Rethinking ethnic segregation dynamically

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Abstract

There is renewed debate about the measurement and meaning of ethnic residential segregation across Europe, partly resulting from the period of 'new migration' and 'superdiversity' and party due to changing socio-political contexts. Politically, there are assumptions that ethnic clustering is undesirable and is the result of retreat of ethnic groups from each other. This paper builds on an emerging strand of literature that calls for a shift in emphasis from measures of segregation based on ethnic composition to processes of population change. A census-based time series of population for Great Britain is used to explore local population dynamics for ethnic groups, showing how the ethnic mosaic can be explained by benign natural change and ethnically undifferentiated migration experiences. This dynamic approach is then used to critique conceptualisations of residential segregation. Methodologically, the paper demonstrates the possibility and potential of decomposing population change into net migration and natural change by ethnic group, age and sex for small areas. Conceptually it challenges established thinking about the meaning of spatial segregation.

Introduction: race, migration and segregation

The changing ethnic make-up of Britain's population has become an issue of social and political concern. The concern is twofold: first, the faster growth of minority ethnic populations; second, the concentration, and particularly the segregation, of those populations. In particular, a popular assumption has emerged that minority ethnic populations are self-segregating into particular areas, with accompanying 'white-flight' from these areas. This paper argues that patterns of minority and white migration need to be understood in relation to other components of population change, births and deaths. The significance of natural change – a relatively benign process – for the growth of minority ethnic populations is demonstrated at national and local levels, raising a challenge to interpretations of divisive clustering.

There is a long history of concern in Britain about immigration, ethnicity and diversity, characterized in the twentieth century by the challenge of the imperial legacy (Gilroy 1987). In the 1960s and 70s race was the pivot of political debate, and the extreme right wing gained prominence, not least in the formation of the National Front in 1966 and the 1968 anti-immigration speeches of Enoch Powell (Layton-Henry 1984; Anwar 1986). These issues remained prominent on the political agenda of the Conservative governments through the 1980s and 90s, during which time 'race riots' affected a number of British cities (Spencer 1997). The recent origins of concerns about ethnic group population change can be located in 2001, a year that was something of a watershed in debates on race in Britain and elsewhere in the Europe and North America (Kundnani 2001; Vertovec 2007). The urban disturbances in English towns in the summer of that year and the terrorist attacks on US cities in September changed the national and international terrain for thinking about integration, segregation, migration and multiculturalism. In Britain, a swing was observed from an era of concern about discrimination and racism, which culminated in the identification of institutional racism in the Metropolitan Police during the enquiry into the murder of Stephen Lawrence (MacPherson 1999), to an era of concern about extremism and separateness.

The independent review of the disturbances in Oldham, Bradford and Burnley concluded that communities living 'parallel lives' was at the heart of the issue (Cantle 2001). Segregation was identified as the problem and policies of multiculturalism were seen as contributing to a state of separation between ethnic and religious communities (Modood 2007; Kundnani 2007). The message was reinforced by prominent actors, not least the then Chair of the Commission for

Racial Equality, Trevor Phillips, who gave a speech in 2005 claiming that Britain was 'sleepwalking to segregation' (Phillips 2005). Anxiety about segregation has been fueled by allegations of 'pulling apart' by different ethnic groups, a combination of self-segregation by minority ethnic groups and 'white flight' of the white majority from areas of large minority ethnic populations.

Similar concerns about segregation are evident elsewhere in Europe, Australasia and North America and there are numerous studies that have measured segregation and attempted to understand its meaning and consequences (e.g. Musterd and de Vos 2007; Johnston, Poulsen and Forrest 2004, 2005a). There have been some attempts at international comparison (Peach 1996a, forthcoming; Musterd 2005).

Findings about segregation are conditional on the conceptualization and measure of segregation that is employed. Indices that measure segregation of human populations have been developed from a variety of disciplines including sociology, economics and biology (White 1986). In race research, work by Douglas Massey and Nancy Denton in the 1980s was influential in setting the research agenda. Massey and Denton (1988) identified 5 conceptual dimensions of segregation/integration: evenness, exposure, concentration, centralization and clustering.

Current research still refers to these dimensions and they remain conceptually useful in developing measures of patterns of residence by ethnic group (e.g. Johnston, Poulsen and Forrest 2005a; Simpson 2007; Brown 2006). However, in recent years there has been renewed debate about how to conceptualise and measure spatial segregation, together with mixed findings about trends in segregation. For example, although African American segregation in the US was seen to decrease between 1980 and 2000 whilst Asian and Hispanic segregation increased (Johnston, Poulsen and Forrest 2004) this is only the case when the exposure dimension of segregation is measured using the isolation index; other measures show no change or decrease in segregation (Iceland, Weinberg and Steinmetz 2002). In the UK, some have argued that ethnic residential segregation is increasing (Johnston, Poulsen and Forrest 2005b) whilst others have found decrease (Peach forthcoming, Simpson 2005).

One consequence of this renewed debate about segregation has been a call for the emphasis to be shifted from measures based on ethnic composition, to an understanding of the processes of population change that are creating the ethnic mosaic (Simpson 2007). Little previous work has

examined internal migration by ethnic group in Britain, though some studies, notably by Champion (1996), made use of the arrival of an ethnic group question in the census to demonstrate the differing migration experiences of ethnic groups. Recently, in both the USA and Britain, work focusing on migration patterns of immigrant origin populations has begun to challenge established theories about residential dispersion indicating social integration (Ellis and Goodwin-White 2006) and demonstrated increased residential mixing and dispersal from concentrations as a result of migration (Simpson, Gavalas and Finney forthcoming). Indeed, counterurbanisation is evident for all ethnic groups and when socio-economic and demographic factors are taken into account, there are few differences in how likely different ethnic groups are to migrate (Finney and Simpson forthcoming).

This paper builds on this emerging body of work that is concerned with processes of ethnic group population change. It contends that a demographic approach can contribute much to debates about integration, segregation and cohesion and that, in addition to migration, we should aim to understand how natural change is affecting the distribution, and segregation, of ethnic groups. Demographic theories are at the heart of understanding structural changes to populations, but relatively underdeveloped for understanding ethnic group geographies.

Ethnicity is an important factor in understanding population change in Britain because of the demographic differences between ethnic groups (Coleman and Salt, 1996; Haskey 2002; Office for National Statistics, 2006a). As international migrants are predominantly young we can expect each ethnic group to have an age structure dependent on the periods in which it migrated. Both natural change and migration are closely associated with life stage, migration and fertility being most common among young adults and mortality among older adults. Thus different rates of population change can be expected for different immigrant-origin groups. In this paper such demographic patterns and explanations are explored as a way of understanding Britain's ethnic mosaic. The paper first explains the derivation of a new set of migration estimates for Britain for the period 1991-2001, before using it to describe the population dynamics of ethnic groups both nationally and locally. The insights gained by separating the impacts of migration and natural change are then applied to the measurement of segregation.

Method for estimating components of population change

This research has used well established demographic techniques for estimating migration (Voss *et al.* 2004, Rowland 2002, Edmonston and Michalowski 2004). These have been developed for application to ethnic groups, small areas and the data available in the UK. The resultant dataset is particularly original in its estimation of migration over a decade with emigration included. Such information is not available directly from the UK censuses. The method has the disadvantage that it can only provide statistics of net migration; details of inflows, outflows, origins and destinations are lacking. However, the method has the advantage of being applicable at all geographical scales and points in time. This section provides a brief overview of the estimation procedures; for full technical details see Simpson, Finney and Lomax (2007).

The method used for estimating the components of population change relies on the demographic balancing equation (Box 1). Migration is that part of population change which is not due to births or deaths, which together constitute natural change. When the start and end populations are known, as they are from censuses and other population estimates in the UK, population change is easily obtained. The challenge to estimate migration during the period is reduced to measuring natural change and deducting it from population change.

BOX 1 ABOUT HERE.

There are two broad approaches for measuring natural change. The first is the vital statistics approach that uses known births and deaths. However, vital statistics are not available for ethnic groups in Britain so it is not possible to apply this method as in some other countries (e.g. in the USA, Voss *et al.* 2004). The second approach is the survival method. This involves estimating the number of people (in each age-sex-ethnic sub-group) who survived over the defined period (1991 to 2001 in this case) to estimate deaths, and applying fertility rates to estimate births. Survival can be estimated using survival ratios from life tables and can be calculated from the starting population (forward survival) or the end point population (reverse survival).

An adaptation of the survival approach was used in this research, and applied to each ethnic group in each of the 408 local authority districts of Britain, which on average have a total population of 130,000. The estimation involved five stages that take into account ethnic group and local variations. First, the number of births into each age cohort that will be aged between 0

and 9 at 2001 were estimated using child-woman ratios in 1991 and the number of children in 2001. Second, these births estimates were scaled so that when summed across ethnic groups they are consistent with official vital statistics data by district, age and sex for the relevant year. Third, an initial estimation of the number of deaths was made using an average of the forward and reverse survival methods. Fourth, these deaths estimates were scaled so that when summed across ethnic groups they are consistent with total deaths from official vital statistics for each district for the period 1991-2001. Fifth, final estimates of migration were generated with calculations based on the demographic balancing equation.

The success of this method depends partly upon the quality of the measure of population change. An accurate and reliable time series of population estimates is an essential starting point for robust decomposition of population change. The research presented here used estimates produced by Sabater (see Sabater and Simpson, this issue), which give populations for districts of England, Wales and Scotland by sex, single year of age and ethnic group for 1991 and 2001. Each estimate is based on census data but takes into account the problems of non-response, alteration to the enumeration of students, timing adjustment between census day and mid-year, boundary changes, and changes to the ethnic group census categories.

Sabater provides population estimates for ten ethnic groups for 1991 and sixteen for 2001. For the purposes of comparison over time the data for each of the two time points have been aggregated to eight ethnic groups: White, Caribbean, African, Indian, Pakistani, Bangladeshi, Chinese and Other, with the 2001 Mixed groups being included in the residual Other category. There are a number of issues about the comparability of ethnic group categories over time but it has been found that the first seven of these groups were the most coherent and stable classification from 1991 to 2001 (Office for National Statistics 2006b; Simpson and Akinwale 2007). The residual eighth category is used for completeness but is very diverse and of different composition in the two years.

The validity of using the eight group classification is supported by comparison with population change due to net migration and natural change calculated using an alternative construction of ethnic group categories (Table 1). This alternative uses a matrix of the proportion of people who selected each ethnic group in 1991 and 2001, developed by Simpson and Akinwale (2007) from the Longitudinal Study. The matrix shows, for example, that 0.6 per cent of those recorded as Caribbean in 1991 were recorded as African in 2001, and 2.4 per cent of

1991 Africans moved to Caribbean in 2001. Discounting the residual Other category, comparison of the estimates for the country as a whole suggests that the eight group classification is reliable but that we should bear in mind potential underestimation of natural change and overestimation of net out-migration for the Caribbean group; overestimation of net in-migration for the African group; and under-estimation of net migration for the Indian group. The alternative classification is not used in this paper because its application is complex in comparison to the method chosen and the matrix of transitions between groups from 1991 to 2001 is unlikely to apply equally to each district of Britain and each age.

Ethnic Group Population Dynamics

The following two sections explore the estimates of natural change and net migration for ethnic groups 1991-2001 for districts in Britain. The first section explores the national picture, examining the roles that natural change and net migration play for each ethnic group. The contributions of each component and the relationships between them are explored. This section also presents net migration by age nationally, demonstrating the differing international migration-age profiles for different ethnic groups. The second section asks whether the national patterns are consistent at a local (district) scale. Population dynamics are analysed for types of districts, and a case study of net migration and natural change for ethnic groups in Bradford and its surrounding districts is presented.

A national view of components of change for ethnic groups

Quite different dynamics of population change are revealed for the eight ethnic groups (table 1 and figure 1). The population of all groups increased over the decade (by 2.8% overall), though at differing rates. The African population grew at the fastest rate (93% increase on 1991 population) followed by Bangladeshi (62%) and Pakistani (46%). Chinese (35%) and Indian (18%) grew less; and Caribbean and White least (1.1% and 0.5% respectively).

TABLE 1 ABOUT HERE.

FIGURE 1 ABOUT HERE.

The net migration figures in table 1 and figure 1 show the balance of *international* migration for each ethnic group over the decade 1991-2001 because the district figures have been summed to the country level, thus giving migration once the internal movements have cancelled each other out. For all ethnic groups apart from the Caribbean group, there was population increase over the decade as a result of both positive natural change and positive net migration. The Caribbean group differed in that it lost population from Britain between 1991 and 2001 as a result of emigration.

Population change due to natural change in relation to 1991 population size varied from 0.2% for Whites – a small impact on the population – to 41% for the Bangladeshi group i.e. there was a 41% growth in the Bangladeshi population over the decade due to an excess of births over deaths. Population growth of around one third due to natural change was seen for African and Pakistani groups; and one tenth for Chinese, Indian and Caribbean (figure 1). Natural change, therefore, played a very significant role in population growth nationally for minority ethnic groups.

Population change due to net migration in relation to 1991 population size varied from 0.3% for Whites (marginally higher than the impact of natural change) to 60% for African. Pakistani, Bangladeshi, Chinese and Other had population growth due to migration of 16-29%. The figure is much smaller for the Indian group (5%). The Caribbean group lost 9% of its 1991 population as a result of migration and was the only group to experience net emigration.

If the impact of natural change and net migration are compared, migration had a greater impact on population increase over the decade for the Chinese, African and White groups; for all other groups - Caribbean, Indian, Pakistani, Bangladeshi and Other - and the population as a whole, natural change had the greatest impact.

The ethnic group differences can be interpreted in terms of recency and type of immigration and demographic structure of the groups (table 2). The African group is yet to reach the peak of immigration to Britain during the modern era of migration and its population has therefore been greatly influenced by international migration (Salt 2006). The young age structure of the African population, whose migration to Britain has been predominantly for work or refuge, results also in a high rate of natural increase. In comparison, the Chinese group has a much older age structure thus a smaller proportion of the population in reproductive ages. Also, although the immigration

rate was high, this is largely accounted for by student migrants who are less likely to start families.

The stability of the White population is clear: there was little population growth and the population age structure is mature. In the South Asian groups, natural change was greatest for Bangladeshi then Pakistani and then Indian as expected by the younger age structures of the first two groups which is a result of their more recent arrival in Britain. The higher levels of immigration for Bangladeshi and Pakistani groups than Indian can also be interpreted as a result of their more recent arrival and the greater significance therefore of immigration for family reunification (Salt 2006).

The Caribbean group is the exception with slight overall growth due to natural change. Natural change was lowest second only to Whites, as would be expected from the relative timing of the major immigration of this group. The emigration, which persists when transitions between ethnic groups are considered in the alternative estimates of table 1, is likely to be a reflection of return retirement migration to the Caribbean.

TABLE 2 ABOUT HERE.

These interpretations are corroborated by figure 2 which shows net international migration over the decade for ethnic groups by age. In particular, the immigration of young Africans and Chinese is striking. Immigration of ages 10-50 (in 2001) of the South Asian groups is also notable. The Caribbean group showed immigration only at ages 20-30 and at ages 50-60. There was emigration both of working ages 30-50 and retirement ages 60+.

FIGURE 2 ABOUT HERE.

The scatter plots in figure 3 reveal that the overall relationship between natural change and net migration at district level is quite different for each ethnic group. Note here that the scale of the first graph for the White group is different from the scale on the other charts; and that net migration includes both international and internal migration. Very high percentage values are the result of small 1991 populations (though districts with 1991 population less than 50 have been excluded from the graphs).

For the White group the pattern is that districts with high net in-migration have low natural change, and districts with low net migration have high natural change. In other words, districts are growing predominantly as a result of either natural change or net migration. For the White population this pattern fits with a life-stage migration theory: the productive-age population moves to urban areas where they have children then migrate out to less urban areas where they die.

For all the minority ethnic groups the relationship between net migration and natural change is in the opposite direction; high migration is associated with high natural change. The strength of this correlation varies considerably between the ethnic groups. For the Pakistani, Caribbean and Indian groups only 2%, 4% and 9% of the variation in net migration for districts respectively is accounted for by natural change. For the Other, Chinese and Bangladeshi groups, 13%, 15% and 16% of net migration variation is explained by natural change. The strongest relationship between these two components of population change is for the African group, where 48% of the variance in net migration is accounted for by natural change.

Interpretation of these relationships is complicated because it is not possible to identify the growth due to migration that results from internal migration and that which results from immigration. For the recent immigrant groups in particular (African and Other), it may be immigration followed by family building that is responsible for the recent population growth.

FIGURE 3 ABOUT HERE.

Natural change and net migration locally

The previous section has demonstrated the significance of natural change for minority ethnic groups at a national level and shown differing relationships between natural change and net migration, putting forward explanations based on the age structure of migrants and the population, and the known timings and motivations for migration. Figure 3 has already revealed differences between districts; the paper now explores the local situation in more detail, to ask to what extent the national picture is evident at a local scale.

The local dynamics of natural change and net migration are explored in two ways in this section. First, natural change and net migration for types of district are examined, to assess

whether population dynamics can be explained by the urban-ness or the ethnic composition of an area. Second, a case study of Bradford and its bordering districts is presented to explore how the broader patterns play out for one particular locality.

Population Dynamics for Types of Districts

Maps of net migration and natural change for districts of Britain and ethnic groups (not shown here) reveal complex geographies of population dynamics. This section draws on theories about the geographies of population change with an ethnic group dimension to lend some explanation to the complex picture. Districts have been grouped in three ways and the results are presented in table 3.

TABLE 3 ABOUT HERE.

Urban-ness and Rural-ness of Districts

First, districts are categorised according to their urban-ness and rural-ness. For the population as a whole we expect migration patterns to demonstrate counterurbanisation (Champion 1989) and natural growth to be greatest in urban areas. Is this evident for all ethnic groups? The district classification used here was initially devised by OPCS (1989) and has been used in many studies of internal migration (e.g. Champion 2005).

It is clear from table 3 that the pattern of natural change across the spectrum of urban to rural areas was quite different for the White group compared to the other ethnic groups. Natural change resulted in little population change for Whites in either urban or rural areas. Greatest natural change was in mixed urban and rural areas and there was slight population growth due to natural increase in London, both inner and outer. The single district with greatest natural growth for Whites over the decade was the new town of Milton Keynes (7.2% natural increase as a % of 1991 population). Overall there was slight natural decline of the White population in other urban and rural areas. The white population was the only group that experienced natural decrease in any of the area categories.

For all the minority ethnic groups London (inner and outer together) exhibited greatest natural growth, and for all groups except Bangladeshi natural growth was greater in outer London than inner London. Other metropolitan cities also had large growth for minority ethnic groups,

especially for the Pakistani and Bangladeshi groups, which is expected due to the distribution of their productive-age population in cities outside the capital. However, other urban areas, mixed urban and rural area and rural areas had higher natural growth than cities for all minority ethnic groups. In general, the pattern was one of increasing natural growth with increasing rurality outside London.

Migration patterns for districts classified according to urban-ness reveal general patterns of greatest net movement to outer London; and counterurbanisation outside London. The White group experienced a cascade of counterurbanisation over the decade with movement out of London and Metropolitan cities and into smaller cities, mixed urban and rural areas and rural areas. The Caribbean and African groups are the exception to these patterns. Caribbean population grew through migration in only outer London and rural areas. We know that the out-migration from other district types was in part due to emigration. The African group exhibits urbanisation, with the largest growth due to migration for each category of districts, and particularly so for outer London and other urban areas. The urban-ness of the migration of the Africans is characteristic of immigration.

Ethnic composition of Districts

The second method for categorising districts is based on minority ethnic population composition. If 'white flight' and 'self-segregation' are occurring this will be evident in white out-migration from the areas of greatest minority ethnic population and in-migration of minority ethnic groups to the same areas. Natural change is expected to reflect population distribution and so to be higher for all groups in the most concentrated areas which generally represent urban areas that have younger age structures than more rural districts. The districts have been divided into five groups, quintiles, which each contain one fifth of the minority ethnic population of Britain. The first quintile contains this population in districts where the minority ethnic population is least concentrated, where it makes up the smallest proportions of the population. The fifth quintile contains the same population but from the districts where minority ethnic population is most concentrated. Consequently, the fifth quintile contains far fewer districts than the first.

Given that minority ethnic populations are unevenly distributed and predominantly urban, we would expect the patterns for population change in relation to districts classed by minority ethnic

composition to confirm the patterns of counterurbanisation. This is indeed the case: for most groups there was a general pattern of net migration being greater in less concentrated areas than in areas of high minority ethnic concentration. The exception is the growth of Pakistani and Bangladeshi populations in the highest minority ethnic quintile being greater than the growth due to migration in any other quintile, and accounting for a population increase of a fifth to a third on the 1991 population. It is important to flag here that the migration figures include international migration as well as internal migration and this pattern may well be indicative of continued chain immigration for the Pakistani and Bangladeshi groups to areas of traditional settlement. The African group again shows high levels of net in-migration, including in areas of high minority-ethnic concentration reflecting the urban-ness of recent immigration.

The impact of natural growth increased from the lowest minority ethnic quintile to the highest quintile for all minority ethnic groups. This may be a reflection of the minority ethnic urban populations having a younger age structure than populations elsewhere. However, there was little variation in the impact of natural change across the quintiles of minority ethnic population for the Indian, Pakistani and Chinese groups. For example, there was Pakistani population growth of around 30 per cent due to births being higher than deaths in areas of all levels of concentration of minority ethnic population.

Settlement and Dispersal Districts

Are these patterns an indication of dispersal from areas of traditional settlement of immigrant origin populations? The third method of district classification explores theories that suggest the increased clustering and mixing of ethnic group populations is a result of minority ethnic population growth through immigration followed by natural change in areas of original immigrant settlement; and out-migration, or dispersal, to areas elsewhere in Britain. High natural change may also be expected in dispersal areas as families establish themselves in their new locations, but at a slower rate than in settlement areas. Settlement areas are defined as the forty districts of Britain with highest minority ethnic immigration between 1960 and 1971 or the forty districts with highest minority ethnic immigration from 1990-1991, which also had a minority ethnic population in 2001 that was greater than the minority ethnic immigration 1960-1971. This gives forty five districts that have had continued high minority ethnic immigration and have retained a large minority ethnic population. Dispersal districts, of which there are 144, are

defined as those that are not settlement areas that had minority ethnic in-migration between 2000 and 2001 greater than or equal to twenty, as measured by the Census. Districts that meet neither the settlement nor dispersal criteria are classed as Other.

Table 3 shows that population growth due to migration was greater in dispersal areas than in settlement areas for all ethnic groups, even when this migration included immigration which may be assumed to be predominantly to settlement areas. Natural growth was clearly higher in settlement areas than elsewhere for the African population and to a lesser extent for the Caribbean and Bangladeshi populations. Indian and Pakistani natural growth did not differ between settlement and dispersal areas; and for the Chinese group, natural growth was greatest in dispersal areas. It can also be seen that settlement areas were growing more through natural change than migration for the White, Caribbean, Pakistani, Indian and Bangladeshi groups. For the Pakistani and Bangladeshi groups, all types of area - settlement, dispersal and other - were growing more through natural change than through migration.

A Case Study of Bradford and Bordering Districts

The discussion of local patterns of natural change and net migration has so far demonstrated the differing geographies of population dynamics of different ethnic groups and has supported theories of counterurbanisation and dispersal from settlement areas. In this section, we examine how these processes played out for Indian and Pakistani ethnic groups in the Yorkshire district of Bradford, and the districts that border it.

Bradford has been chosen as a case study for two main reasons. First, it has been the focus of political concerns since 2001 when urban disturbances in the city were put down to tensions between ethnic groups and interpreted as a result of increasing separation of groups residentially and otherwise (Cantle 2001). Second, Bradford has a high minority ethnic population of 22% (compared to 8.3% for Britain as a whole) making it an interesting case for investigating minority ethnic population dynamics. The case study will look at the White, Indian and Pakistani populations of Bradford and its bordering districts because these ethnic groups account for the largest proportion of the population and as such the majority of population change (table 4).

TABLE 4 ABOUT HERE.

FIGURE 4 ABOUT HERE.

Figure 4 shows Bradford and the six districts that border it: Calderdale, Kirklees, Leeds, Harrogate, Craven and Pendle. These districts are located in the north of England. In the urban-rural classification used in table 3, Bradford, Kirklees and Leeds are metropolitan city districts, Calderdale is a city district, Pendle is urban, Harrogate is a mixed urban and rural area and Craven is a rural area. In the settlement-dispersal classification Bradford, Kirklees and Leeds are settlement areas and the other four districts are neither settlement nor dispersal (and therefore classed as Other). Table 4 shows that the ethnic composition of the seven districts varies considerably, from 78% White in Bradford to 98% White in Harrogate and Craven. The case study will consider only these seven districts but of course this is not a closed system of population dynamics; each district has numerous interactions with places elsewhere.

For each district figure 4 shows natural change and net migration as a percentage of the 1991 population for the White, Pakistani and Indian populations. The importance of natural change for population growth of the minority ethnic groups in each of the districts is clear. In Bradford over the decade 1991-2001 White population was lost, mainly through migration; natural growth of the Indian population cancelled out the loss through migration; and the Pakistani population grew through migration and through natural change. A very similar pattern is seen in Leeds. Both cities show counterurbanisation of Whites, dispersal of Indian and continued clustering of Pakistani population through natural change and continued immigration.

In Calderdale, Kirklees and Pendle there is also White out-migration. Pakistani and Indian growth in these three districts derives both from births and in-migration, the latter being greater than in the most urban districts of Bradford and Leeds. It is likely that this in-migration is partly dispersal from Bradford and Leeds, and the same conclusion may be drawn from Indian population growth due to migration in Craven. The two most rural districts of Craven and Harrogate have a somewhat different dynamic. White populations gain through in-migration; migration results in Indian population growth in Carven and stability in Harrogate; but Pakistani experiences net out-migration in both districts.

The population decline for the Pakistani group due to out-migration from Harrogate and Craven is an anomalous and therefore interesting result. The first point to note is that the percentages shown in figure 4 are based on relatively small numbers: in Craven over the decade

1991-2001 there was Pakistani natural growth of 78 and net out-migration of 18 on a 1991 population of 222, resulting in overall population growth of 60; in Harrogate there was Pakistani natural change of 25 and net out-migration of 25 resulting in a stable population of 64. That these population dynamics do not fit with the general picture of in-situ natural change, dispersal and counterurbanisation raises the question of what is disrupting the general pattern in this locality. It is notable that, in contrast to the other districts in this case study, Craven and Harrogate are politically Conservative and it is possible to speculate that anti-immigrant prejudice may be a cause of the lack of in-migration, and indeed the out-migration, of Pakistani population from these areas.

Natural change and segregation

The previous two sections have illustrated the importance of natural change for minority ethnic population growth in Britain locally and nationally. This is to be expected demographically; it is internally driven and benign. In this section we return to the issue of segregation and ask what impact natural growth over the decade 1991-2001 has had on the segregation of Britain's minority ethnic populations and in doing so we question some interpretations that have been made of measures of segregation.

One of the most commonly used indices of segregation is the Index of Isolation, or P^*, which was developed by Lieberson (1980). The formula for P^* is given in Box 2. This index is used here because it is the one index of segregation that has increased in Britain in the 1991-2001 period (Simpson 2007) and because it has been used to make the case for the persistence of the problem of segregation (Johnston, Poulsen and Forrest 2005b).

BOX 2 ABOUT HERE.

The Index of Isolation (P^*) measures the exposure, or lack of exposure, of one group to another and can change independently of the evenness of the distribution of the population in ethnic terms. P^* can be interpreted as the probability that a member of an ethnic group will meet someone of their own group locally, or conversely the probability that they will not meet someone of another group. Alternatively, it can be interpreted as the average proportion of an

area's population in a certain ethnic group, in areas where that group lives. *P** takes values between 0 and 1 (or 0 and 100 if multiplied by 100 for ease of use), where 1 indicates greatest isolation (least exposure) (see Massey and Denton, 1988; Simpson, 2007).

Table 5 shows the Index of Isolation calculated for each of eight ethnic groups in 1991, 2001 and for the 2001 population as it would be without the effect of natural change over the preceding decade. The Index has been calculated using the same population estimates for the 408 districts of Britain that were used for the components of change analysis above, not using census data as published, and the results therefore differ slightly from (and are an improvement upon) previously published measures. One of the major criticisms of the Index of Isolation is that it is highly dependent on population size and Sin (2002) has demonstrated the need for interpretation of the index to be contextualised. Table 5 therefore also provides the proportion of the population of each ethnic group in Britain in 2001. If a group comprises 90% of the population and their *P** is 90, they would be evenly distributed; if they comprise 1% of the population and their *P** is 5, they are five times more isolated than they would be with an even population distribution.

Table 5 shows that for all ethnic groups apart from the White and Caribbean groups, the isolation from other groups increased from 1991 to 2001 both when natural changes is included and excluded from the population. The percent increase is particularly high for the African group that has grown most in size over the decade; and is also high for the Bangladeshi and Pakistani groups (results already noted by Simpson, 2007, using census data). However, when natural change is taken into account, *P** in 2001 decreases for all groups apart from the White group thereby reducing the increase in isolation over the decade as measured by this index. The reduction in the index when natural changed is removed is particularly marked for the Bangladeshi and Pakistani groups, the groups for whom natural change had greatest impact, and also the groups who have been central in segregation concerns in recent years.

Two points can be made from these patterns. The first is to confirm the inadequacy of *P** for drawing conclusions about trends in segregation. The index reflects changes in population size and composition, which is illustrated by the growth in *P** being reduced when natural change is removed from the calculation. For the Indian, Pakistani and Bangladeshi groups the majority of the increase in *P** over the decade is the result of natural population growth. Arguments of divisive segregation that are based on *P** should therefore be questioned. Secondly, we are led to the question of what accounts for the remaining increase in the Index of Isolation between 1991

and 2001 for minority ethnic groups. There are two possibilities: immigration to areas of large minority ethnic populations and internal migration towards these concentrations. We have seen above that the second possibility is not demonstrated by the data; there is within-Britain dispersal from settlement areas of minority ethnic concentration. This suggests that immigration, both in its geography and in its ability to increase population, accounts for a significant amount of the increase in P^* that is not due to natural change. Again, this interpretation causes problems for stories of minority groups retreating into their own areas.

TABLE 5 ABOUT HERE.

Conclusion

Ethnic geography has become contentious, based on notions of segregation as a negative phenomenon, which have in turn been challenged as unhelpful or irrelevant. What is lacking in these debates is a thorough understanding of how and why the population is changing. This paper has put forward a demographic perspective, arguing that much can be learnt about the geographies of ethnicity by examining ethnic group demographics. A focus on processes of population change – on migration and natural change – challenges the emphasis on segregation as problematic and reveals the dynamics of in-situ natural growth and dispersal that have created Britain's ethnic mosaic.

Using new estimates of net migration and natural change the different dynamics of population change for ethnic groups in Britain have been demonstrated. Nationally, the importance of natural growth as the dominant component of population growth for the Pakistani, Bangladeshi, Indian and Caribbean populations has been clearly evidenced. For Bangladeshis, for example, there was population growth in Britain of 41% due to natural change between 1991 and 2001 compared to growth of 21% as a result of migration. The age structure of international migration reveals the prominence of young African and Chinese immigrants, and family and retirement-age Caribbean emigrants that resulted in net emigration of that group over the decade. This paper has interpreted these patters in terms of recency of immigrant arrival, type of international immigration and demographic structure of immigrant-origin groups.

At a district level both the relationship between natural change and net migration and the geographies of these components of population change are complex. Different areas experienced net migration and natural change differently for different ethnic groups, as expected from the uneven distribution of ethnic group populations. However, if districts are classified into types, explanations emerge for the patterns. There was counterurbanisation for all ethnic groups and increasing natural growth (as a per cent of 1991 population) for minority ethnic groups with increasing rurality outside London.

In relation to where the minority ethnic population is resident there was greater growth through migration in areas with less minority ethnic concentration than in concentrated areas, with the exception of the Pakistani and Bangladeshi groups whose experience is likely to be affected by the inclusion of immigration in the net migration figures used. There was little difference in natural growth in areas of differing concentration of minority ethnic population. If considered in terms of settlement and dispersal, there was greatest growth due to migration in dispersal areas, and settlement areas grew more through natural change than migration for the Pakistani, Bangladeshi, Indian and Caribbean groups.

This paper represents an initial exploration of ethnic group population dynamics through new estimates of natural change and migration. As the Bradford case study illustrates, general processes of natural growth, dispersal and counterurbanisation are evident but a great deal more investigation is needed for a full understanding of local ethnic group population dynamics. Social policy will gain from demographic knowledge about the relationships between migration and natural change for smaller areas than those treated in this paper, because of the significance of movement within district boundaries; differentiating between the effects of international and internal migration will allow choices of residence within-country to be distinguished; analysis of flow data will further test hypotheses of dispersal and avoidance; relating demographic processes of population change to measures of socio-economic change will provide evidence about the extent to which lack of social mobility limits geographic mixing of ethnic group populations; studies of migrant decision making will reveal how discrimination and prejudice shape ethnic geographies.

This initial exploration has, however, clearly demonstrated that the growth of minority ethnic clusters is to a great extent the result of natural change, which is entirely benign and unexceptional given the demographic maturity of Britain's immigrant-origin groups; and that

there is no clear ethnic differentiation in migration experiences, which generate a picture of dispersal and urban de-concentration. Calculation of the Index of Isolation has shown how an apparent increase in segregation can be largely the result of population growth from an excess of births over deaths. This paper therefore provides a warning to those who continue to assume that clustering is the undesirable result of the pulling apart of ethnic groups.

Tables and Figures

Acknowledgements

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BOXES

Box 1: The demographic balancing equation

Population change = natural increase + net migration
= (births-deaths) + (arrivals-departures)

(arrivals-departures) = Population change – (births-deaths)

Box 2: Index of Isolation

$$P^* = \sum_i \left(N_{gi} / N_{g.}\right)\left(N_{gi} / N_{.i}\right)$$

Where N_{gi} is the number of people of group g in area i, and **.** indicates the summation over the index

TABLES

Table 1: Components of population change for ethnic groups in Britain 1991-2001

Ethnic group	Population 1991	Population 2001	Population Change 1991-2001	Births 1991 to 2001	Deaths 1991 to 2001	Natural Change 1991 to 2001	Net Migration 1991 to 2001	Natural Change 1991 to 2001 as % of 1991 population	Net Migration 1991 to 2001 as % of 1991 population	Natural Change 1991 to 2001 as % of 1991 population (alternative ethnic groups)	Net Migration 1991 to 2001 as % of 1991 population (alternative ethnic groups)
White	52,441,709	52,709,827	268,119	6,136,459	6,018,735	117,724	150,395	0.22	0.29	0.35	0.60
Caribbean	570,751	573,990	3,239	86,952	30,003	56,949	-53,710	9.98	-9.41	12.67	-5.24
African	258,746	499,790	241,044	94,024	7,775	86,249	154,795	33.33	59.82	31.32	47.96
Indian	903,024	1,068,343	165,319	162,250	39,434	122,816	42,503	13.60	4.71	14.36	12.55
Pakistani	519,115	759,540	240,425	177,798	18,151	159,647	80,778	30.75	15.56	30.22	17.40
Bangladeshi	178,195	288,673	110,478	78,712	5,679	73,033	37,444	40.99	21.01	40.26	22.70
Chinese	184,788	249,666	64,879	27,143	7,242	19,901	44,978	10.77	24.34	11.20	23.01
Other	775,035	1,274,346	499,311	302,695	26,731	275,963	223,348	35.61	28.82	25.44	-1.67
All Groups	*55,831,363*	*57,424,176*	*1,592,813*	*7,066,033*	*6,153,751*	*912,282*	*680,531*	*1.63*	*1.22*	*1.63*	*1.22*

Source: Authors' Estimates

Table 2: Ethnic group age structures and main period of arrival in Britain

Ethnic Group	% GB population aged 15-40 2001	% GB population ages 60+ 2001	Main period of arrival in Britain
White	35.0	22.0	Pre-1900
Caribbean	44.5	16.1	1955-1964
African	53.1	4.0	Since 1991
Indian	46.3	10.1	1965-1974
Pakistani	47.1	6.5	1965-1979
Bangladeshi	47.9	5.8	1980-1988
Chinese	53.8	7.6	Since 1991
Other	44.8	5.1	-

Source: Peach (1996); African and Chinese: analyses in this paper

Table 3: Net migration and natural change for area types and ethnic groups

	Natural Change 1991 to 2001 as % of 1991 population						
	White	Caribbean	African	Indian	Pakistani	Bangladeshi	Chinese
Inner London	1.0	11.9	36.4	12.0	27.4	45.7	10.0
Outer London	1.0	13.0	39.9	13.2	28.5	32.5	10.5
Metropolitan and City Districts	0.0	6.5	18.8	13.7	30.9	38.1	9.0
Other Urban	-0.1	7.7	28.0	15.4	32.7	39.3	13.0
Mixed urban and rural	1.5	8.6	23.0	13.7	32.4	38.4	13.3
Rural	-1.3	8.0	19.3	16.2	35.1	34.4	14.5
Lowest Quintile of Non-White Population	0.0	7.3	20.2	13.3	29.1	38.7	11.8
Low Quintile	0.9	6.5	26.9	14.0	31.0	38.4	10.3
Medium Quintile	0.5	9.3	32.6	13.0	30.5	39.7	8.9
High Quintile	0.2	11.8	35.6	13.6	32.3	36.3	9.9
Highest Quintile of Non-White Population	0.1	12.0	39.6	14.0	28.9	46.6	11.2
Settlement	0.2	10.6	35.5	13.6	31.0	41.6	9.6
Dispersal	0.9	8.3	28.8	13.1	30.0	38.3	11.8
Other	-0.2	5.9	18.2	13.9	31.0	40.0	11.3
	Net Migration 1991 to 2001 as % of 1991 population						
	White	Caribbean	African	Indian	Pakistani	Bangladeshi	Chinese
Inner London	-0.6	-15.0	44.3	-0.5	14.5	25.2	15.1
Outer London	-5.4	12.5	104.8	11.6	34.2	33.0	28.4
Metropolitan and City Districts	-3.2	-20.8	35.0	-3.5	10.8	15.4	19.8
Other Urban	1.7	-3.0	112.0	6.5	16.0	15.5	27.5
Mixed urban and rural	2.4	-3.3	40.2	18.7	26.1	10.4	36.3
Rural	7.0	8.4	-1.2	30.4	57.0	25.3	38.8
Lowest Quintile of Non-White Population	1.6	-7.4	30.6	15.1	16.2	14.0	24.4
Low Quintile	-1.4	-15.3	94.4	3.3	12.6	17.9	30.0
Medium Quintile	-3.2	-13.8	47.9	3.7	12.5	12.6	22.9
High Quintile	-8.0	-1.5	76.9	1.9	20.0	15.4	17.7
Highest Quintile of Non-White Population	-5.3	-11.2	60.9	3.1	20.2	33.6	21.7
Settlement	-4.2	-9.5	59.0	2.1	16.2	22.5	21.1
Dispersal	1.8	-4.0	99.1	18.6	25.9	22.6	32.3
Other	1.4	-18.3	22.3	3.3	10.9	13.5	21.2

Area Classification	1991 Population						
	White	Caribbean	African	Indian	Pakistani	Bangladeshi	Chinese
Inner London	1,877,349	199,337	129,428	79,474	31,881	76,733	32,567
Outer London	3,471,462	123,804	63,201	285,836	62,367	15,935	30,621
Metropolitan and City Districts	17,349,325	180,488	39,759	361,485	323,424	56,722	64,668
Other Urban	13,543,574	36,064	11,361	92,410	71,734	16,575	26,126
Mixed urban and rural	10,010,822	27,440	11,584	77,936	27,786	10,562	23,501
Rural	6,189,177	3,618	3,414	5,883	1,923	1,669	7,303
Lowest Quintile of Non-White Population	37,447,229	55,409	34,215	130,900	88,396	27,225	80,320
Low Quintile	8,433,909	98,577	25,232	207,425	163,471	31,808	36,143
Medium Quintile	3,171,954	116,954	65,006	168,676	102,310	31,981	31,597
High Quintile	2,242,472	156,048	47,443	228,611	127,497	29,469	17,140
Highest Quintile of Non-White Population	1,146,144	143,764	86,851	167,413	37,441	57,712	19,588
Settlement	9,882,199	461,584	209,750	665,529	343,911	129,970	82,439
Dispersal	16,670,731	65,341	25,983	124,907	50,905	18,942	46,725
Other	20,876,089	42,696	19,603	101,391	100,156	28,000	44,021

Source: Authors' Estimates

Table 4: Ethnic composition of Bradford and surrounding districts, 2001 (per cent of district population)

District	White	Pakistani	Indian	Other Ethnic Group
Bradford	78.2	14.6	2.7	4.6
Pendle	84.9	13.4	0.3	1.5
Kirklees	85.6	6.8	4.1	3.5
Leeds	91.8	2.1	1.7	4.4
Calderdale	93.0	4.9	0.4	1.7
Harrogate	98.4	0.0	0.1	1.4
Craven	98.5	0.5	0.1	0.9

Source: Full Population Estimates (Sabater and Simpson forthcoming)

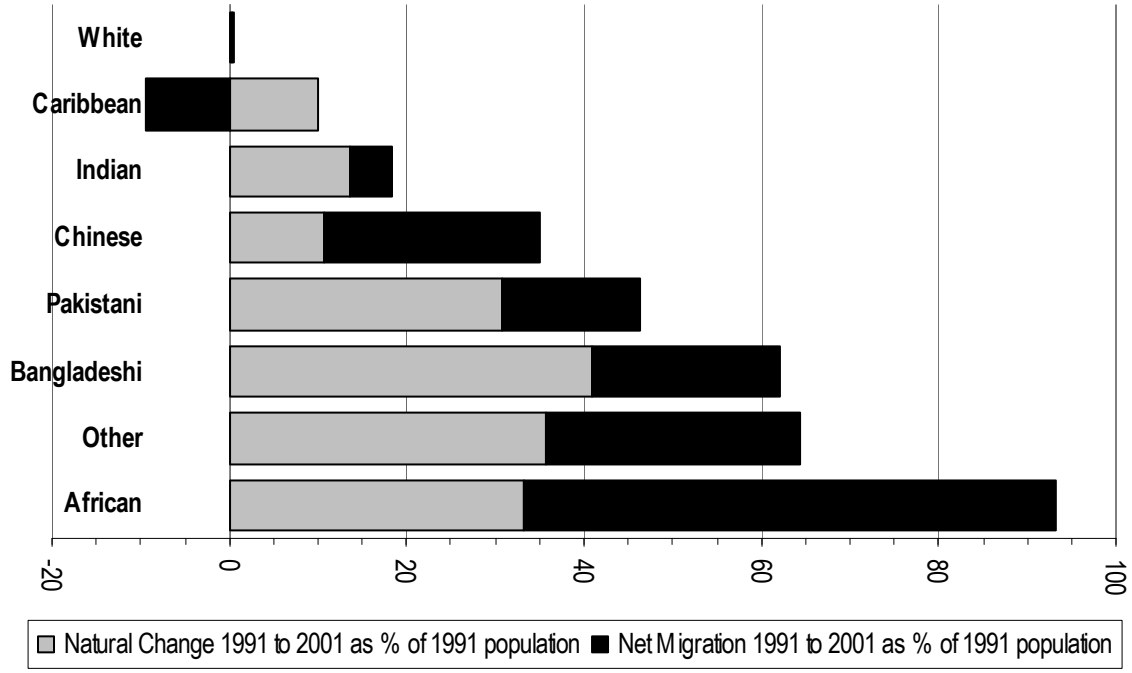
Table 5: Index of Isolation for Districts in Britain by ethnic group: the effect of natural population change

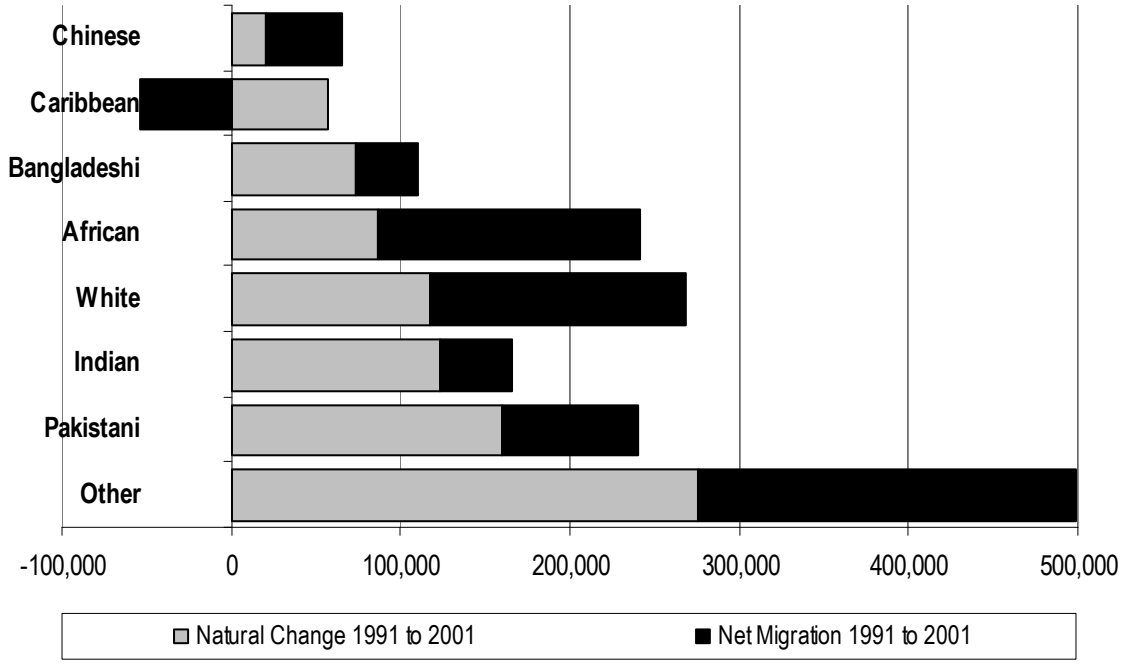
Ethnic Group	% GB population 2001	P* 1991	P* 2001	P* 2001 without natural change 1991-2001
White	91.8	94.71	93.12	94.06
Caribbean	1.0	5.47	5.36	5.03
African	0.9	3.52	6.39	5.46
Indian	1.9	8.09	8.94	8.24
Pakistani	1.3	4.32	6.09	4.90
Bangladeshi	0.5	6.20	9.48	7.53
Chinese	0.4	0.63	0.79	0.77
Other	2.2	3.60	4.92	4.03

Source: Authors' Estimates and Full Population Estimates (Sabater and Simpson forthcoming)

FIGURES

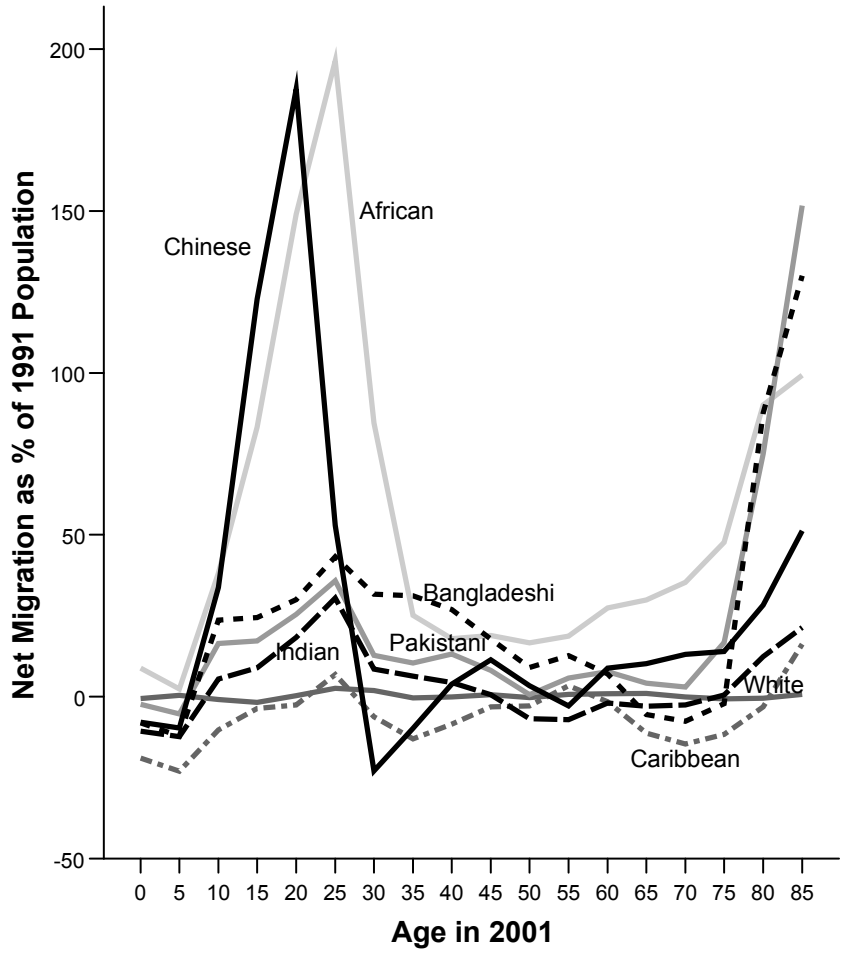
Figure 1: Natural change and net migration 1991-2001 for ethnic groups in Britain, percent and counts





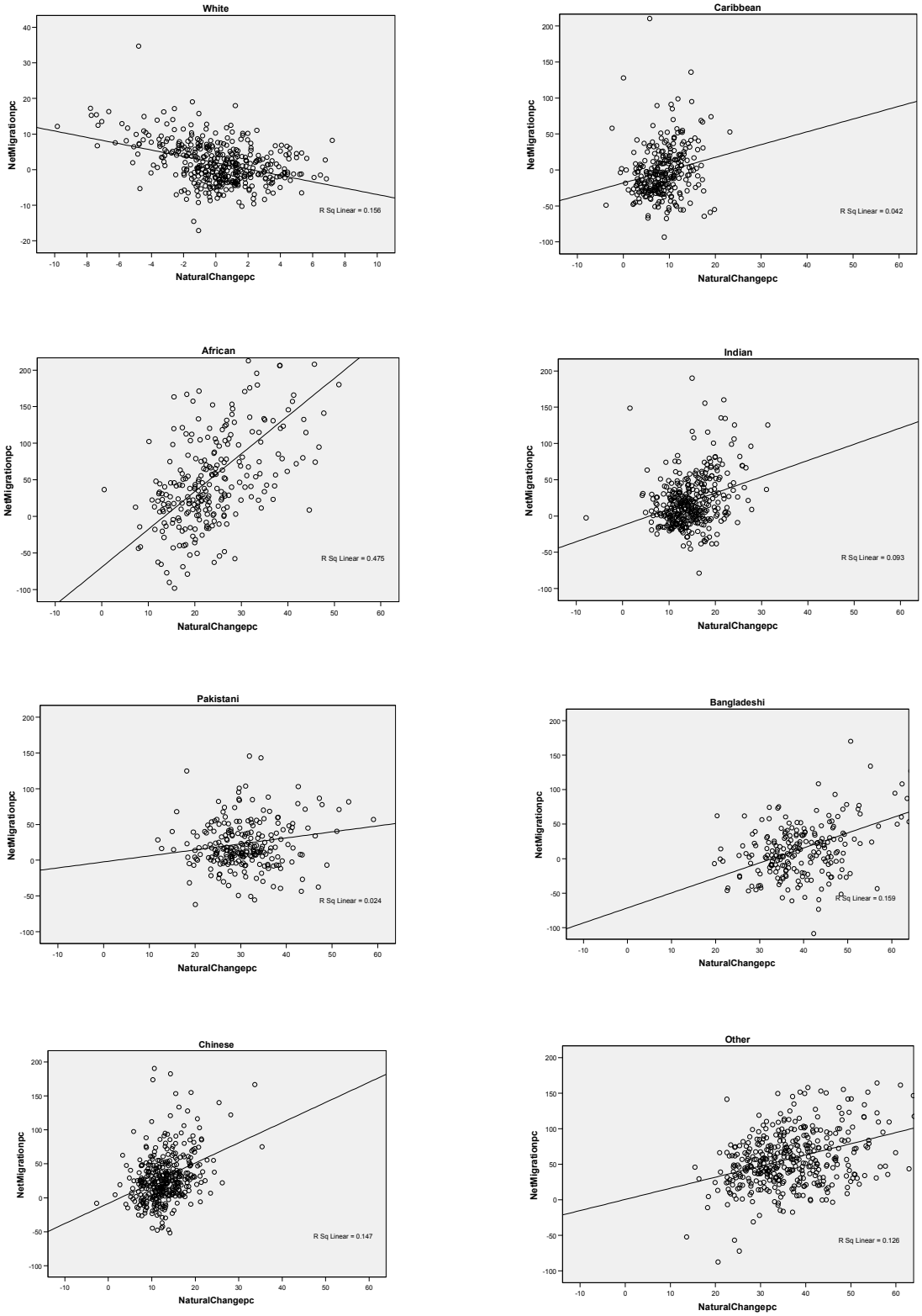
Source: Authors' Estimates

Figure 2: Age profile of net migration to Britain 1991-2001 by ethnic group as a % of 1991 Population



Source: Authors' Estimates

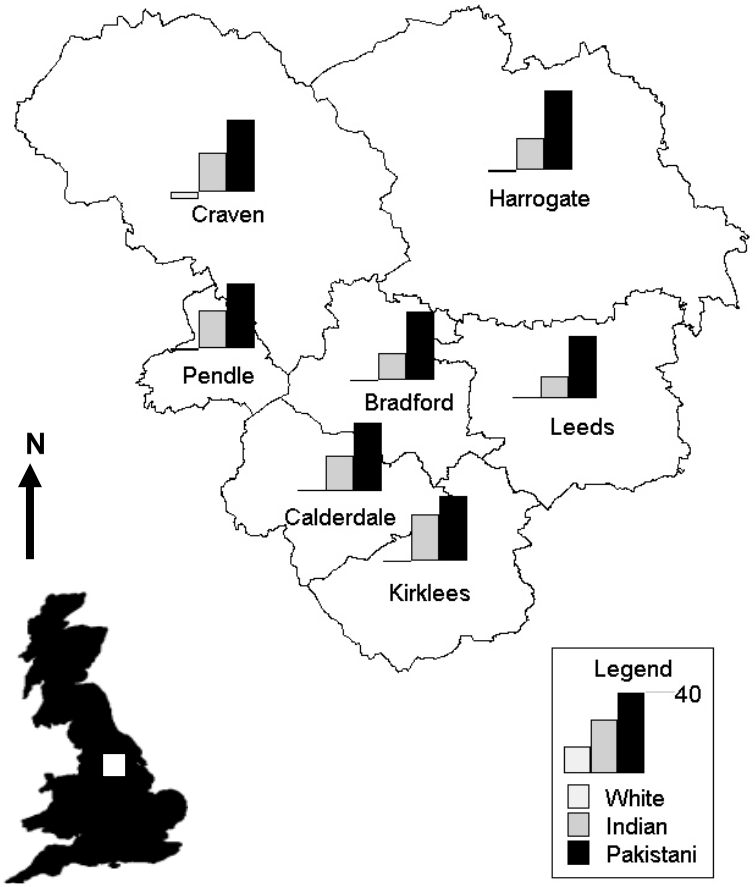
Figure 3: Relationships between natural change and net migration 1991-2001 for ethnic groups in Districts in Britain

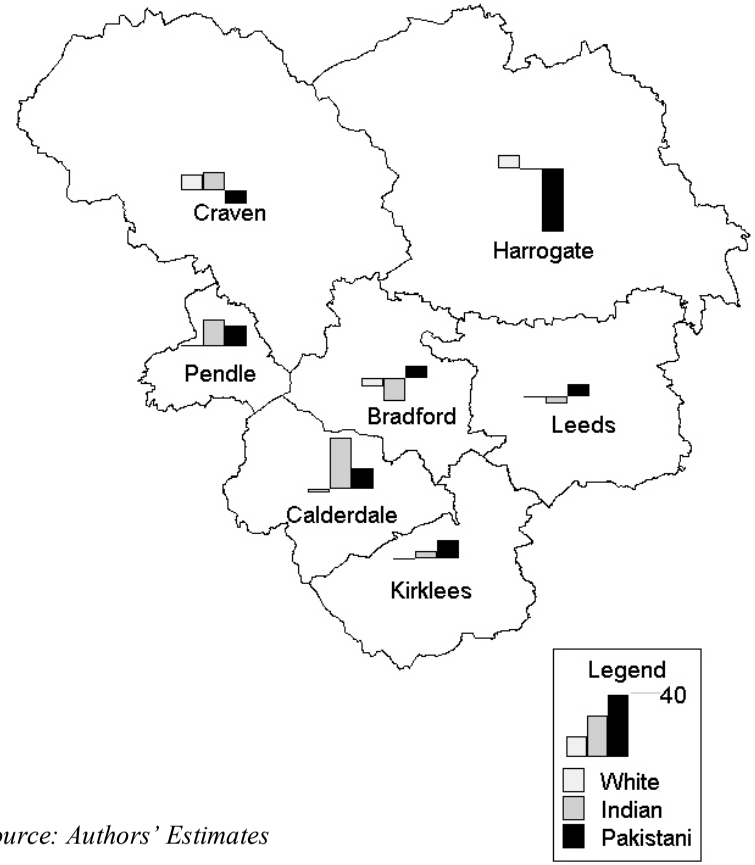


Source: Authors' Estimates. Note: districts with 1991 population less than 50 have been excluded.

Figure 4: Natural change and net migration 1991-2001 for Bradford and bordering districts for White, Indian and Pakistani groups

(a) Natural change as % of 1991 population *(b) Net migration as % of 1991 population*





Source: Authors' Estimates