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Trends in social class segregation between schools in England, Wales and Scotland since 1984

Linda Croxford [a]; Lindsay Paterson [a]
[a] University of Edinburgh. UK

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Linda Croxford* and Lindsay Paterson
University of Edinburgh, UK

The article describes trends in social class segregation between British secondary schools from 1984 to 1999, and includes 'home international' comparisons of trends in England, Wales and Scotland. The analysis is based on comparable youth cohort datasets: the England and Wales Youth Cohort Study and the Scottish School Leavers' Survey. The measures of social class are derived from parents' occupational status and education, and thus provide different dimensions of segregation from those used in some earlier studies which focused on average free school meal entitlement. Segregation indices derived using standard methods include a measure of (un)evenness (S) and a measure of isolation (I). In addition, the variance ratio is derived using a multilevel statistical model, with the advantage that confidence intervals can be estimated. Differences in segregation between the three countries are small, but the indices provide evidence that segregation is consistently lower in Scotland than in England, and this is compatible with the view that the more comprehensive system in Scotland is associated with lower segregation. However, the picture for Wales is rather varied, and hampered by small sample size and changing sampling methods. In the 1990s, the trajectory of segregation in Scotland was different from that in England or Wales: it may have fallen slightly in Scotland but risen elsewhere. But gaps in the available data prevent us being sure about that. The segregation indices do not reveal clear upward or downward trends in the period since parental choice legislation was introduced.

Keywords: *Comprehensive schooling; Home–international comparison; Multilevel modelling; School choice; Social class segregation; Trends*

Introduction

The aim of this paper is to describe overall trends in social class segregation between British secondary schools, and to consider whether the trends in the more comprehensive school systems in Scotland and Wales are different from those in England.

*Corresponding author. Centre for Educational Sociology, University of Edinburgh, St John's Land, Holyrood Road, Edinburgh EH8 8AQ, UK. Email: L.Croxford@ed.ac.uk

The paper describes trends, and does not discuss the social or educational significance of what it reports: these important questions are for elsewhere, and could not be dealt with adequately in the space available if we are also to report the statistical information fully. However, we may note briefly that the problem of social segregation between schools arises where pupils from lower social class backgrounds are concentrated in particular schools to the extent that they are isolated from pupils of higher social class background, or *vice versa*. That isolation may be held to contradict some important principles of preparing people for common democratic citizenship. More specifically, it runs counter to some of the explicit aims of comprehensive secondary schooling, not only relating to citizenship, but also to the belief that schooling is partly about learning to live with others as a good in its own right and as conducing to emotional development. Insofar as schools are differentially effective, and as that is correlated with the socio-economic characteristics of their intakes, the question of segregation is also about equal opportunities and about ensuring that the nation draws on all the talent that is available: for example, if schools serving many pupils with affluent and well-educated parents are more likely to be effective because they can draw on these resources informally, then the separation of such children from their less advantaged peers is educationally unfair and a waste of resources. One of the ways in which the educationally beneficial effects of substantial numbers of children from advantaged families may be felt could be through the so-called 'peer-group' effect: children learn from each other, and so children with fewer educational resources at home may benefit indirectly from the advantages of those who are rich in that respect.

We do not have the data to model the ways in which segregation comes about. Segregation may be associated with residential segregation in towns and cities, for example where particular schools serve large areas of public housing, while others serve the more affluent areas; this is sometimes referred to as 'selection by mortgage'. Recently there has been considerable debate as to whether the introduction of greater 'choice' of schools may have led to greater social segregation. It has been argued that school choice has been exercised to a greater extent by the higher social classes than lower social classes, and that these choices favour schools with strong academic reputations and high average socio-economic status (SES) (Willms & Echols, 1992; Gewirtz *et al.*, 1995; Noden, 2000). Others have suggested that social segregation may in fact be declining, because the initial advantage of high social class families in exercising school choice was merely a 'starting-gun' effect, and that subsequently lower social class families were using the opportunity for school choice to move their children away from the low achieving schools to which housing schemes would otherwise constrain them (Gorard *et al.*, 1998, 2001).

We aim to make four contributions to the debate. Firstly, we contribute a 'home–internationals' perspective by considering the three national education systems separately. Although Scotland, Wales and England share a broadly similar societal context, including social, economic and (for most of the period) political structures, they have developed increasingly different policies and priorities for education, even before the formal devolution of political power in 1999 (Raffe *et al.*, 1999). This is

most marked in the extent to which Scotland and Wales have been more whole-hearted in the provision of comprehensive schooling, compared with the piecemeal approach in England (Benn & Chitty, 1996; Croxford, 2001). Selective systems, whether overt or covert, tend to select higher social class pupils into relatively advantaged schools. McPherson and Willms studied the effects of comprehensive reorganization in Scotland in the 1970s, and found that it was accompanied by, and probably caused, a reduction in social segregation (McPherson & Willms, 1987). Thus there is potential for differences between the three national systems to affect the degree of social segregation between schools. In addition, the introduction of parental choice followed a different course in Scotland from elsewhere; initially (from 1981) the rights of parents in Scotland were stronger than elsewhere, but subsequently (from 1988) parental choice became stronger in England and Wales than in Scotland (Adler, 1997).

Our second contribution is to consider several dimensions of segregation, by using indicators based on parents' social class. Hitherto, the data for construction of segregation indicators have been restricted to aggregate measures of entitlement to free school meals (FSM) per school (Gorard & Fitz, 2000; Noden, 2000; Goldstein & Noden, 2003). Recent papers in this journal have discussed whether FSM is an appropriate variable with which to measure segregation in view of its relationship to economic fluctuations (Gibson & Asthana, 2000, 2002; Gorard, 2000, 2002; Noden, 2002). For this paper we have developed further SES indicators, less susceptible to short-term economic fluctuation, using pupil-level information on parental occupational status. These comprise indicators of high social class focusing on whether parents were in managerial and professional occupations, and indicators of low social class focusing on whether parents were in working class occupations. We also report results of a composite measure of SES, drawing on measures of parental education as well as parental class.

Thirdly, we extend the time period for comparison of trends in social segregation from the early 1980s to the late 1990s, by using the England and Wales Youth Cohort Study (YCS) and the Scottish School Leavers' Survey (SSLS). In both series the first cohort started secondary school before the parental choice legislation was on the statute book (in England and Wales the majority of the first YCS cohort entered secondary school in autumn 1979, and in Scotland the first cohort entered secondary school in autumn 1980). Subsequent cohorts made the transition into secondary school during the period when parental choice of school was increasing. (However, few of the surveys include any questions about school choice, and so we cannot model the effects of choice at the individual level.)

Finally, our paper makes a methodological contribution by demonstrating the use of multilevel modelling to estimate standard errors and confidence levels for one particular index of segregation. The standard methods of calculating segregation indices have been set out clearly by Gorard and Taylor (2002), and are based on comparison of the proportion of the minority group in each school with the proportion of the minority group in the population as a whole. However, it is mathematically intractable to estimate confidence levels for each proportion using these methods; simulation

methods may be used (as, e.g., by Willms & Paterson, 1995), but are not feasible routinely. Moreover, there is a potential problem with bias in the sample estimates of segregation indexes when the true value is small. Because the indexes are defined to be positive (see Figure 1 below), that part of the sampling variability that ought to take the value below '0' when the true value is close to '0' is removed, and will appear as an inflated value of the index itself. This is probably not a problem if the sample size per school is fairly constant, but is a potential problem if that changes, which is exactly what happens here in the data series for England and Wales between 1990 and 1993.

   The lack of confidence levels may not be a problem for analyses that use administrative data on FSM for the entire population (as Gorard and Taylor did), but is a serious worry when—as here—survey data based on school samples are being used. Multilevel modelling provides a method of conveniently calculating an index based on the variance ratio, together with standard errors and confidence levels, while adjusting for differences in school sample size.[1] The multilevel estimates do not suffer from the problem of bias in the same way as those derived by standard methods: they are biased (although not in very large samples), but the extent of bias is related inversely to the sample size, and so is adjusted for by the multilevel technology itself.

Research questions

1. To what extent is there segregation between schools of students from different social class backgrounds? Does the extent of segregation differ in England, Wales and Scotland? If there are differences in segregation, do these support the hypothesis that segregation is lower in more comprehensive education systems?
2. Has the extent of segregation changed during the 1980s and 1990s? If levels of segregation have changed, do they support the hypothesis that parental choice legislation has increased segregation? Is there evidence of a 'starting-gun' effect and subsequent decline?
3. Have there been different patterns of change in England, Wales and Scotland? If there are differences, do they suggest that parental choice has had different effects in each national system?

Indices of segregation

There are several dimensions of segregation, and thus it can be measured in different ways (James & Taeuber, 1985; Massey & Denton, 1988). Recent research on segregation in British schools has focused on two dimensions, namely (un)evenness (Gorard & Taylor, 2002) and exposure or isolation (Noden, 2000). The former looks at whether a group is over-represented in some schools, and under-represented in others, while the latter looks at the extent to which a minority group is isolated from the mainstream.

Indices of (un)even distribution

Commonly used measures of (un)evenness in the distribution of minority groups between schools are the Dissimilarity Index (D) and the Segregation Index (S). These

(Un) even-ness	
• Dissimilarity	$D=0.5*\Sigma\,(|A_i/A-B_i/B|)$
• Segregation	$S=0.5*\Sigma\,(|A_i/A-T_i/T|)$
Isolation/exposure	$I=\Sigma\,(A_i/A).(A_i/T_i)$
Where: A_i is the number of pupils of the minority group in each school, B_i is the number of pupils of the majority group in each school, and T_i is the total number of pupils in the school. A is the total number of pupils in the minority group in the area, B is the total number of pupils of the majority group in the area, and T is the total number of pupils in the area.	

Source: Gorard and Taylor (2002); see also James and Taeuber (1985) and Massey and Denton (1988).

Figure 1. Definitions of segregation indices

indices measure the proportion of the minority group that would have to change schools in order to achieve an even distribution of the group across schools. The equations for D and S are set out in Figure 1.

The measures D and S are very similar, but Gorard and Taylor argue that S has the advantage of being 'composition invariate'; in other words, they suggest that an over-all increase in the size of the minority group influences the value of D, whereas S is unaffected (*op. cit.*). Where there are only two groups ('minority' and 'majority') then D is the sum of S and the version of S calculated with the two groups interchanged.

Using a segregation index S derived from administrative data on eligibility for free school meals (FSM) in England, Gorard *et al.* (2001) found that segregation declined from a high of 35% in 1989–1990 to around 30% in 1996 before rising to 32% by 1999–2000. Therefore around one-third of students would have to change schools in order for there to be an even spread of 'poor' children between schools (*op. cit*). In a separate paper the researchers show the segregation index for Welsh schools at around 50% following a similar pattern of decline from 1989–1990 to 1995 (Gorard & Taylor, 2002). The researchers conclude that there was an overall decline in socio-economic stratification between schools after the 1988 Education Reform Act (ERA) which introduced the right of school choice in England and Wales, and that despite the upturn after 1996 schools are now significantly more socially mixed than in 1988. One possible explanation is that the reforms have allowed poor families to attend schools in areas they cannot afford to live in. They note that residential stratification explains around half of the variance in school admissions, and the policy of open enrolment may have broken the link between area of residence and school assignment, but they emphasize that these possible explanations are speculative (Gorard *et al.*, 2001).

Indices of exposure/isolation

The Isolation Index (I) measures the extent to which members of a minority group are exposed only to each other, and thus isolated from members of its complementary

group. It is conceptually distinct from indices of (un)evenness (D and S) because a group could be unevenly distributed across schools in a community, but if it were a relatively small minority group it would not necessarily be isolated from members of the majority group.

Noden (2000) has argued that the isolation index is a more appropriate and policy-relevant indicator of segregation than indices based on (un)evenness. In particular, he suggests that the Gorard index S does not take account of the locations of minority pupils, whereas the isolation index takes account of high concentrations of the minority group in particular schools. Such concentration of pupils with FSM in particular schools may be associated with so-called 'failing schools', and create peer group effects where pupils encounter lower-attaining peer groups than in other schools. The isolation index also provides more information about the social mixing between more or less advantaged groups in society. One argument against using the isolation index is that it is strongly influenced by the population size of the group in question: generally speaking, small groups are less likely to be isolated than large ones. However, this is an argument against misinterpreting changes in the index rather than against using it at all: as a descriptive measure, it can tell us about the likelihood of pupils in a group coming into contact with pupils outside the group, which is interesting regardless of the explanations that might then be offered (Massey & Denton, 1988, pp. 287–289).

Using an isolation index based on FSM per school and LEA in England, provided by the Office for Standards in Education (Ofsted), Noden found that the average score on the isolation index rose from 1994 to 1997 before falling from 1997 to 1999. He decomposed the index to show that the overall isolation index closely tracks changes in the average FSM eligibility in English LEAs, but that the within-LEA component shows a steady but small increase in the isolation of pupils with FSM. He argues that these findings support the hypothesis that the educational quasi-market is facilitating the creation of schools of concentrated social disadvantage.

Indices based on multilevel models

Multilevel modelling allows data analysis to take account of the hierarchical nature of the education system. With respect to segregation indices, multilevel modelling makes it possible to analyse differences in the distribution of minority groups of pupils, and apportion the variance between pupils, schools and local authorities. It allows us to take account of differences in the size of schools and local authorities, and to calculate confidence intervals for estimates.

Goldstein and Noden 2003 used multilevel modelling to estimate change in the variance of the proportion with FSM between schools and LEAs from 1994 to 1999 (using the same dataset as Noden, 2000). The authors suggest that the estimates of between-school variance of the school proportion of pupils receiving FSM provide measures of segregation (Goldstein & Noden, 2004). Their analysis shows that variance between schools has increased markedly between 1994 and 1999. They also

found that the extent of change was greater in LEAs which were operating selective secondary systems (Goldstein & Noden, 2003).

Different approaches to the estimation of segregation by multilevel models are demonstrated by Willms (1986), and Willms and Paterson (1995). Whereas Goldstein and Noden use population data aggregated at school level (i.e., the proportion of the school population in receipt of FSM), Willms and Paterson used individual student level data on social class from the Scottish School Leavers' Surveys.

The chief measure of segregation used by Willms (1986) is the variance ratio (also known as the correlation ratio), which is the percentage of total variance in a variable that lies between schools (i.e., the ratio of the between school sum of squares and the total sum of squares). The greater the variance ratio for a set of schools, the greater is the dissimilarity in their social class composition. Willms's variance ratio was calculated for a summary measure of socio-economic status (SES) derived from father's occupation, mother's education, and number of siblings, and for two dummy variables indicating high and low SES. It can be interpreted as the proportion of total variance attributable to segregation. Willms found that at the end of the 1970s there was large between-school variation in SES in most school divisions in Scotland, and that much of this variation was associated with an unequal distribution of pupils from high SES backgrounds. The findings also suggested that there are substantial contextual effects of school mean SES on examination attainment, that they are more strongly related to the proportion of high social class pupils in a school than the proportion of low social class pupils, and that they are equally strong for pupils of high and low ability.

For dichotomous indicators, the variance ratio is the same as the isolation index adjusted to remove its dependence on the total proportion of the minority group in the population (Massey & Denton, 1988, p. 289; James & Taeuber, 1985, pp. 6–7). Another interpretation of the variance ratio for dichotomous indicators is in terms of the chances that, if we picked two students at random, one would be from the minority group and the other from the majority. If 'p_i' is the proportion of the minority group in School I (i.e., A_i/T_i) and 'p' is the analogous proportion for the population as a whole (i.e. A/T), then that chance in School I is $p_i(1-p_i)$, and in the population as a whole is $p(1-p)$; these expressions may be thought of as the chance of two students from different groups meeting each other in School I or in the population. Then the variance ratio index for this dichotomous indicator can be restated as:

$$1 - \sum T_i p_i (1 - p_i) / [T p (1 - p)]$$

When the p_i are all equal (and hence equal to p), the index is 0; as the variation of the p_i rises, the index gets larger. It is in this sense that the index may be thought of as measuring the extent to which random encounters between members of the minority and majority groups are more likely to occur in some schools than in others.

Paterson (1991) and Willms and Paterson (1995) focused on the problems of sampling error in segregation indices. The size of the sampling error depends not only

on the size of the community, but also on the number of units and the size of the units within the community. The sampling distribution for the majority of segregation indices is unknown. Even where population data are used, the observed data may be thought of as a sample of some 'hyper-population', and errors of estimation are still a concern. Indices of social class segregation also include measurement error. To address these problems Paterson (1991) and Willms and Paterson (1995) used the bootstrap technique to estimate standard errors of segregation indices, and multilevel regression modelling to describe and explain variations in the extent of segregation between communities. The analyses demonstrated methods of constructing segregation indices with standard errors using multilevel modelling.

We follow that multilevel technique here. Because the components of the conventional variance ratio index (between-group sum of squares and total sum of squares) may be calculated from a classical analysis of variance, they may also be thought of as deriving from a simple regression, where the only explanatory variables are dummy indicators of group membership. So our modification is simply to use a multilevel regression instead of a simple regression, with the dummy indicators being replaced by group membership (groups being schools). The advantage of this multilevel approach is simply that it provides estimates of standard errors, and also shrinks the contribution made to the index by schools with only small samples (Goldstein, 1995, p. 44; Bryk & Raudenbush, 1992, pp. 76–82). The non-multilevel calculation of the variance ratio does not provide standard errors.

Data used for the current analysis

The data are derived from two nationally representative surveys of youth cohorts, the England and Wales Youth Cohort Studies (YCS) and Scottish Young People's Surveys/School Leavers' Surveys (SSLS). Both surveys have been carried out regularly since 1985 and have similar purposes and content. The England and Wales surveys cover age cohorts comprising young people aged 16 years at the end of August of the relevant school session, most of whom were in the last year of compulsory schooling (known as Year 11 or Y11). The Scottish youth cohorts are defined by year-stage, and comprise cohorts of students in the last year of compulsory schooling (know as the S4 stage) at all Scottish secondary schools. In both survey series, the sample is defined on the basis of birthdate (typically the 5th, 15th and 25th of each month) and sample details are provided by schools to the relevant Government department. The SSLS samples cover all secondary schools, including independent schools but excluding special schools. For cohorts 1984–1996 the SSLS target samples comprised 10% of the relevant year group, and for the 1998 cohort it increased to 20%.

Selection of the cohort samples for YCS was more complex and problematic than for SSLS, and changes in sample design have implications for the analyses described below. The first YCS (1984 cohort) did not include independent schools and is therefore omitted from this analysis. YCS up to and including the 1990 cohort were sampled using a two-stage sampling process: firstly a sample of schools was drawn,

stratified by school type, local education authority and region; secondly, a sample of pupils was selected within participating schools. Later YCS cohorts (1992–1999) started with a simple random sample derived from all schools. For all YCS cohorts head teachers were asked to consult with eligible pupils, and to pass on the names and addresses only of those willing to take part in the survey. There were some difficulties with school-level non-response at the sampling stage and to compensate for this, and to reduce the sample numbers, there was a further stage of sampling before the survey took place: the initial sample was subsampled to give a target sample that was representative of a population matrix of pupil numbers by school type by sex by region. Types of school attended by the YCS samples include independent, grammar, modern schools, and city technology colleges as well as comprehensive schools. One result of the change in the design between 1990 and 1993 was that the average sample size per school fell.

Response rates to both surveys have declined over time: YCS from 77% of the 1986 cohort to 55% of the 1999 cohort; SSLS from 81% of the 1984 cohort to 63% of the 1998 cohort. If we compare the achieved samples (i.e., respondents at Sweep 1 of the surveys) to the estimated population of 16-year-olds in the relevant year, the average fraction is 2% in England and Wales and 8% in Scotland.

Administrative data for each survey respondent identify the school attended. For all Scottish cohorts, and England and Wales cohorts from 1995 onwards, the school is identified by the full establishment number. However, for England and Wales cohorts prior to 1995 an anonymized school identifier is used.

Measures of socio-economic status

Questions about the occupational status of mother and father were asked in all the surveys, and provide the basis for constructing social class variables. The detailed occupational codes were used to derive the new socio-economic classification (NS-SEC) using the 'reduced method' detailed on the National Statistics web site. Note therefore that this entailed recoding occupations into the NS-SEC from as far back as the mid-1980s; although the scheme was produced for the 2001 Census, its theoretical origins in the Goldthorpe class scheme that has been current since the early 1980s would suggest that this procedure is not invalid. Unfortunately, the YCS did not include detailed occupational codes until 1990, and so, in order to include earlier cohorts in the analysis, we have derived an approximate three-class variable from socio-economic group. The measures for England and Wales before 1990 should therefore be treated with caution. Details of the construction of social class variables are given in Croxford (2005).

A summary variable for parents' social class was derived by taking the higher of mother's and father's occupational status. This variable was further collapsed into the three-class classification: (1) managerial and professional; (2) intermediate; (3) working (Rose & O'Reilly, 1998, Figure 6, p. 22). Cases for whom parents' social class was missing were omitted from the analysis. We also derived a composite measure of socio-economic status based on four separate measures: occupational status of

mother's and father's occupations (using NS-SEC eight classes), and dummy indicators of post-compulsory education of mother and father. For England and Wales the measures of post-compulsory education were derived from questions as to whether each parent had A levels, and for Scotland from questions about age of leaving school. Each of the four measures was converted to a z-score, and the average calculated from two or more valid responses. The composite SES variable could not be calculated for England and Wales cohorts 1984–1988 because parental occupation was not coded in detail and questions about parental education were not asked.

Deriving segregation indices

Thus the measures of SES used for the segregation indices were:

- Working class family (*vs.* other two classes).
- Managerial and professional family (*vs.* other two classes).
- Composite SES measure.

The first set of segregation indices were derived by the method summarized in Figure 1. Derivation of the indices requires calculation of the proportion of the minority group per school, and since the survey data comprise relatively small samples per school, we were concerned that the results might be influenced by small school sample sizes. Therefore, we omitted cases where the within-school sample size per year was less than five.[2] Appendix 1 shows the average sample sizes of schools included in the analysis. Differences in sample sizes in England and Wales between 1990 and 1993 demonstrate the effects of changes in YCS sampling procedures.

The second set of segregation indices were based on the variance ratio, using multilevel modelling. All cases were included in the multilevel model, because the mathematics of the statistical software adjusts for school sample size, and provides confidence intervals for the estimates.

The multilevel analyses were carried out separately for each national system, with individual pupils at Level 1 and schools at Level 2. Separate dummies were fitted for each cohort, and these were allowed to vary in the random part of the model at both Level 1 and Level 2. An example of the equation for Scotland is shown in Appendix 2. 95% confidence intervals were calculated for the estimates.

Results

Segregation and isolation indices

Trends in segregation based on the segregation and isolation indices are summarized in Figures 2–5. The label for each cohort on the horizontal axis is the year they completed compulsory schooling at 16 years old (S4 or Year 11). For ease of presentation the Scottish 1992 cohort is shown at the same point as the England and Wales 1993 cohort, the Scottish 1996 cohort with the England and Wales 1995 cohort and the Scottish 1998 cohort with the England and Wales 1997 cohort. The first cohort
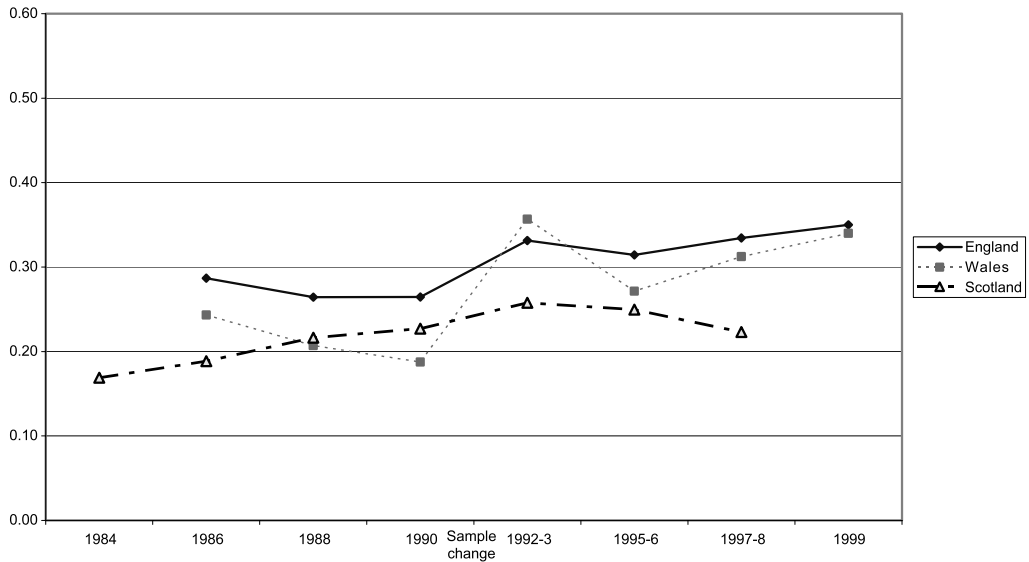
Figure 2.   Segregation index: working class SEC

(1984) typically started secondary school before the first parental choice legislation in 1980–1981 (the strongest effects of which applied only to Scotland). The fifth cohort (1992 in Scotland and 1993 in England and Wales) typically entered secondary school in autumn 1988, the same year as the 1988 ERA (which mostly related to England and Wales only).

Figure 2 shows the segregation of young people with parents in working class occupations, using the measure of unevenness (S) advocated by Gorard. The first finding to note is that segregation was consistently lower in Scotland than in England throughout the period, but the position of Wales is less clear.[3] For Scotland, there is a steady upward trend in segregation among cohorts 1984–1992, and a subsequent fall between 1992 and 1998. These changes are consistent with Gorard's suggestion that in the years following the parental choice legislation (1981) the distribution of low-SES students between schools became more uneven as middle class children moved to the more popular schools, but that after 1992 there was a trend to more even distribution, as working class parents exercised their choice to a greater extent, and less popular schools were closed to rationalize school provision. In England and Wales we would expect any impact of the 1988 ERA to be reflected in cohorts from 1993 onwards. However, the pattern for England and Wales is not as consistent as for Scotland, and it is possible that the change in sampling procedures between 1990 and 1993 has led to more inconsistent school samples: as noted earlier, the reduction in the average sample size per school may itself have increased the calculated value of the indexes. We should also be cautious in interpreting the trends for England and Wales before the 1990 cohort because the full occupational coding was not available to derive social class measures. Between 1990 and 1993 there appears to have been
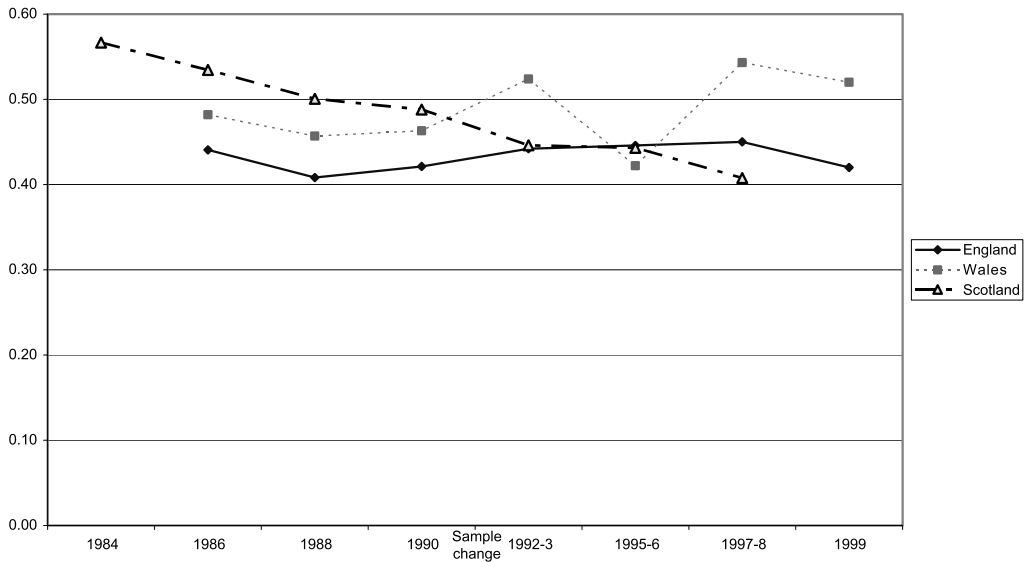
Figure 3.   Isolation index: working class SEC

an increase in segregation in England from 26% to 33% (possibly an artefact of sampling change), and thereafter the figure remained stable at this level to 1999. We note that the average level of S for England between 1990 and 1999 is broadly similar to that estimated by Gorard *et al.* (2003) based on FSM, but the trend is different: Gorard's index fell from 35% in 1990 to 30% in 1996.

The index of isolation of working class pupils (Figure 3) is an indicator of the extent to which low-SES pupils are concentrated in low-SES schools. Before 1992–1993 the isolation of working class students was greater in Scotland than in England, but this position was reversed by 1997–1998. In Scotland, the isolation index fell steadily throughout the period. To some extent this may be associated with social change as the proportion of working class students has declined, but—even if that change in the margins is the whole explanation—it is also an indication that working class children are attending more socially mixed schools. However, in England there is no such decline, and if anything a slight upward trend in isolation from 1990 to 1997 (sustained even after the change in sample design), despite the fact that a declining working class would tend to push the index in the other direction. (This is consistent with the findings of Noden, 2000.)

Turning to young people from managerial and professional social groups, we see in Figure 4 very similar levels of segregation (unevenness) for all three countries.

The index of isolation of managerial and professional students (Figure 5) shows the extent to which high-SES students are concentrated in high-SES schools. In Scotland, the index shows a consistently upward trend to 1992, and thereafter remains fairly stable. This upward trend is consistent with the hypothesis that parental choice was exercised to a greater extent by high-SES families who chose schools with
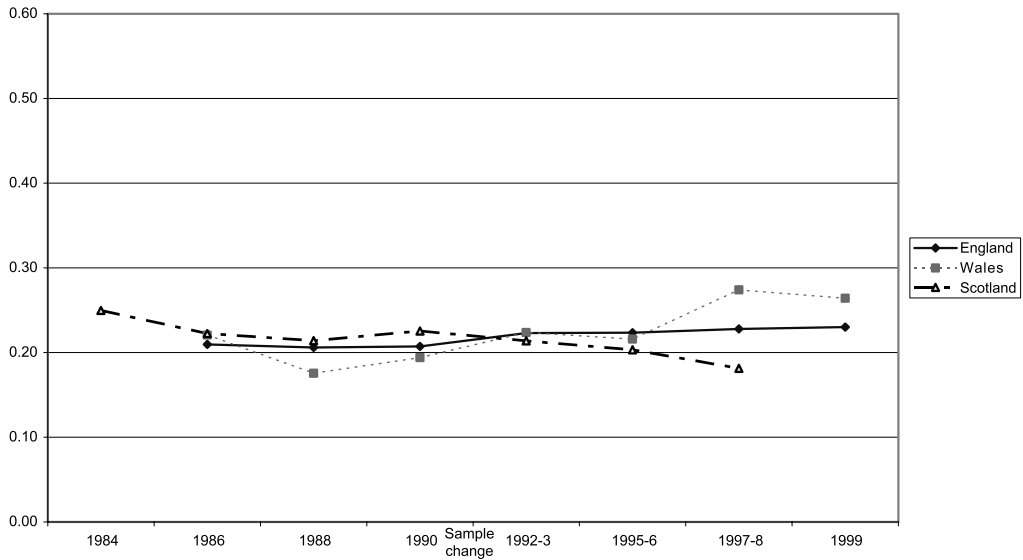
Figure 4.   Segregation index: managerial and professional SEC

relatively high average SES. However, it is also consistent with the simple fact of growth in the proportion of pupils in this middle class group, and so these trends cannot be taken as evidence that class patterns in parental choice caused a rise in segregation. The trend in England and Wales is broadly similar: isolation of high-SES
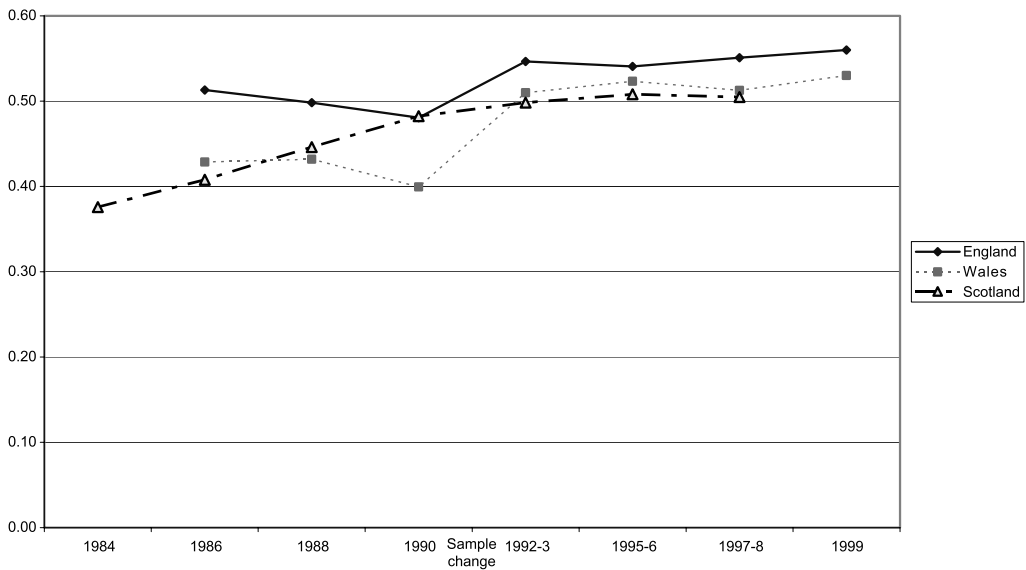

Figure 5.   Isolation index: managerial and professional SEC

students increased steeply between 1990 and 1993 (which may have been due to the change in sample design), and subsequently neither increased nor decreased, but the issue of sample change makes us cautious in interpreting these trends.

The multilevel segregation indices

The variance ratios were calculated using multilevel models; trends in segregation of working class pupils are shown by Figures 6–8, for managerial and professional pupils by Figures 9–11, and for the composite measure of SES by Figures 12–14. The patterns demonstrated for both minority groups within each national system are broadly similar. In each case it appears that around ten percent of overall variance is attributable to segregation between schools, and this is a much lower estimate of segregation than is provided by the isolation or segregation indices (Figures 2–5).

Focusing on working class pupils, we see that in England and Wales there was a decrease in the variance ratio between 1990 and 1993, followed by a steep rise from 1993 to 1995 and thereafter gradual decline. This is a very different pattern from that given by the segregation index (Figure 2) which showed an increase in segregation from 1990 to 1993. It seems likely that this discrepancy is associated with the change in sampling procedures for YCS which meant that in 1993 there were more schools than in 1990 but the within-school sample sizes were smaller. This demonstrates that sample size is a very important factor in the crude indices shown in earlier figures, and leads us to conclude that sharp changes in the segregation indices for England and Wales between 1990 and 1993 in Figure 2 may be mere artefacts of the data. However, the increase between 1993 and 1995 shown by the variance ratios in Figures 6 and 7 occurred after the YCS sample design had stabilized, and therefore an alternative explanation is possible: the increase may provide evidence of increased segregation following the 1988 ERA. Scotland was not subject to the 1988 ERA, and there is no evidence (Figure 8) that the variance ratio in Scotland increased after 1992/3 as it did in England and Wales. The variance ratios for Scotland are much more consistent, because the sampling procedures for Scottish data have remained constant throughout the series. Nevertheless, the variance ratio for working class pupils in Scotland (Figure 8) does not rise between 1984 and 1992 as suggested by the segregation index in Figure 2.

The variance ratios for managerial and professional students (Figures 9–11) show that, up to 1990, segregation in Wales was significantly lower than in England or Scotland, but that by 1995 it was closer to the pattern for England and Scotland. In both England and Wales the variance ratio for managerial and professional pupils increased between 1993 and 1995, possibly associated with the 1988 ERA, and showed a slight decline between 1995 and 1999. In Scotland the variance ratios for managerial and professional students remained fairly constant throughout the period.

The composite measures of SES (Figures 12–14) are consistent with these findings from the dichotomous indicators, although for a more restricted set of years. The full-est series is for Scotland (Figure 14): as in Figure 8, there is evidence that by 1998 segregation was slightly lower than in 1984. In England and in Wales (Figures 12 and

13), segregation increased in the cohorts following the 1988 ERA, and at the end of the 1990s was probably higher than in 1993.

For Scotland, we repeated all this analysis for local authority areas where the exercise of parental choice was high in the mid-1990s (specifically, where at least 10% of the pupils on the first-year roll in 1995–1996 in secondary schools in the area had been the subject of a placing request). Because we do not have information on placing requests at the level of individual respondents to the surveys, we cannot test in any strong way for effects of placing requests, and so this measure is to be interpreted simply as a convenient way of picking out areas where placing requests were relatively high.[4] There were 14 such areas (out of 32 in total), including all the cities, the areas around the cities, and most of the former industrial and manufacturing areas of central Scotland. We then recalculated the indices for the 14 areas. Because these are mainly urban or semi-urban areas, it was not surprising to find that, on the segregation index and on the variance ratio measures, segregation was higher in every year in these areas taken together than in Scotland as a whole. The same was true also of the isolation of the managerial and professional class. Isolation of the working class was lower in these areas, and this may reflect the proportionally larger size of that class in the 14 areas than in the rest of Scotland. However, the main points for our discussion are that the trends in all the indices in these areas of greater parental choice were almost exactly the same as the trends shown for Scotland in the graphs, and that there was almost no change over time in the difference in the values of the index between these areas and Scotland as a whole. The only exception was in 1990, when the variance ratio showed a temporary rise in segregation of the working class, in contrast to the steady fall for Scotland as a whole (Figure 8); thereafter, the trend even of this measure followed the national trend downwards to levels below those of the mid-1980s. If Gorard's suggestion of the working class following the middle class in exercising placing requests is an explanation of declining segregation, then it is possible that this slightly different trend in mainly urban areas could indicate that the catching up took longer there than in less densely populated areas. But the main conclusion to draw from this replication of the analysis on areas of relatively high placing requests is that parental choice was not, in itself, an impediment to almost all kinds of segregation falling, the exception being the rise in middle class isolation driven simply by the growth in the relative size of that group.

Discussion

A serious issue for the research is the quality of datasets available. The Scottish series has major gaps in terms of cohorts in the early 1990s. However, the Scottish series has been very consistent in design, sampling and coding, whereas the England and Wales YCS have inconsistencies which make them less reliable: in particular, the coding of parents' occupation has been inadequate, and sampling procedures have changed in significant ways. So the quality of the data has to make us cautious about drawing strong conclusions. The same has to be said about our lack of information on placing requests exercised by individual survey respondents. Nevertheless, the
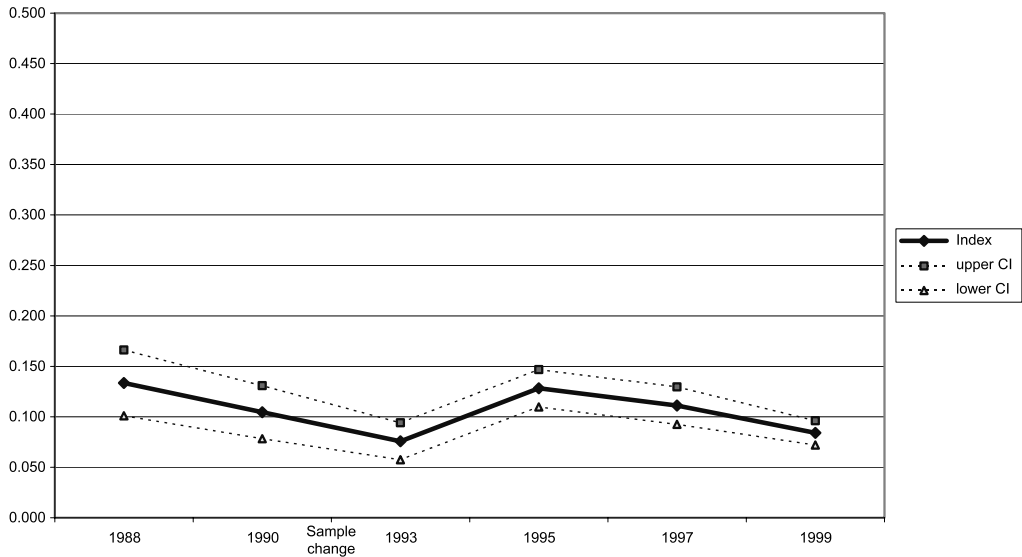
Figure 6.   Variance ratio: working class SEC—England

data are the best that are available: the strength of the analysis is the length of time over which the data are available, the opportunity to compare the three British education systems, and the scope for studying segregation of social classes (defined by parental occupation) rather than by administrative variables such as the proportion entitled to free school meals. That allows some tentative conclusions to be suggested, relating to the three broad sets of research questions we outlined earlier: (1)
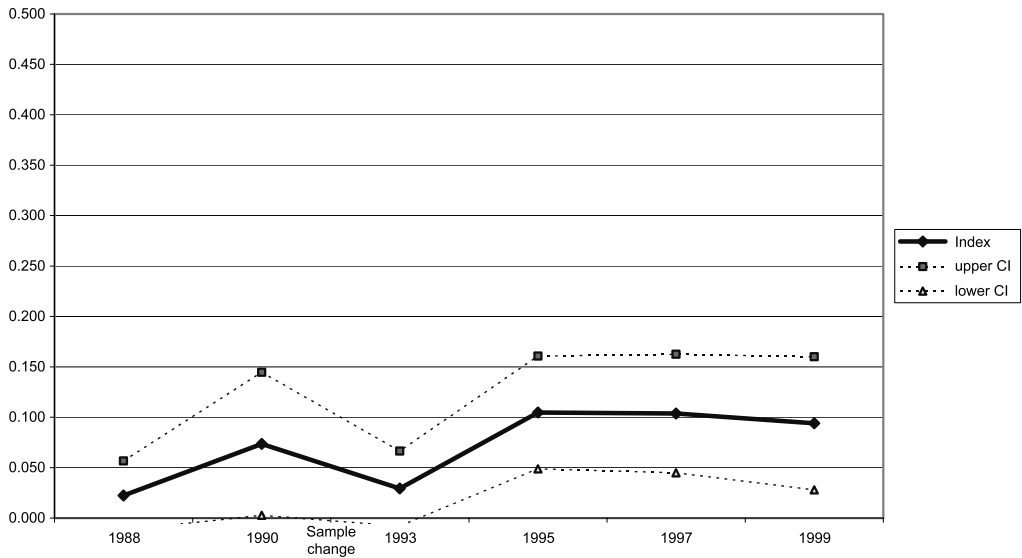

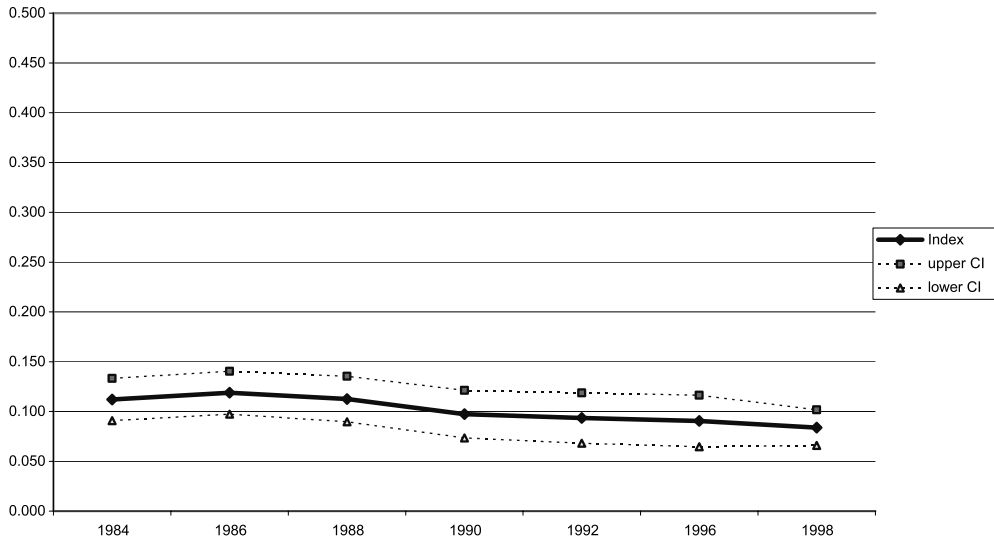Figure 7.   Variance ratio: working class SEC—Wales

Figure 8.   Variance ratio: working class SEC—Scotland

differences between national systems; (2) trends between 1984 and 1999; and (3) differential trends associated with parental choice.

There are some differences in levels of segregation between the national systems, but these differences are not as large as we might have expected. The standard index of (un)evenness of spread (S) of working class pupils suggests that segregation is consistently lower in Scotland than in England, and this is compatible with the view
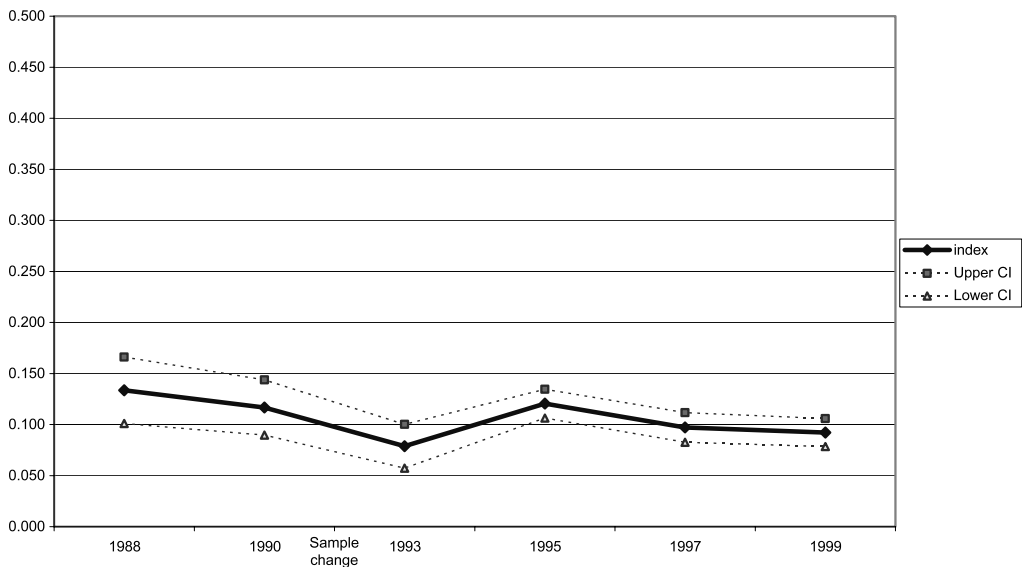
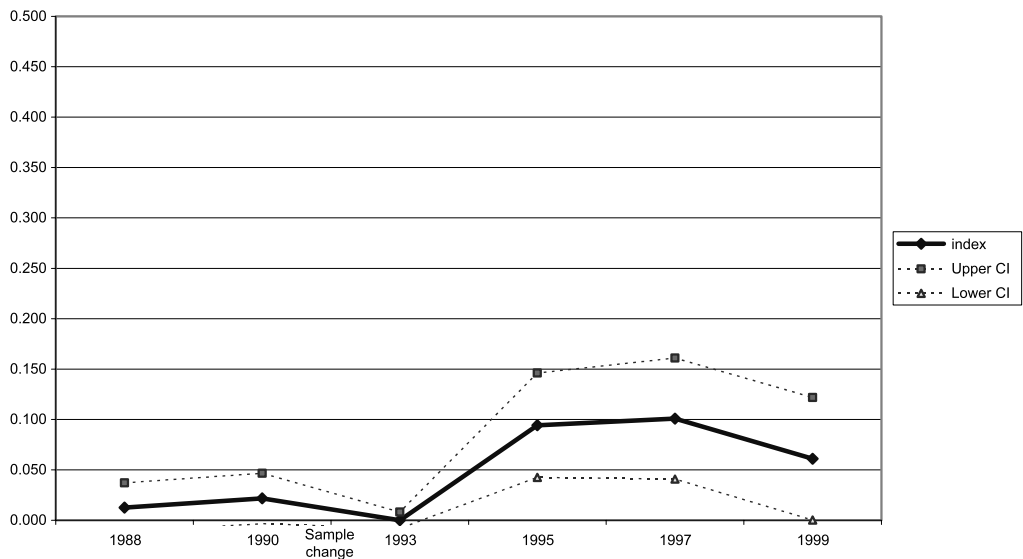Figure 9.   Variance ratio: managerial and professional SEC—England

Figure 10.   Variance ratio: managerial and professional SEC—Wales

that the more comprehensive system in Scotland led to lower segregation. However, the pattern of S for managerial and professional pupils is very similar in all three countries, and the variance ratios of the dichotomous indicators for England and Scotland are also very similar. There is some evidence that segregation was lower in Wales for the cohorts in the 1980s, and in particular that the variance ratio for managerial and
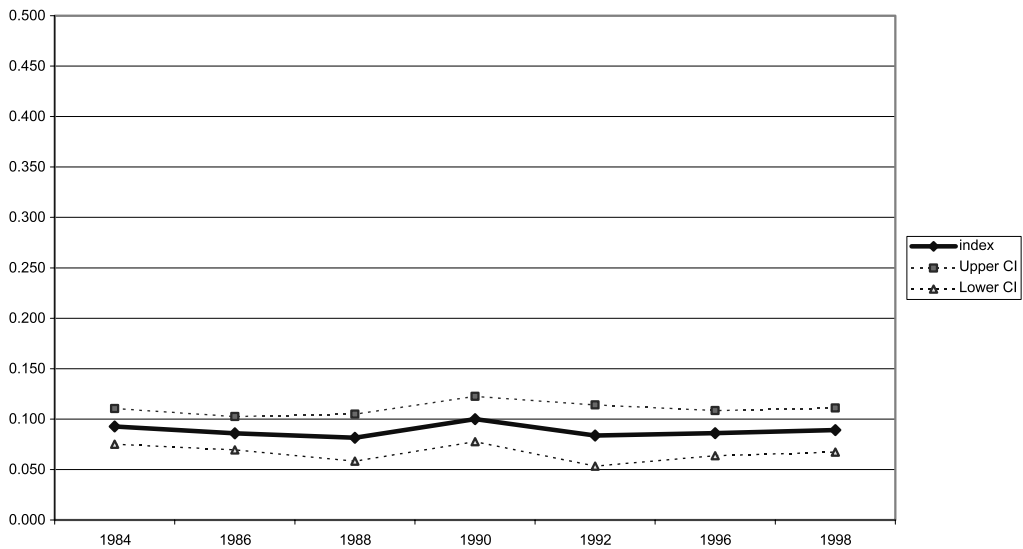
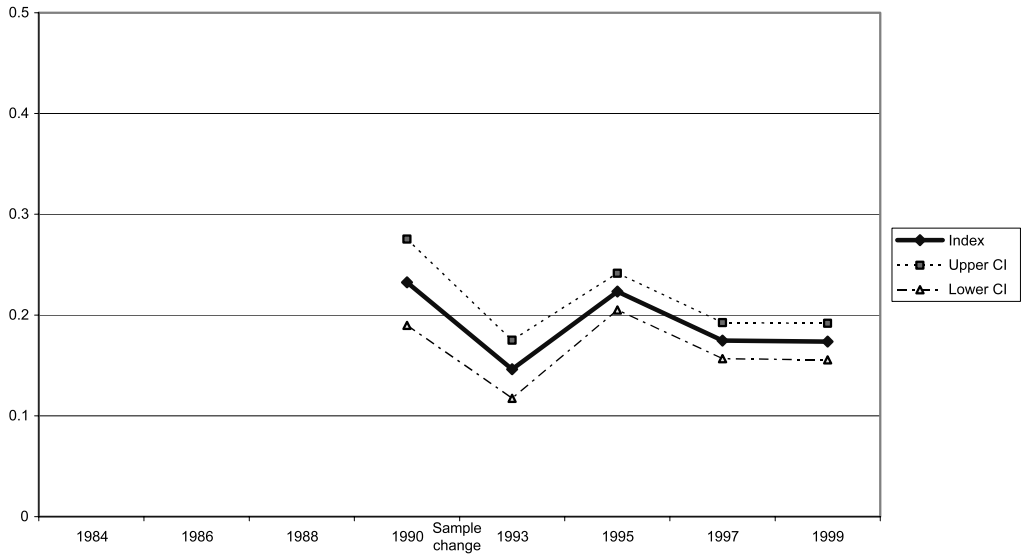Figure 11.   Variance ratio: managerial and professional SEC—Scotland

Figure 12.   Variance ratio: SES composite—England

professional pupils was lowest for Wales up to 1993, and this may support the hypothesis of lower segregation in more comprehensive systems. However, the picture for Wales is rather varied, and hampered by small sample size and changing sampling methods. The composite measure of SES did tend to suggest that, in the 1990s, the trajectory of segregation in Scotland was different from that in England or Wales: it may have fallen slightly in Scotland but risen elsewhere. But gaps in the available data prevent us being sure about that.
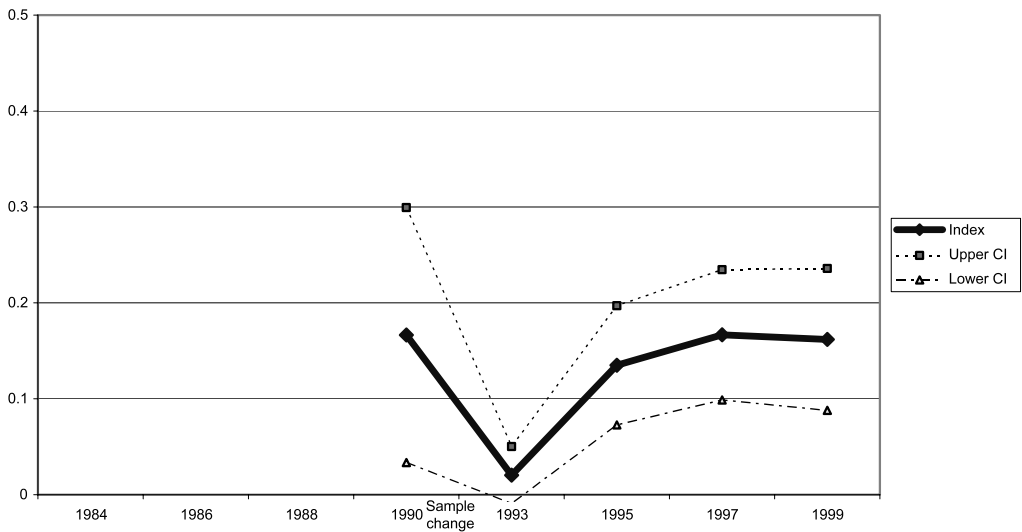

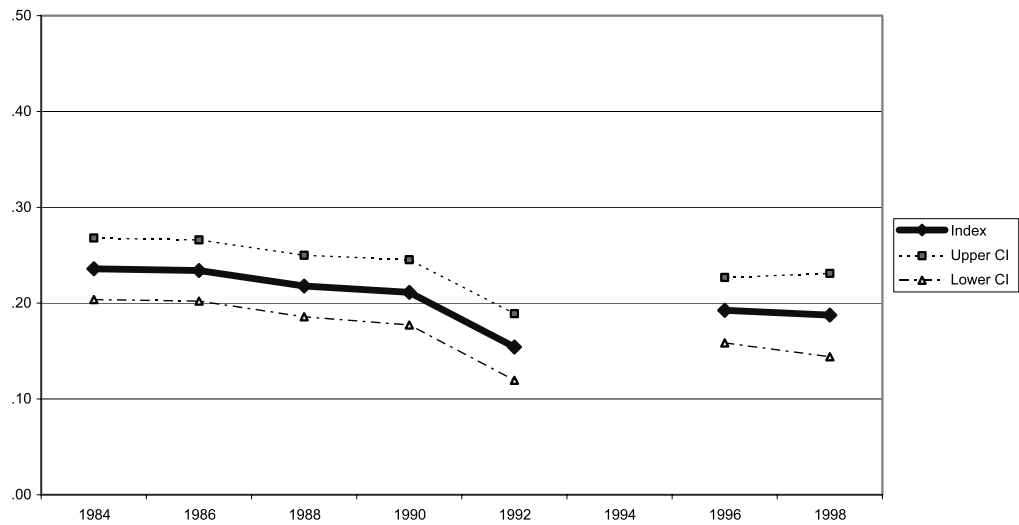Figure 13.   Variance ratio: SES composite—Wales

Figure 14.   Variance ratio: SES composite—Scotland

The segregation indices do not reveal clear upward or downward trends in the period since parental choice legislation was introduced. There is some evidence that working class pupils became more unevenly spread between schools, and that managerial and professional pupils became more isolated. However, there is also some evidence that working class pupils became less isolated, and the variance ratio for working class pupils decreased. These trends are clearer for Scotland than England and Wales, where the general pattern that emerges is continuation of existing levels of segregation. There is some evidence from the variance ratios of an upturn in segregation in England and Wales after the 1988 ERA, followed by decline, and this is supportive of the 'starting-gun effect': this change is evident in the consistent survey series after the sample design had stabilized. Since some social changes may have been working to increase segregation in this period—most notably, the growth of poverty in spatially concentrated form (Dorling & Rees, 2003)—it may even be that, as Gorard has suggested, parental choice has allowed some working class pupils to escape one-class ghettoes. That is all rather speculative, however, on the basis of the data we have here. But we may be entitled to draw one conclusion for Scotland at least: there is no evidence in these data that parental choice legislation has undermined the capacity of comprehensive schooling to keep segregation down.

Our analysis offers some evidence relevant to the debate in this journal between Gorard and Fitz on the one hand and Gibson and Asthana on the other (Gibson & Asthana, 2000, 2002; Gorard & Fitz, 2000; Gorard, 2000, 2002; Noden, 2002), in three respects.

The first is methodological. We have tried to draw on good-quality data sources of the kind that all of these authors say are necessary to making progress in understanding school segregation. These data are not without their problems, as we have

explained, but we do believe that their richness allows the investigation of this topic in an appropriately subtle way. We have also made some methodological suggestions about the calculation of indexes that draw on and supplement those of Gorard and Fitz. In particular, we have suggested using multilevel models to calculate an index analogous to the variance ratio index and allowing us to estimate standard errors of estimates.

The second contribution we have made to this debate concerns our substantive conclusions. These do, on the whole, tend to lend empirical support to the conclusions which Gorard and Fitz drew from their data. As a matter of descriptive fact, there was no consistent increase in the level of segregation in the 1980s and 1990s. As Gorard and Fitz point out, that absence of a trend does itself require explanation, and our data do not permit us to provide any; but, regardless of the explanations that might be offered, we agree with Gorard and Fitz that such results cast doubt on the strong claims made by opponents of markets in education: the least we can say is that parental choice of school does not, in all circumstances, lead to increasing levels of segregation.

One explanation of the absence of consistent trend may be, as Gibson and Asthana (2000) suggest, that levels of segregation are driven much more by overall levels of poverty and by the overall size of schools than by particular policy changes. But here, too, we agree with Gorard (2000) that this point does not invalidate the evidence; it merely points to a possible explanation. Gibson and Asthana (2000) tend to confuse two meanings of 'segregation'—as a process or as an outcome of that process (see, for example, p. 147). We have been describing the outcomes, but explanations would require attention to what we could call the segregating process. Changes in segregation indices do, by definition, measure changes in segregation in the descriptive sense, and—we would argue—are important social facts about the experience of schooling. These changes do not in themselves, as Gibson and Asthana (2002) say and as Gorard (2000, 2002) readily agrees, tell us anything about the process of segregating.

Our third contribution is further caution about whether, even with explanations, any of this would have much to say about school choice as a policy. If choice is independently valued as a good in its own right, then we might be concerned only to know that it does not make segregation worse, which is broadly what we have concluded here. If, by contrast, choice was a good only if it reduced segregation—one of the points allegedly in its favour according to some of its more enthusiastic advocates—then our evidence would not offer conclusive support either way.

Nevertheless, our findings do have implications for the future of policies towards comprehensive schooling in Great Britain. They suggest that the more comprehensive system in Scotland is associated with lower segregation, and the more diversified system in England with greater segregation. In future, these differences may become greater because current education policy in England is pushing forward greater diversity of schools. The Government in England has articulated a new philosophy of comprehensive education based on specialization, collaboration, decentralized control and strong accountability, rather than uniformity, isolation,

centralized control and weak accountability (DfES, 2002). The DfES's (2004) *Five year strategy* included plans to increase school powers further and to enable all schools to become specialist schools by 2008. In Scotland and Wales, by contrast, the devolved administrations remain committed to something closer to the original ideal of the community comprehensive school. They have ruled out specialist schools and the notion that comprehensive principles can be realized by enabling parents to choose from an increasingly diverse range of schools (National Assembly for Wales, 2001; Scottish Executive, 2004). Comparison among these three national systems will therefore continue to provide a form of quasi experiment, allowing research to suggest some of the effects which divergent policies may be having.

Acknowledgements

Notes

1. The method demonstrated here uses student-level data and estimates the between-school percentage of variance in social class origin. It is different from the approach used by Goldstein and Noden (2003) which uses school-aggregate data to estimate variance between schools within education authorities.
2. The analysis was repeated using all cases and found that the broad trends and relationship between national systems did not alter.
3. The sample sizes for Wales are quite small. See Appendix 1.
4. These areas were defined as the post-1996 unitary authorities even prior to their creation.

References

Adler, M. (1997) Looking backwards to the future: parental choice and education policy, *British Educational Research Journal,* 23, 297–313.

Benn, C. & Chitty, C. (1996) *Thirty years on: is comprehensive education alive and well or struggling to survive?* (London, Penguin Books).

Bryk, A. S. & Raudenbush, S. W. (1992) *Hierarchical linear models* (London, Sage).

Croxford, L. (2001) School differences and social segregation: comparison between England, Wales and Scotland, *Education Review,* 15, 68–73.

Croxford, L. (2005) Construction of social class variables. EYT Working Paper 4. Available online at: www.ces.ed.ac.uk/eyt/publications.htm (accessed 31 August 2006).

DfES (2002) *Education and skills: investment for reform* (London, DfES).

DfES (2004) *Five year strategy for children and learners* (London, The Stationery Office).

Dorling, D. & Rees, P. (2003) A nation still dividing: the British census and social polarisation 1971–2001, *Environment and Planning,* 35, 1287–1313.

Gewirtz, S., Ball, S. J. & Bowe, R. (1995) *Markets, choice and equity in education* (Buckingham, Open University Press).

Gibson, A. & Asthana, S. (2000) What's in a number? Commentary on Gorard and Fitz's 'Investigating the determinants of segregation between schools', *Research Papers in Education,* 15(2), 133–153.

Gibson, A. & Asthana, S. (2002) Understanding social polarisation: a possible research agenda, *Research Papers in Education,* 17(4), 414–415.

Goldstein, H. (1995) *Multilevel statistical models* (London, Arnold).

Goldstein, H. & Noden, P. (2003) Modelling social segregation, *Oxford Review of Education,* 29, 225–237.

Goldstein, H. & Noden, P. (2004) A response to Gorard on social segregation, *Oxford Review of Education,* 30, 441–442.

Gorard, S. (2000) Here we go again: a reply to 'What's in a number?' by Gibson and Asthana, *Research Papers in Education,* 15(2), 155–162.

Gorard, S. (2002) The missing impact of marketisation revisited, *Research Papers in Education,* 17(4), 412–414.

Gorard, S. & Fitz, J. (1998) The more things change … the missing impact of marketisation, *British Journal of Sociology of Education,* 19, 365–376.

Gorard, S. & Fitz, J. (2000) Investigating the determinants of segregation between schools, *Research Papers in Education,* 15(2), 115–132.

Gorard, S., Fitz, J. & Taylor, C. (2001) School choice impacts: what do we know?, *Educational Researcher,* October, 18–23.

Gorard, S. & Taylor, C. (2002) What is segregation? A comparison of measures in terms of strong and weak compositional invariance, *Sociology,* 36, 875–895.

James, D. R. & Taeuber, K. E. (1985) Measures of segregation, in: N. B. Tuma (Ed.) *Sociological methodology* (San Francisco, Jossey-Bass), 1–31.

Kish, L. (1965) *Survey sampling* (New York, Wiley).

Massey, D. S. & Denton, N. A. (1988) The dimensions of residential segregation, *Social Forces,* 67, 281–315.

McPherson, A. & Willms, J. D. (1987) Equalisation and improvement: some effects of comprehensive reorganization in Scotland, *Sociology,* 21, 509–539.

National Assembly for Wales (2001) *The learning country: a paving document* (Cardiff, National Assembly for Wales).

Noden, P. (2000) Rediscovering the impact of marketisation: dimensions of social segregation in England's secondary schools, 1994–1999, *British Journal of Sociology of Education,* 21, 371–390.

Noden, P. (2002) Education markets and social polarisation: back to square one?, *Research Papers in Education,* 17(4), 409–411.

Paterson, L. (1991) *Segregation indices and multilevel modelling* (Edinburgh, Centre for Educational Sociology, University of Edinburgh).

Raffe, D., Brannen. K., Croxford, L. & Martin, C. (1999) Comparing England, Scotland, Wales and Northern Ireland: the case for 'home internationals' in comparative research, *Comparative Education,* 35, 9–25.

Rose, D. & O'Reilly, K. (1998) *The ESRC review of Government social classifications* (London, National Statistics and ESRC).

Scottish Executive (2004) *Ambitious, excellent schools* (Edinburgh, Scottish Executive).

Willms, J. D. (1986) Social class segregation and its relationship to pupils' examination results in Scotland, *American Sociological Review,* 51, 224–241.

Willms, J. D. & Paterson, L. (1995) A multilevel model for community segregation, *Journal of Mathematical Sociology,* 20, 23–40.

Willms, J. D. & Echols, F. (1992) Alert and inert clients: the Scottish experience of parental choice of schools, *Economics of Education Review,* 11, 339–350.

Appendix 1. Sample sizes per school

National system	Cohort	Number of cases	Number of schools	Sample size per school				
				Minimum	Lower Q	Median	Upper Q	Maximum
England	1986	9623	884	5	7	10	14	38
	1988	11594	713	5	10	15	21	59
	1990	11552	679	5	10	16	22	73
	1993	10968	1248	5	6	7	10	46
	1995	10839	1329	5	6	7	10	29
	1997	7630	1127	5	5	6	8	18
	1999	8763	1165	5	6	7	9	23
Wales	1986	585	63	5	6	8	12	21
	1988	787	45	6	12	17	22	31
	1990	1071	55	8	15	19	23	45
	1993	466	72	5	5	6	7	11
	1995	690	86	5	6	7	10	21
	1997	600	83	5	5	7	8	15
	1999	408	56	5	5.5	7	9	15
Scotland	1984	5648	391	5	9	14	19	42
	1986	5600	395	5	9	13	18	35
	1988	4872	381	5	8	12	16	33
	1990	3863	346	5	8	10	14	32
	1992	2658	273	5	6	9	12	31
	1996	3548	319	5	7	10	14	28
	1998	6631	381	5	11	16	22	47

Note: The 1984 cohort sample for England and Wales did not include independent schools.

Appendix 2. Multilevel model for variance ratio

$$hi\_ses_{ij} \sim N(XB, \Omega)$$

$$hi\_ses_{ij} = \beta_{0ij}in84_{ij} + \beta_{1ij}in86_{ij} + \beta_{2ij}in88_{ij} + \beta_{3ij}in90_{ij} + \beta_{4ij}in92_{ij} + \beta_{5ij}in96_{ij} + \beta_{6ij}in98_{ij}$$

$$\beta_{0ij} = \beta_0 + u_{0j} + e_{0ij}$$

$$\beta_{1ij} = \beta_1 + u_{1j} + e_{1ij}$$

$$\beta_{2ij} = \beta_2 + u_{2j} + e_{2ij}$$

$$\beta_{3ij} = \beta_3 + u_{3j} + e_{3ij}$$

$$\beta_{4ij} = \beta_4 + u_{4j} + e_{4ij}$$

$$\beta_{5ij} = \beta_5 + u_{5j} + e_{5ij}$$

$$\beta_{6ij} = \beta_6 + u_{6j} + e_{6ij}$$

$$\begin{bmatrix} u_{0j} \\ u_{1j} \\ u_{2j} \\ u_{3j} \\ u_{4j} \\ u_{5j} \\ u_{6j} \end{bmatrix} \sim N(0, \Omega_u) : \Omega_u = \begin{bmatrix} \sigma_{u0}^2 & & & & & & \\ 0 & \sigma_{u1}^2 & & & & & \\ 0 & 0 & \sigma_{u2}^2 & & & & \\ 0 & 0 & 0 & \sigma_{u3}^2 & & & \\ 0 & 0 & 0 & 0 & \sigma_{u4}^2 & & \\ 0 & 0 & 0 & 0 & 0 & \sigma_{u5}^2 & \\ 0 & 0 & 0 & 0 & 0 & 0 & \sigma_{u6}^2 \end{bmatrix}$$

$$\begin{bmatrix} e_{0ij} \\ e_{1ij} \\ e_{2ij} \\ e_{3ij} \\ e_{4ij} \\ e_{5ij} \\ e_{6ij} \end{bmatrix} \sim N(0, \Omega_e) : \Omega_e = \begin{bmatrix} \sigma_{e0}^2 & & & & & & \\ 0 & \sigma_{e1}^2 & & & & & \\ 0 & 0 & \sigma_{e2}^2 & & & & \\ 0 & 0 & 0 & \sigma_{e3}^2 & & & \\ 0 & 0 & 0 & 0 & \sigma_{e4}^2 & & \\ 0 & 0 & 0 & 0 & 0 & \sigma_{e5}^2 & \\ 0 & 0 & 0 & 0 & 0 & 0 & \sigma_{e6}^2 \end{bmatrix}$$

$-2*loglikelihood(IGLS) = 45986.020(34302$ of 34302 cases in use)

Figure A(1). ML model of variance ratio

For each cohort, the index and confidence limits were calculated from the random part as follows:

Index
compute index=(u/(u+e)).

Variance of the index
compute var_index=(1/(u+e)**4)*(((e**2)*(u_se**2)) +((u**2)*(e_se**2))).

This is based on an approximation to the variance of a ratio: see Kish (1965, pp. 206–208), with the further approximation that the covariance of u and e is assumed to be 0.

Standard error of index
compute index_se=sqrt(var_index).

Confidence intervals of index
compute conf=(index_se*1.96).
compute upper=index+conf.
compute lower=index-conf.