major life-cycle events. Data were obtained from 11,470 individuals to calibrate a nested logit model which combined the departure decision with a destination choice model. A destination choice model was first calibrated and then information from that was transmitted to the departure choice model via the inclusive variable. The destination choice model contains variables such as:

- the partner's pre-marital residence
- distance from the origin
- contiguity
- linguistic similarity
- income level
- employment growth
- population

The departure choice model includes the following origin attributes:

- income level
- employment growth
- population density
- employment growth
- the inclusive value

Results

The results for the destination choice model are shown in Table H below for the full model and a variety of combinations of attributes. The results for the departure choice model are given in Table I.

The destination choice results indicate that migrants are more likely to choose destinations with which they have close ties, are nearby, have a high degree of linguistic similarity, have high employment growth and a large population. The departure choice results indicate that migrants are more likely to leave origins which have low employment growth, high population density, if they previously lived in a different prefecture, if they were male, and if they had high levels of education. The inclusive value is not statistically significant indicating that in this instance, departure rates do not seem to be linked with destination choice.

Table H The estimation results of the destination choice model of interprefectural migrations in Japan

Explanatory variable	Full model	Test 1 -Employment growth & interaction	Test 2 -Income level & interaction	Test 3 -Log (Population)	Test 4 -Economic & Population variables
	Coefficient (T)	Coefficient (T)	Coefficient (T)	Coefficient (T)	Coefficient (T)
1. ECOLOGICAL VARIABLES:					
Partner's location	3.03 (7.1)	2.96 (6.5)	3.01 (7.1)	3.14 (7.1)	3.21 (8.0)
Log (Distance)	-0.63 (-6.1)	-0.69 (6.3)	-0.63 (-6.1)	-0.69 (-6.6)	-1.12 (-13.0)
Contiguity	0.48 (2.7)	0.44 (2.3)	0.47 (2.6)	0.48 (2.7)	0.10 (0.7)
Linguistic similarity	0.60 (3.4)	0.53 (2.9)	0.60 (3.5)	0.54 (3.0)	-0.03 (-0.2)
Income level	0.78 (1.4)	2.07 (4.0)	—	2.81 (6.5)	—
Employment growth	0.25 (4.6)	—	0.29 (6.7)	0.25 (4.5)	—
Log (Population)	0.74 (5.3)	0.73 (4.9)	0.85 (9.4)	—	—
Inhabitable area	0.05 (2.8)	0.06 (2.8)	0.04 (2.6)	0.10 (6.5)	0.08 (5.0)
11. INTERACTIONS					
Partner's location*					
Female	3.20 (8.6)	3.21 (7.9)	3.20 (8.6)	3.17 (8.3)	3.22 (9.0)
Partner's location*					
Male with low education	0.79 (1.7)	0.76 (1.6)	0.78 (1.7)	0.77 (1.7)	0.61 (1.4)
Partner's location*					
Period: 1961-73	-0.88 (-2.6)	-0.80 (-2.2)	-0.86 (-2.6)	-0.93 (-2.6)	-0.63 (-2.0)
Partner's location*					
Period 1974-86	-0.43 (-1.2)	-0.33 (-0.8)	-0.41 (-1.1)	-0.49 (-1.3)	-0.31 (-0.9)
Income level*					
Non-native	-0.61 (-0.9)	-1.44 (-2.8)	—	-0.58 (-0.9)	—
Employment growth*					
Non-native	-0.14 (-1.7)	—	-0.20 (-3.2)	-0.14 (-1.6)	—
Log of quasi-likelihood	-2108	-2128	-2110	-2132	-2338
Contribution beyond null model: Rho-square	0.68	0.68	0.68	0.68	0.65
Contribution below full model: Decrease in Rho-square	—	0.0030	0.0003	0.0036	0.0346

Note: Total number of migrants = 1,741

Evaluation

Another example of a migration model calibrated with individual level data. This time the framework contains a departure choice and a destination choice component. It appears that there is little connection between the two for this data set. One problem in the aplication of nested logit models to migration is that the results are inclusive.

Table B The estimation results of the departure model of interprefectural migrations at marriage in Japan

Explanatory variable	Full Model	Test 1 -Employment growth	Test 2 -Income level	Test 3 - Population density	Test 4 - Sex*Partner's pre-marital location
	Coefficient (T)	Coefficient (T)	Coefficient (T)	Coefficient (T)	Coefficient (T)
1. MIGRANT/STAYER CONTRAST:					
Migrant status	0.20 (0.3)	1.73 (3.7)	-0.44 (-0.9)	-094 (-1.9)	-1.90 (-8.4)
2. ECOLOGICAL (ORIGIN) VARIABLES					
Income level	-0.82 (-1.7)	-2.29 (-6.8)	—	0.59 (2.7)	-0.99 (-1.8)
Employment growth	-0.17 (-1.5)	—	-0.21 (-7.8)	-0.23 (-7.3)	-0.21 (-5.0)
Population density	0.13 (3.3)	0.22 (6.8)	0.07 (4.0)	—	0.11 (2.4)
Inhabitable area	-0.05 (-3.6)	-0.05 (-3.6)	-0.06 (-3.8)	-0.06 (-1.1)	-0.02 (-1.4)
111. SYSTEMATIC VARIABLE:					
National employment growth	0.18 (2.5)	0.16 (2.3)	0.18 (2.4)	0.15 (2.2)	0.14 (1.8)
Inclusive variable	0.02 (0.4)	-0.01 (-0.1)	0.02 (0.3)	0.03 (0.5)	0.40 (8.3)
1V. PERSONAL FACTORS:					
Pre marital residence:					
Different prefecture	1.45 (11.6)	1.46 (11.6)	1.46 (11.6)	1.45 (11.5)	2.52 (17.6)
Sex:					
Male	-3.63 (-22.3)	-3.68 (-22.5)	-3.64 (-22.3)	-3.61 (-22.2)	-1.60 (-13.8)
Nativity:					
Non-native	0.58 (6.3)	0.52 (5.7)	0.58 (6.3)	0.61 (6.7)	0.60 (5.8)
Education level:					
Highschool graduate	0.37 (4.1)	0.35 (3.9)	0.38 (4.1)	0.38 (4.2)	0.37 (3.7)
College graduate	0.38 (2.8)	0.36 (4.5)	0.38 (2.7)	0.39 (2.8)	0.46 (3.1)
University graduate	0.59 (4.6)	0.58 (4.5)	0.60 (4.7)	0.62 (4.8)	0.52 (3.5)
Sibling status:					
Surplus sibling	0.24 (2.6)	0.23 (2.6)	0.24 (2.7)	0.24 (2.7)	0.25 (2.3)
V. INTERACTION:					
Female * Same prefecture	-3.28 (-18.0)	-3.33 (-18.5)	-3.29 (-18.1)	-3.27 (18.0)	—
Log of quasi-likekihood	-2720	-2731	-2722	-2726	-2889
Contribution beyond null model:Rho-square	0.44	0.44	0.44	0.44	0.41
Contribution below full model:					
Decrease in Rho-square	—	0.002 1	0.000 3	0.001 1	0.034 6

Note: Size of at-risk population = 11,470 persons.

Nijkamp P., Van Wissen L. and Rima A. (1993) A household life-cycle model for residential relocation behaviour. *Socio-economic Planning Sciences*, 27, 35-53.

Aims

The aim of the research was to construct a model of the demand for housing within sub-markets and to predict changes in household numbers and types together with migration between municipalities in the Amsterdam metropolitan area. The model was designed to simulate demographic changes, changes in household composition, new household formation, household dissolution, the matching of households with housing units in sub-markets, transitions between sub-markets, and municipalities.

Methods

A robust multistate accounting framework is adopted to capture all elements of the model in all time periods. The models include *occupancy* matrices which show the links between key attributes (e.g. between the population age distribution and the household distribution) and *transition* matrices which link occupancy matrices at two points in time. The accounting framework represents the dynamics of each model variable over time. These transition matrices are the most important components in the overall model.

The overall model has three major submodels.

(1) A *household life cycle model* is a period- and zone-specific household transition matrix **R**, with transitions between pairs of households types.

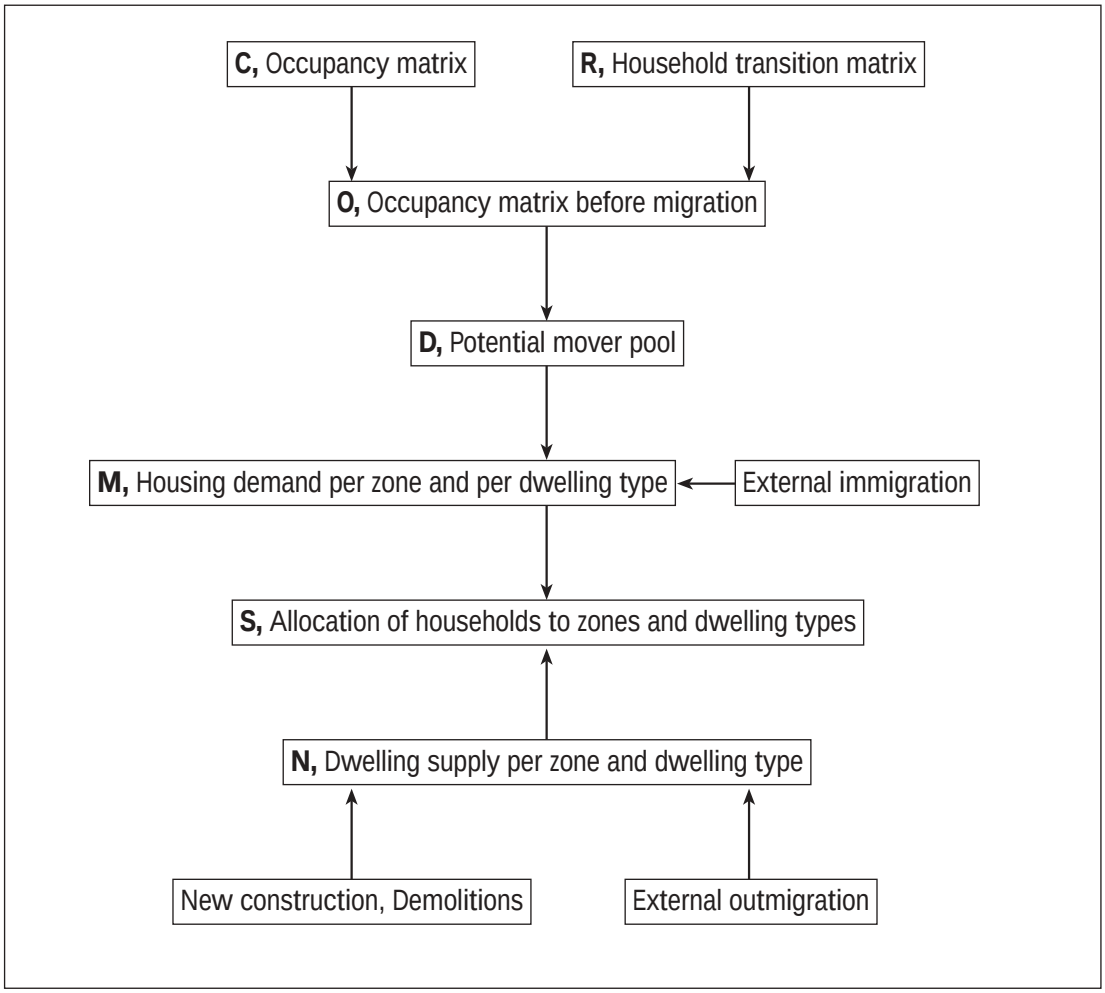
(2) A *migration model* produces a period- and household-type-specific transition matrix of potential migration between all pairs of zones and dwelling types. This is done in two steps. First, a mover pool of potential relocation is estimated, based on the household's *willingness-to-move*, indcated by a matrix **D**. Next, a potenitial relocation table, **M**, is estimated from **D** using information on the intended direction of the move and the preferred dwelling type.

(3) Finally, the actual transitions of households between zones and dwelling types in the region are modelled in the *allocation model*, which produces transition matrix **S** with the same form as **M** of observed household relocations between all pairs of zones and dwelling types in the urban area. The Figure below shows the structure of the model.

Results

The model was tested against a time series of data on populations and migration between 1971 and 1983 for Greater Amsterdam. It correctly predicts the 1982 distribution of households by size, by age of head and simulates the ups and downs of intra-Amsterdam migration with accuracy.

Figure A An accounting framework for the housing market model



Evaluation

This paper is important because it involves the analysis of the migration and transition of households within a housing market context. Most migration analyses and most migration data sources concentrate on the individual migrant.

The authors warn that design of an operational model for a variety of households, dwellings and urban zones is a substantial task. They claim, however, that the model provides for local governments detailed information on the implications of long term demographic developments and life cycle phenomena for housing markets and a means of tracking the impacts of various policy measures (e.g. supply of specific new dwelling types) on demand by various categories of household.

Pandit K. (1997) Cohort and period effects in U.S. migration: how demographic and economic cycles influence the migration schedule. ***Annals of the Association of American Geographers,*** **87, 439-450.**

Aims

This paper assesses the influence of birth cohort size and the business cycle on the level of migration in the United States using an interesting methodology. The hypothesis that the relative size of birth cohorts affects early adult behaviour had been put forward by Easterlin (1980) in the context of fertility. When birth cohorts are small relative to those that preceded them, they are likely to face favourable labour market conditions (low unemployment, high wage rates), assuming little competition from older workers or from immigrant labour. This results in higher fertility in conditions of economic security and lower fertility in times of poorer economic conditions. Pandit, following suggestions by Plane and Rogerson, investigates this argument in the context of migration but adds a more rigorous assessment of the effect of economic cycles in general.

Methods

She attempts to explain the variation in the migration rates of young people aged 17-35 in the USA over four decades (1949-1993) by measuring the association with relative cohort size and with the overall level of unemployment. Because migration rates vary by age in a well known systematic way this variable is also incorporated into the analysis through adopting an exponential of a third order polynomial of age in tens of years. Each parameter of the polynomial is made a function of relative cohort size in a first set of equations, of unemployment rate in a second set of equations and of the two combined in a third set of equations. The equations were linearized to yield the following forms:

an additive age-cohort model

$$\ln M_x = r_0 + r_1C + r_2x + r_3xC + r_4x^2 + r_5x^2C + r_6x^3 + r_7x^3C \quad (1)$$

an additive age-period model

$$\ln M_x = s_0 + s_1U + s_2x + s_3xU + s_4x^2 + s_5x^2U + s_6x^3 + s_7x^3U \quad (2)$$

additive joint age-cohort-period

$$\ln M_x = a_0 + a_1C + a_2U + b_0x + b_1xC + b_2xU + c_0x^2 + c_1x^2C + c_2x^2U + d_0x^3 + d_1x^3C + d_2x^3U \quad (3)$$

where

M_x is the interstate migration rate (migrants/population) for age group x
C is cohort size, the ratio of a population in a one-year age group to the total
U is average unemployment rate for the three years centred on a given period
$r_0 \ldots r_7$, $s_0 \ldots s_7$, $a_0 \ldots a_2$, $b_0 \ldots b_2$, $d_0 \ldots d_2$ are regression parameters.

Results

The table below gathers together Pandit's results for interstate migration.

Table J Regression results for the single and joint cohort and period models for interstate migration

Ind variable	Cohort model	Ind. variable	Period model	Ind. variable	Additive joint model	Multiplic-ative joint model
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept	-54.2*	Intercept	-41.1*	Intercept	-55.0*	-177.1*
C	19.5*	U	2.7*	C	16.9	98.2*
x	66.8*	x	50.9*	U	1.0	20.5*
xC	-23.9*	xU	-3.4*	CU	-	-12.7*
x^2	-25.9*	x^2	-19.4*	x	68.1*	220.0*
x^2C	9.3*	x^2U	1.3*	xC	-20.7	-121.7*
x^3	3.1*	x^3	2.4*	xU	-1.3	-25.7*
x^3C	-1.2*	x^3U	-0.2*	xCU	-	-15.8*
				x^2	-26.1*	-86.9*
				x^2C	8.0	48.4*
				x^2U	0.5	10.3*
				x^2CU	-	-6.3*
				x^3	3.2*	11.1*
				x^3C	-1.0	-6.2*
				x^3U	-0.1	-1.4*
				x^3CU	-	0.8*
R^2	0.86	R^2	0.86	R^2	0.89	0.89

* significant at the 0.01 level or better

The results in columns 2 and 4 show that both cohort size and unemployment have a large and significant effect, when used separately, on the migration rates by age of young adults. When cohorts are small, migration rates are raised; when cohorts are large, migration rates are depressed. Similarly, when unemployment rates are low, migration rates are high and when unemployment rates are high, migration rates are low. The column 6 results show that with an additive model, neither cohort or period (unemployment) effect is significant when no interaction terms are included. When these are included in column 7 all terms in the model become statistically significant. Pandit (1997, p.446-7) concludes:

> The results confirm the expectation that the age schedule of migration is jointly shaped by demographic and economic variables and also that the influence of demographic variables varies with economic conditions and vice versa.

Further simulation analyses led the author to conclude that generation size has a greater influence on the intensity of the migration schedule than the unemployment rate. The depressing effect of generation size on migration propensities was marked enough to counteract the impetus to migration provided by low unemployment rates.

Evaluation

These results apply to the US migration situation and have not to date been replicated for any other country. A current research project, *Migration in Australia and Britain: an age-period-cohort study*, funded by ESRC (Award R000237375, Investigators Rees, Stillwell and Boyle), seeks to investigate these relationships, not just at the national scale but also for individual regions. If the importance of generation effects is confirmed, then it provides a method for forecasting the level of inter-regional migration because national projections can provide leading indicators of the relative size of future age groups.

Pellegrini P.A. and Fotheringham A.S. (1988) Intermetropolitan migration and hierarchical destination choice: a disaggregate analysis from the US PUMS. *Environment and Planning A* forthcoming.

Aims

To demonstrate the calibration of a disaggregate migration model with individual level data taken from the US Public Use Microdata Series (the equivalent of the UK's SARs) and to examine the relevance of various destination attributes for different migrant groups.

Methods

Pellegrini and Fotheringham (1998) use the US Public Use Microdata Samples (PUMS) as a basis for their analysis of 1985-90 intermetropolitan migration. In contrast to their UK equivalent (the SAR), PUMS provide rich geographical detail on migrants (Fotheringham and Pellegrini, 1996). Pellegrini and Fotheringham calibrate a multinomial logit model of destination choice with the following destination attributes:

- population
- distance from the origin
- centrality
- employment growth
- unemployment rate
- income level
- climatic index
- cultural similarity to origin
- contiguity

The model is calibrated separately for different origins and for different cohorts of migrants.

Results

The table below gives a sample of the model calibrations for New York City as the origin. Only statistically significant parameter estimates are reported for each cohort as indicated by the t statistics. Some relationships are consistent across the different cohorts of migrants such as migration levels being inversely related to destination centrality, inversely related to distance and positively related too the climatic index but there are clearly differences in migration behaviour between the cohorts. Those with lower education levels, for instance, are much more deterred by distance than are migrants with higher education levels (a finding noted earlier); those with higher education levels are the only group of migrants attracted to cities with high incomes; the elderly are the only migrants attracted to cities with high proportions of elderly; and black migrants are the only ones attracted to cities with high proportions of black residents. Pellegrini and Fotheringham (1998) further report that there are variations in these findings across metropolitan areas.

Table K New York: various disaggregations

Explanatory Variable	65+ Coeff.	(t)	High-ed Coeff.	(t)	Low-ed Coeff.	(t)	Black Coeff.	(t)	Female Coeff.	(t)
Population	0.73	8.5	0.52	5.5	0.17	1.7	-	-	0.09	0.9
Distance	-0.50	-4.9	-0.75	-5.3	-1.66	-12.3	-1.22	-6.1	-1.27	-8.9
Competition	-1.54	-6.4	-1.26	-4.3	-3.71	-11.7	-2.27	-4.5	-2.14	-6.3
Emp. Growth	-	-	0.38	6.5	-	-	0.83	8.3	0.86	11.0
Unemp. rate	-	-	-	-	-	-	-	-	-	-
Income	-	-	1.47	2.5	-	-	-	-	-	-
Rel. Income	-	-	-	-	-	-	-	-	-	-
Climate	0.80	3.2	0.73	2.8	0.58	2.4	1.38	3.2	1.41	3.9
% young	-	-	-	-	-	-	-4.58	-8.2	-5.40	-11.4
% old [Black]	5.14	27.7	-	-	-	-	0.99	6.8	-	-
Contiguity	-	-	0.74	3.5	-	-	-	-	-	-
sample	980		3312		2121		921		2349	
ρ^2	0.253		0.120		0.083		0.198		0.162	

Evaluation

The paper demonstrates a rare use of individual level migration data for migration model calibration. The calibrations are more difficult than for an aggregate model and are only possible throught he greater spatial resolution of the US PUMS. The results provide a good comparison with the output of aggregated spatial interaction models.

Rees P. (1994) Estimating and projecting the populations of urban communities. *Environment and Planning A*, 26, 1671-1697.

Rees (1994) provides an example of how some of the determinants of migrations and how spatial interaction models in particular can be incorporated into a projection model for small area populations.

Aims

The model was designed for use by the five metropolitan districts of West Yorkshire within a software system built by GMAP Ltd. The five local authorities asked for a model which was capable of projecting the population forward year by year at single year of age detail, with means for altering assumptions and scenarios. The model had, in addition to the demographic elements, a module for determining the number of households using a standard headship rate method, a module for converting the standard ward projection outcomes into any other geography used by the local authorities, and a module for projecting the population of six ethnic groups in the same detail as the whole population.

Accompanying this basic framework were an additional set of requirements. All of the estimation procedures used in the model were to be tested and were designed to be updated by local authorities year by year during the 1990s (independent of any maintenance contract with the suppliers). A comprehensive manual describing how the software could be used and a technical manual discussing all of the methods employed had to be prepared. The model had to run on a 386 PC with standard memory and be capable of being delivered over a server network. However, the local authorities reserved the right to reject the software and associated databases if they felt dissatisfied with the results.

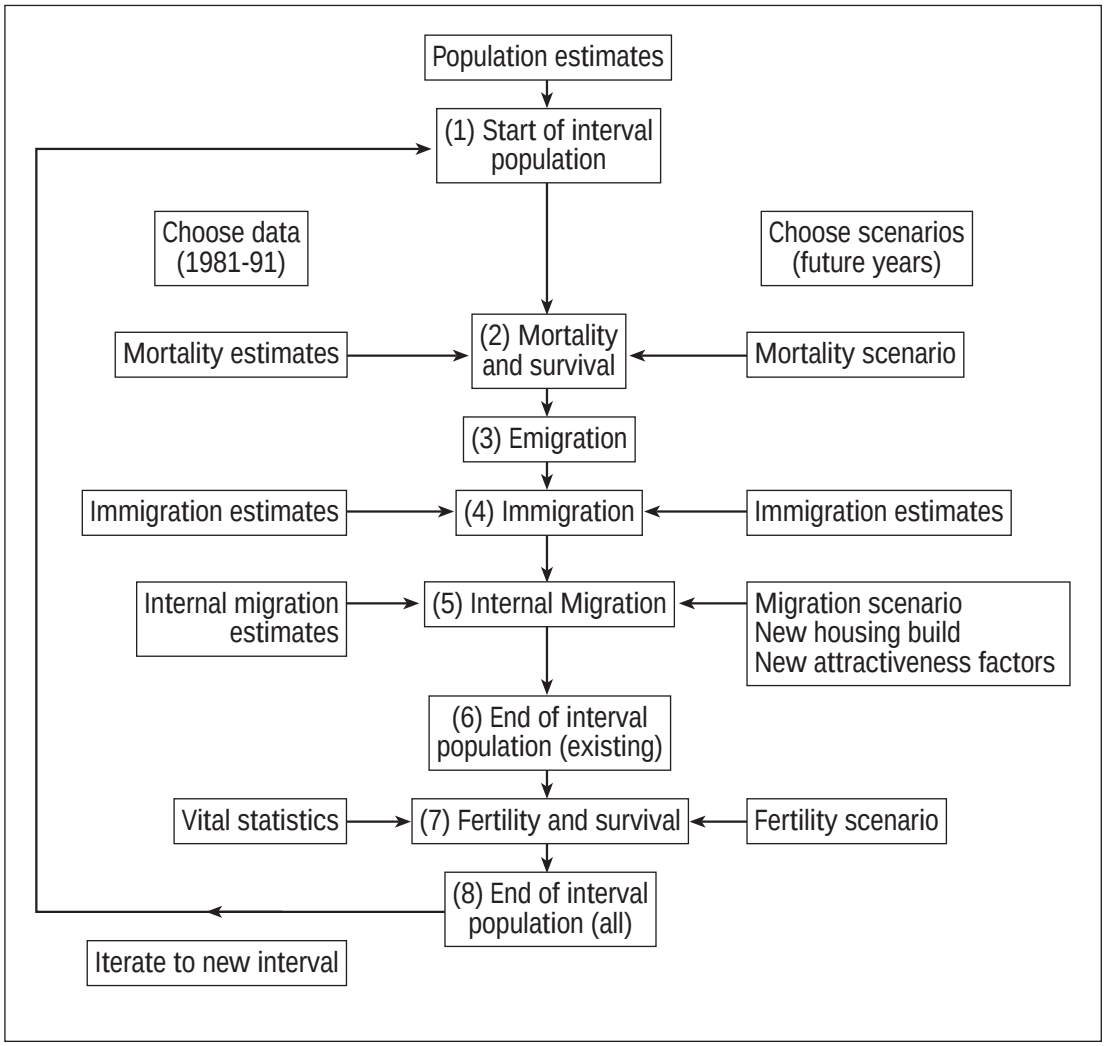
The method for estimating year by year populations was evaluated by the ESRC Estimating with Confidence project directed by Ian Diamond and Ludi Simpson (Simpson *et al.* 1997) and achieved an overall accuracy rating second only to that of special surveys attached to the electoral (annual mini-censuses), though the method did not work well for wards with a high number of students for whom inadequate migration information was available. An additional problem was that it proved very difficult to make the general population projections compatible with those for the separate ethnic groups (the two sets of projections had to be done separately because only some of the local authorities wanted ethnic projections).

Methods

The steps in the projection model are set out in the Figure below. A standard cohort-component equation underpins the calculations for each age (period-cohort) and sex group for each small area for a time interval:

end population = start population - non-survivors
- surviving emigrants + surviving immigrants
- surviving internal out-migrants + surviving internal in-migrants

Figure B The structure of the West Yorkshire small-area projection model



The steps in the projection for any time interval and each period-cohort are as follows.

(1) The start populations are input from the estimate series (usually the last but it is useful to be able to input earlier populations for model calibration purposes) in the first period and are transfers from the previous period's end population subsequently.

(2) The populations are multiplied by non-survival probabilities (input from the database or from scenario calculations) to yield numbers of non-survivors.

(3) The populations are multiplied by the emigration and survival probabilities (input from the database or from scenario calculations) to yield the numbers of surviving emigrants.

(4) The populations are multiplied by immigration ratios (input from the database or from scenario calculations) to yield the numbers of surviving immigrants.

(5) Internal migration is handled separately for inter-district and intra-district flows.

(5a) Inter-district migrant flows are projected by multiplying district populations by inter-district migration probabilities and are allocated to wards using shares derived

from the Special Migration Statistics. In effect, this is a standard multiregional migration model (see Rogers 1985).

(5b) Intra-district flows are projected as the sum of three component flows which are predicted by separate spatial interaction models. The three components are migrants who move between existing housing units (turnover migration), migrants who move into new housing units and migrants who move out of housing units which are demolished or converted and so lost from the housing stock.

(6) The surviving populations aged 1 to 91+ are computed by implementing the accounting equation given earlier.

(7) Then a births sub-model is implemented that uses age-specific fertility rates set by the user selected scenario and averages of start and end populations of women in the fertile ages. The babies born are subject to mortality, external and internal migration processes as with the older period-cohorts.

(8) Finally, before moving to the next projection interval the end populations of the current period are transferred into the start populations of the next period. Thus, surviving births become the start period-cohort one population; the surviving period-cohort populations become the start populations for period-cohort two and so on, except that the surviving populations for the age 89 and 90+ period-cohorts must be combined to give a start population for the 90+ period-cohort in the next projection interval.

Interward (intra-district) migration is projected as three streams using spatial interaction models.

(1) Turnover migration is projected using a production constrained model that uses destination (attractiveness) factors calibrated through comparing projections of ward populations from 1981 to 1991 with estimated 1991 populations based on the census.

(2) Migration to new housing is projected using an attraction constrained model that uses as destination constraints the capacity of the new dwelling units to house people.

(3) Migration as result of demolition is projected using a production constrained model similar to that used for turnover migration.

Results

The projected populations of wards are extremely sensitive to the values of the destination attractiveness factors adopted and to the number of new housing units planned for areas. This has the advantage of providing the local authorities with the capacity for exploring the consequences of particular development policies, but does mean that the projection depends on the accurate prediction of new build and of the changing attractiveness of neighbourhoods. The illustrative projections reported in Rees (1994) for Bradford show considerable contrasts between the 1981-91 change picture and a 1991-2001 projection with the same attractiveness factors but no new build. Population in the projection piles up in the inner city wards of Asian settlement in the absence of new housing to move to while the older populations of the suburbs shrink under the attrition of natural decrease.

Evaluation

This paper is important because it integrates so many of the components needed in a comprehensive model of inter-regional migration. The model includes all migration flows and handles them in different ways. A production constrained spatial interaction model is used to project migration flows between wards within districts, while a demographic model is employed to handle migration to and from other districts. The model also makes estimates of immigration from abroad and emigration to overseas countries and provides a capability of trending those estimates. The model incorporates policy variables in the form of new housing units to be built in projection periods at destinations and has heuristic attractiveness parameters which govern the migration within the existing housing stock.

The work also reveals some data deficiencies which need remedying. The out-migration rates of students from term time residence wards cannot be well estimated from current data sources. The model also uses a single spatial interaction model for all age groups, which led to difficulties since the determinants of migration vary between life course stages.

Stillwell J.C.H. (1978) Interzonal migration: some historical tests of spatial interaction models. *Environment and Planning A*, 10, 1187-1200.

Aims

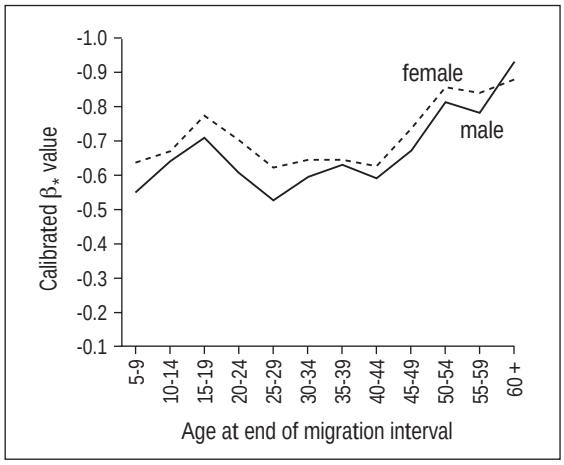
It was mentioned in the text that spatial interaction models can be calibrated separately for different cohorts of migrants. The cohort-specific parameter estimates will then indicate the varying sensitivity of migration behaviour to origin and destination attributes. The aim of this paper is to demonstrate the sensitivity of distance-decay parameter estimates in a spatial interaction model to the disaggregation of migrants by age.

Methods

Stillwell (1978) uses an 18 zone system containing metropolitan and non-metropolitan districts in the UK for which a spatial interaction model is calibrated separately for migrants in different age categories.

Results

Figure C Generalised beta values for inter-county migration flows, England and Wales, 1961-66.



From the Figure it can be seen that the deterrence of distance is lowest for migrants in their early twenties, corresponding to the time when young adults often leave home and search for employment opportunities. The deterrence of distance becomes increasingly greater with age until flattening off at retirement. Families with children in school are also deterred from migrating long distances more than the rest of the population. While it is well-known that migration propensities are likely to vary with age, these results show that the pattern of migration also varies with age with younger migrants being more likely to move longer distances than older migrants.

Evaluation

A useful paper demonstrating quite vividly how the determinants of migration paterns can vary by migrant type. The results reinforce the recommendation not to use a single model for all migrants.

Stillwell J.C.H. (1991) Spatial interaction models and the propensity to migrate over distance. In J. Stillwell and P. Congdon (eds.) *Migration Models: Macro and Micro Approaches*. London: Belhaven.

Aims: Stillwell (1991) compares the results of calibrating examples of four types of spatial interaction model (total-flow-constrained; production-constrained; attraction-constrained; and doubly constrained) with a common migration data set.

Methods: The data are 1980-81 migration flows between 10 standard regions in the UK.

Results

The table below compares the results of the four migration models. Here only the distance-decay parameter is reported along with four separate measures of Goodness-of- Fit. The distance-decay parameter becomes more negative and the accuracy of the predictions increases as constraints are added to the model. The doubly-constrained model is by far the most accurate. However, it should be noted that accuracy is based on the replication of existing flows where the row and column totals are known and not on the forecasting of unknown flows where these totals would have to be estimated.

Table L Parameters and goodness-of-fit statistics for spatial interaction models fitted to aggregate interregion flows, Great Britain, 1980-81

Model	Decay parameter (b_*)	SSD ('000)	MAD (%)	IOD	R
		Interregion flows			
		(Total flows = 611213; mean distance = 238 km)			
Unconstrained	0.63	1 778 870	32.7	16.4	0.82
Production constrained	0.71	1 509 284	30.4	15.2	0.85
Attraction constrained	0.62	835 666	23.7	11.9	0.92
Doubly constrained	0.77	378 699	18.2	9.1	0.97
		Inter + intraregion flows			
		(Total flows = 4 745 025; mean distance = 48 km)			
Doubly constrained	1.57	18 504 306	15.6	7.8	0.997

Evaluation

A useful reinforcement to the results presented in Fotheringham and O'Kelly (1989) because any empirical comparison of models is data dependent. The findings on comparative performance found in one data set might not be replicable in others. Generally, though very similar results are found in the calibration of the four spatial interaction models with a common data set. The only discrepency usually is the relative performances of the production-constrained and the attraction-constrained models which is data dependent.

Stillwell J.C.H. (1991) Spatial interaction models and the propensity to migrate over distance. In J. Stillwell and P. Congdon (eds.) *Migration Models: Macro and Micro Approaches*. London: Belhaven.

Aims

To compare the abilty of several different extrapolation methods to replicate a known flow matrix.

Methods

Stillwell (1991) usefully compares the performance of seven different extrapolation methods for forecasting 85-85 migration data from observed NHSCR data on movements between the metropolitan and non-metropolitan regions of Britain in 1980-81 and 1984-85. The seven methods are:

i. Initial Populations: The migration flows in time t are multiplied by the rate of population increase in the system.

$$M_{ij}^{t+1} = M_{ij}^{t} (Pop^{t+1} / Pop^{t})$$

ii. Total moves: The migration flows in time t are multiplied by the rate of increase in the overall migration volume.

$$M_{ij}^{t+1} = M_{ij}^{t} (M^{t+1} / M^{t})$$

iii. Total out-migration and in-migration: Migration flows are predicted based on projected total outflows and total inflows according to:

$$M_{ij}^{t+1} = (O_i^{t+1} / O_i^{t}) . (D_j^{t+1} / D_j^{t}) . M_{ij}^{t}$$

iv. Total out-migration: This uses a production-constrained spatial interaction model with a projected total out-migration from each origin.

$$M_{ij}^{t+1} = O_i^{t+1} . (A_j d_{ij}^{\beta} / \Sigma_j A_j d_{ij}^{\beta})$$

where A_j denotes the attractiveness of a destination.

v. Total in-migration: This uses an attraction-constrained spatial interaction model with a projected total in-migration into each destination.

$$M_{ij}^{t+1} = D_j^{t+1} . (P_i d_{ij}^{\beta} / \Sigma_i P_i d_{ij}^{\beta})$$

where P_i denotes the propulsiveness of an origin.

vi. Total out-migration and total in-migration with global distance-decay: This method employs a doubly constrained spatial interaction model with projected total outflows and total inflows.

$$M_{ij}^{t+1} = A_i O_i^{t+1} B_j D_j^{t+1} d_{ij}^{\beta}$$

vii. As above with origin-specific distance-decay:

$$M_{ij}^{t+1} = A_i O_i^{t+1} B_j D_j^{t+1} d_{ij}^{\beta(i)}$$

The performance of the seven methods is compared using two goodness-of-fit statistics: a Mean Absolute Deviation which has a value of 0 when the flows are predicted perfectly; and an R^2 which takes a value of 1 when the predictions are perfect.

Results

The results are shown below.

Table M Goodness-of-fit statistics for selected migration projection models

Information available for projection period (1985-86)	Type of model		Fit statistic MAD	R^2
	Movement rates model			
Initial populations	based on	(a) 1980-81	10.11	0.992
		(b) 1984-85	7.66	0.994
	Conditional probability model			
Total moves	based on	(a) 1980-81	8.59	0.994
		(b) 1984-85	7.44	0.994
	Constrained growth factor model			
Total outmigration and inmigration	based on	(a) 1980-81	5.14	0.998
		(b) 1984-85	2.65	0.999
	Production constrained SIM			
Total outmigration	based on	(a) 1980-81	34.23	0.842
		(b) 1984-85	34.23	0.842
	Attraction constrained SIM			
Total inmigration	based on	(a) 1980-81	29.58	0.925
		(b) 1984-85	29.63	0.925
	Doubly constrained SIM (with b.)			
Total outmigration and inmigration	based on	(a) 1980-81	28.06	0.930
		(b) 1984-85	27.93	0.931
	Doubly constrained SIM (with b.)			
Total outmigration and inmigration	based on	(a) 1980-81	20.28	0.960
		(b) 1984-85	20.33	0.961

Several point are worth noting from these results:

1. As would be expected, the projections are generally more accurate with the more recent flow matrix although the differences are not great.

2. The simple projections (i) to (iii) appear to forecast migration flows more accurately than any of the spatial interaction models (iv) to (vii) although their relative performances when the forecast year's macro totals are unknown is not clear.

3. Of the four spatial interaction models, the doubly constrained model with origin-specific distance-decay parameters appears to be the most accurate in forecasting migration flows. Again, though, it is not clear whether this advantage holds when the row and column totals have to be forecast because the doubly constrained model needs forecasts of both the row and column totals whereas the singly constrained models only need forecasts of one of these totals.

Evaluation

A useful and much-needed comparison of different extrapolation methods. Further comparisons are needed like this to see if the results hold up with different data sets.

Thomas A. (1993) The influence of wages and house prices on British interregional migration decisions. *Applied Economics*, 25, 1261-68.

Aims

This paper is concerned with the paradox that there has been a relatively consistent net outflow of people from areas of high job creation and wages in the UK. It is concerned with those variables that influence the choice of destination region for migrants in the UK which a particular interest in the role of the housing market, pointing out that many studies have assumed that all movement is for employment reasons, ignoring residentially motivated mobility.

Methods

The study used Labour Force Survey microdata which distinguishes between job and non-job movers. Others, such as Hughes and McCormick (1989) used these data, but failed to distinguish between types of movers and consequently found that high real wages raise the desirability of a location, while distance lowers it. No effect of house prices was identified in their study.

Results

This study demonstrates that both job and non-job movers were more likely to move into places with higher wages. However, the choice of destination is only significantly influenced by the housing market for non-job movers and not job movers. Moreover, regional house price differences appear to be important for retirees, but not homemakers.

Evaluation

This study is therefore important as it demonstrates the importance of distinguishing between different categories of people when considering the relationship between migration, housing and wages. However, it can be criticised in a number of ways. First, as with many economic studies, it focuses on regional flows and this scale of analysis masks complex patterns at smaller scales. Second, it only distinguishes between job and non-job movers. It makes no attempt to control for other socio-demographic factors, such as ethnicity, age and social class.

Van der Gaag N., Van Imhoff . and Van Wissen L. (1997a) *Internal migration in the countries of the European Union*. EUROSTAT Working Paper E4/1997-5, The Statistical Office of the European Communities, Luxembourg;

Van Imhoff E., Van der Gaag N., Van Wissen L. and Rees P.(1997) The selection of internal migration models for European regions. *International Journal of Population Geography*, 3, 137-159.

Aims

The Directorate General XVI of the European Commission regularly commissions, in collaboration with the Statistical Office of the European Communities (EUROSTAT) projections of the population of second tier (NUTS 2) regions of the European regions. The purpose of these projections is to provide consistent projections using a uniform methodology and the same set of assumptions for all member states. Simply putting together the existing sub-national projections of member states would not achieve consistent and reliable projections. Projections rounds have been carried out in 1985, 1990, 1993 and 1996 by a variety of Dutch institutions. The latest round of projections were implemented by Statistics Netherlands and the Netherlands Interdisciplinary Demographic Institute. Shaw *et al.* (1997) discuss the latest EUROSTAT projections of EU member state populations; Van Imhoff *et al.* (1997) discuss the key migration modelling issues and propose solutions; Van der Gaag *et al.* (1997a) provide a full account of the regional projection methodology and results for the 1996 round.

Methods

These projections require forecasts of (1) net external migration flows into EU countries, together with the distribution of net external flows across regions within member states, and (2) gross migration flows between regions within member states. Each of these migration variables needs to be disaggregated by age and sex. In the latest round single year ages were used; in previous rounds five age groups (and therefore time intervals) had been used. An alternative classification of external flows into those external to the whole EU and those between member states suggested by University of Leeds researchers (Rees, Stillwell and Convey 1992; Rees 1996) has not been incorporated in the commissioned EU projections.

The methodological problems posed by the task of designing a projection model for a large number of regions (204 in the 1996 round) are considerable. In theory, researchers should assemble time series of inter-regional migration flows by age and sex for a sequence of years and explore trends and develop scenarios. However, the number of variables involved would be very large: with 204 origins and 204 destinations and 91 ages and 2 sexes, we are talking about 7,574,112 variables that need to be projected! A large number of inter-region flows between regions in different countries are very small or nil, so if attention is confined to inter-regional migration within member states, the number of variables reduces to about 460,000 but this is still unacceptably large. Strategies for reducing the number of variables to be forecast have been explored by NIDI researchers. Van Imhoff *et al.* (1994) reviewed current practice in regional projection across European Economic Area states and Van der Gaag *et al.* (1997b) update the review to 1996.

Three classes of migration models may be distinguished in these subnational projections focusing on the amount of information used in the model.

- The multiregional model incorporates intensities (rates or probabilities) of migration from origins to destinations. Five countries (Belgium, Germany, Italy, the Netherlands and England) use a version of this model though none use the full Rogers' specification.

- The migration pool model projects outmigration from a region using some intensity measure and the origin population and then the pool of all outmigrations is assigned to destinations using some form of distribution algorithm (normally in-migration proportions). This model is used by Denmark, Finland, Norway and Spain.

- The net migration model is the simplest form which uses net migration for each region, either as absolute numbers or as proportions of the destination population. Austria, France, Greece, Ireland, Portugal, Scotland and Wales use this form of model.

Van Imhoff *et al.* (1997) explore, using data from the Netherlands, Italy and the United Kingdom, and a variant of the general log-linear model, the ways in which the full multiregional specification of migration can be simplified both to reduce the number of variables that need to be projected and to match with the data available from EU member states.

Results

The migration array which needs to be predicted has the following dimensions: origin (O), destination (D), age (A), sex (S) and time (T). A saturated model would use all elements ODAST but is infeasible (too many variables which are subject to random fluctuations and the small number problem). The migration pool models used hitherto involve using just OAS and DAS elements and assuming constancy over time. The multiregional models use a variety of strategies. That for England includes OAS and DAS submodels combined with ODA_3 intensities where the ages are grouped into three: family, young adult and retired; time is incorporated in the OAS and DAS submodels but the ODA_3 intensities are assumed constant. From their analyses, Van der Gaag (1997) conclude that the Pool + OD model is the most suitable compromise for the internal migration component within the general multiregional projection mode. The basic model contains the terms SAO+SAD+OD. For projection some of these elements are themselves forecast, leading to a SAO+SAD+OD+TAS+TO+TD specification. Changes in the age-sex propensities to migrate are projected (TAS); changes in the origin propensities of out-migration (TO) and the destination propensities form in-migration (TD) are forecast. Previous EUROSTAT regional population scenarios (NEI 1994) had used a simpler model specification for internal migration, namely SA+SOD+T. This simpler model requires less data and is therefore easier to put into practice. However, it misses important ingredients: age-region interaction and the change of regional push and pull factors over time, which were incorporated in the 1996 round of EU regional projections.

Evaluation

In the latest round of EU regional projections, two migration scenarios of convergence and divergence are developed (Van der Gaag *et al.* 1997, Chapter 5). Under convergence the intensities (rates, probabilities) of regional out-migration and in-migration converge on national averages and the volume of net migration reduces and so the redistribution effected by internal migration is reduced. Conversely, under divergence the intensities diverge and net migration volumes and efficiencies increase over time, leading to more population redistribution. Alternatively, Rees, Stillwell and Convey (1992) developed scenarios for the destination in-migrations either that related to regional economic attractiveness to labour migrants (the income scenario) or that related to regional residential attractiveness to migrants (the urbanization/counterurbanization scenario). There is considerable scope for extending the analysis of interregional migration flows over time.

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